



Federal Energy
Regulatory
Commission

Office of
Energy
Projects

November 2016

FERC/FEIS-270F

FINAL ENVIRONMENTAL IMPACT STATEMENT

Volume I

NEXUS Gas Transmission Project and Texas Eastern Appalachian Lease Project



Source: State of Ohio Office of Information Technology

**NEXUS Gas Transmission, LLC
Texas Eastern Transmission, LP
DTE Gas Company
Vector Pipeline L.P.**

Docket Nos.: CP16-22-000
CP16-23-000
CP16-24-000
CP16-102-000

Federal Energy Regulatory Commission
Office of Energy Projects
Washington, DC 20426

Cooperating Agencies:



U.S. Environmental Protection Agency



U.S. Fish and Wildlife Service



US Army Corps
of Engineers®

U.S. Army Corps of Engineers

FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON, D.C. 20426

OFFICE OF ENERGY PROJECTS

In Reply Refer To:
OEP/DG2E/Gas 2
NEXUS Gas Transmission, LLC
Texas Eastern Transmission, LP
DTE Gas Company
Vector Pipeline L.P.
Docket Nos. CP16-22-000
CP16-23-000
CP16-24-000
CP16-102-000

FERC/EIS-270F

TO THE PARTY ADDRESSED:

The staff of the Federal Energy Regulatory Commission (FERC or Commission) has prepared a final environmental impact statement (EIS) for the NEXUS Gas Transmission (NGT) Project and Texas Eastern Appalachian Lease (TEAL) Project (jointly referred to as “Projects”), proposed by NEXUS Gas Transmission, LLC (NEXUS) and Texas Eastern Transmission, LP (Texas Eastern) in the above-referenced dockets. NEXUS and Texas Eastern request authorization to construct a new Greenfield pipeline and expand an existing pipeline system from the Appalachian Basin to deliver 1.5 million dekatherms per day to consuming markets in Northern Ohio, Southeastern Michigan, and Ontario, Canada. DTE Gas Company and Vector Pipeline L.P. are requesting approval to lease capacity on their systems to NEXUS.

The final EIS assesses the potential environmental effects of the construction and operation of the Projects in accordance with the requirements of the National Environmental Policy Act. The FERC staff concludes that approval of the Projects would result in some adverse environmental impacts; however, these impacts would be reduced to acceptable levels with the implementation of NEXUS’s and Texas Eastern’s proposed mitigation measures and the additional measures recommended by staff in the final EIS.

The U.S. Fish and Wildlife Service (FWS), the U.S. Army Corps of Engineers (COE), and the U.S. Environmental Protection Agency (EPA) participated as cooperating agencies in the preparation of the final EIS. Cooperating agencies have jurisdiction by law or special expertise with respect to resources potentially affected by the proposal and participate in the National Environmental Policy Act analysis. Although the FWS, COE, and EPA provided input to the conclusions and recommendations presented in the final EIS, these agencies will each present their own conclusions and recommendations in their respective record of decision or determination for the Projects.

The final EIS addresses the potential environmental effects of the construction and operation of both the NGT and TEAL Projects. The NGT Project consists of about 256.6 miles of pipeline composed of the following facilities:

- 209.8 miles of new 36-inch-diameter natural gas pipeline in Ohio;
- 46.8 miles of new 36-inch-diameter natural gas pipeline in Michigan;
- associated equipment and facilities.

The TEAL Project would include two main components:

- 4.4 miles of new 36-inch-diameter loop pipeline in Ohio;
- 0.3 mile of new 30-inch-diameter interconnecting pipeline Ohio; and
- associated equipment and facilities.

The Projects' proposed aboveground facilities include five new compressor stations in Ohio; additional compression and related modifications to one existing compressor station in Ohio; five new metering and regulating stations in Ohio; one new metering and regulating station in Michigan; and minor modifications at existing aboveground facilities at various locations across Ohio.

The FERC staff mailed copies of the final EIS to federal, state, and local government representatives and agencies; elected officials; environmental and public interest groups; Native American tribes; potentially affected landowners and other interested individuals and groups; and newspapers and libraries near the Projects. Paper copy versions of this final EIS were mailed to those specifically requesting them; all others received a CD version. In addition, the final EIS is available for public viewing on the FERC's website (www.ferc.gov) using the eLibrary link.

A limited number of copies are available for distribution and public inspection at:

Federal Energy Regulatory Commission
Public Reference Room
888 First Street NE, Room 2A
Washington, DC 20426
(202) 502-8371

Questions?

Additional information about the Projects is available from the Commission's Office of External Affairs, at **(866) 208-FERC**, or on the FERC website (www.ferc.gov) using the eLibrary link. Click on the eLibrary link, click on "General Search," and enter

the docket number excluding the last three digits in the Docket Number field (i.e., CP16-22). Be sure you have selected an appropriate date range. For assistance, please contact FERC Online Support at FercOnlineSupport@ferc.gov or toll free at (866) 208-3676; for TTY, contact (202) 502-8659. The eLibrary link also provides access to the texts of formal documents issued by the Commission, such as orders, notices, and rulemakings.

In addition, the Commission offers a free service called eSubscription that allows you to keep track of all formal issuances and submittals in specific dockets. This can reduce the amount of time you spend researching proceedings by automatically providing you with notification of these filings, document summaries, and direct links to the documents. Go to www.ferc.gov/docs-filing/esubscription.asp to subscribe.

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LIST OF ACRONYMS

°F	degrees Fahrenheit
µg/m ³	micrograms per cubic meter
ACHP	Advisory Council on Historic Preservation
ACR	Abandonment and Capacity Restoration Project
ACS	American Community Survey
AG-PEM	agricultural palustrine emergent
AMSL	Above Mean Sea Level
ANR	ANR Pipeline Co.
ANR East	ANR East Pipeline Project
APE	area of potential effect
AQCR	Air Quality Control Regions
ATWS	additional temporary workspace
AWS	agricultural water supply
BA	Biological Assessment
BCC	Birds of Conservation Concern
BGEPA	Bald and Golden Eagle Protection Act
BMP	best management practices
CAA	Clean Air Act of 1970 and its 1977 and 1990 amendments
CAUV	Current Agricultural Use Value
CAZ	critical assessment zone
CEQ	Council on Environmental Quality
Certificate	Certificate of Public Convenience and Necessity
CFR	Code of Federal Regulations
cfs	cubic feet per second
CH ₄	Methane
Chippewa MWCD	Chippewa Subdistrict of the Muskingum Watershed Conservancy District
CMNH	Cleveland Museum of Natural History
CO	carbon monoxide
CO ₂	carbon dioxide
CO _{2e}	carbon dioxide equivalent
Columbia	Columbia Gas Transmission
Commission	Federal Energy Regulatory Commission
CORN	Coalition to Reroute NEXUS
CREP	Conservation Reserve Enhancement Program
CRP	Conservation Reserve Program

LIST OF ACRONYMS

CS	compressor station
CVSR	Cuyahoga Valley Scenic Railroad
CWA	Clean Water Act
CZMA	Coastal Zone Management Area
dBA	A-weighted decibels
dbh	diameter at breast height
DDAGW	Division of Drinking and Ground Water
DEO	Dominion East Ohio
DHHS	U.S. Department of Health and Human Services
Dominion	Dominion Transmission
DOE	Department of Energy
DOT	U.S. Department of Transportation
DTE Gas	DTE Gas Company
Dth/d	dekatherms per day
<i>E&SCP</i>	<i>Erosion and Sediment Control Plan</i>
EI	Environmental Inspector
EIS	Environmental Impact Statement
EM	electromagnetic
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FERC OEP	FERC's Office of Energy Projects
<i>FERC Plan</i>	<i>Upland Erosion Control, Revegetation, and Maintenance Plan</i>
<i>FERC Procedures</i>	<i>Wetland and Waterbody Construction and Mitigation Procedures</i>
FHWA	Federal Highways Administration
FSA	Farm Service Agency
FWS	U.S. Fish and Wildlife Service
g	gravity
GHG	greenhouse gases
GIS	geographic information systems
gpm	gallons per minute
GWP	global warming potential
HAP	hazardous air pollutant
HCA	high-consequence area
HDD	horizontal directional drill

LIST OF ACRONYMS

<i>HDD Plan</i>	<i>HDD Monitoring and Inadvertent Return Contingency Plan</i>
hp	horsepower
HPSA	Health Professional Shortage Area
HUC	Hydrologic Unit Code
IMP	Integrity Management Program
IPCC	Intergovernmental Panel on Climate Change
<i>ISMP</i>	<i>Invasive Species Management Plan</i>
IWS	industrial water supply
kV	kilovolt
L _{dn}	day-night sound level
L _{eq}	equivalent sound level
M&R	metering and regulating
MAC	Michigan Administrative Code
MAOP	maximum allowable operating pressure
<i>MBCP</i>	<i>Migratory Bird Conservation Plan</i>
MBTA	Migratory Bird Treaty Act
MDEQ	Michigan Department of Environmental Quality
MDNR	Michigan Department of Natural Resources
Memorandum	Memorandum of Understanding on Natural Gas Transportation Facilities
MLV	mainline valve
MMBtu/hr	million British thermal units per hour
MNFI	Michigan Natural Features Inventory
MP	milepost
MUA/P	Medically Underserved Area or Population
MWH	modified warm water habitat
N ₂ O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NCNST	North Country National Scenic Trail
NEPA	National Environmental Policy Act
NESHAP	National Emission Standards for Hazardous Air Pollutants for Source Categories
NEXUS	NEXUS Gas Transmission, LLC
NGA	Natural Gas Act
NGT Project	NEXUS Gas Transmission Project
NHA	National Heritage Area
NHPA	National Historic Preservation Act

LIST OF ACRONYMS

NMFS	National Marine Fisheries Service
NNSR	Nonattainment New Source Review
NOAA	National Oceanic and Atmospheric Administration
<i>NOI</i>	<i>Notice of Intent</i>
NOP	National Organic Program
NO _x	nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NRI	National Rivers Inventory
NSA	noise sensitive area
NSPS	New Source Performance Standards
NSR	New Source Review
NWI	National Wetland Inventory
OAC	Ohio Administrative Code
OCRM	Ocean and Coastal Resource Management
ODGS	Ohio Division of Geologic Survey
ODNR	Ohio Department of Natural Resources
ODOT	Ohio Department of Transportation
OEMA	Ohio Emergency Management Agency
OEP	Office of Energy Projects
OEPA	Ohio Environmental Protection Agency
OFTL	Ohio Forest Tax Law
OPEN	Ohio Pipeline Energy Network
ORAM	Ohio Rapid Assessment Method
ORV	outstandingly remarkable value
OSW	Ohio Special Waters
PADEP	Pennsylvania Department of Environmental Protection
Panhandle Eastern	Panhandle Eastern Pipe Line
Pb	(airborne) lead
pCi/L	picocuries per liter
PEM	palustrine emergent
PFO	palustrine forested
PGA	peak ground acceleration
PHMSA	Pipeline and Hazardous Materials Safety Administration

LIST OF ACRONYMS

PM ₁₀	inhalable particulate matter with an aerodynamic diameter less than or equal to 10
PM _{2.5}	inhalable particulate matter with an aerodynamic diameter less than or equal to 2.5
ppb	parts per billion
ppm	parts per million
PSD	Prevention of Significant Deterioration
PSS	palustrine scrub-shrub
PTE	potential to emit
PTIO	Permit-to-Install-and-Operate
PUB	palustrine unconsolidated bottom
PVC	polyvinyl chloride
PWS	Public Water System
RACER	Revitalizing Auto Communities Environmental Response
<i>RCP</i>	<i>Residential Construction Plan</i>
REX	Rockies Express Pipeline
RHA	Rivers and Harbor Act
Rover	Rover Pipeline, LLC
RR	Resource Report
SDWA	Safe Drinking Water Act
SHPO	State Historic Preservation Office
SO ₂	sulfur dioxide
<i>SPCC Plan</i>	<i>Spill Prevention, Control, and Countermeasure Plan</i>
SSA	sole source aquifer
SSURGO	Soil Survey Geographic database
Structure II-A	Muskingum Watershed Conservation District's Structure II-A
SWAP	Source Water Assessment Program
SWAPP	Source Water Assessment and Protection Program
TEAL Project	Texas Eastern Appalachian Lease Project
Texas Eastern	Texas Eastern Transmission, LP
TGP	Tennessee Gas Pipeline Company, LLC
tpy	tons per year
TSA	Transportation Safety Administration
USACE	U.S. Army Corps of Engineers
USC	United States Code
USDA	U.S. Department of Agriculture
USGCRP	U.S. Global Change Research Program

LIST OF ACRONYMS

USGS	U.S. Geological Survey
Vector	Vector Pipeline L.P.
VOC	volatile organic compound
WHPA	Wellhead Protection Area
WHPP	Wellhead Protection Program
WNS	White Nose Syndrome
WWH	warm water habitat

EXECUTIVE SUMMARY

INTRODUCTION

On November 20, 2015, NEXUS Gas Transmission, LLC (NEXUS) filed an application with the Federal Energy Regulatory Commission (FERC or Commission) in Docket No. CP16-22-000 pursuant to Section 7(c) of the Natural Gas Act (NGA) and Parts 157 and 284 of the Commission's regulations. NEXUS is seeking a Certificate of Public Convenience and Necessity (Certificate) to construct, own, and operate a new natural gas pipeline system in Ohio and Michigan. NEXUS' proposed project is referred to as the NEXUS Gas Transmission Project (NGT Project).

On November 20, 2015, Texas Eastern Transmission, LP (Texas Eastern) filed an abbreviated application with FERC in Docket No. CP16-23-000 pursuant to Sections 7(b) and 7(c) of the NGA and Parts 157 and 284 of the Commission's regulations for a Certificate to construct, own, and operate a natural gas pipeline and related facilities in Ohio as well as approval to abandon by lease to NEXUS the capacity created by the Texas Eastern Appalachian Lease Project (TEAL Project) facilities. Collectively the applications are referred to as the "Projects."¹

The purpose of this environmental impact statement (EIS) is to inform FERC decision-makers, the public, and the permitting agencies about the potential adverse and beneficial environmental impacts of the Projects, as well as alternatives, and recommend mitigation measures that would reduce adverse impacts to the extent practicable. We² prepared this EIS to assess the environmental impacts associated with construction and operation of the Projects as required under the National Environmental Policy Act of 1969 (NEPA), as amended. Our analysis was based on information provided by the applicants and further developed from data requests; field investigations; scoping; literature research; contacts with or comments from federal, state, and local agencies; and comments from individual members of the public.

The U.S. Environmental Protection Agency (EPA), U.S. Fish and Wildlife Service (FWS), and U.S. Army Corps of Engineers (USACE) are participating as cooperating agencies in the preparation of this EIS.³

PROPOSED ACTION

The NGT and TEAL Projects include about 261.3 miles of pipeline composed of the following facilities:

- NEXUS' mainline, which consists of about 255.7 miles of new 36-inch-diameter mainline pipeline in Ohio and Michigan;
- NEXUS' interconnecting pipeline, which consists of about 0.9 mile of new 36-inch-diameter interconnecting pipeline in Ohio;

¹ In a related matter, on November 24, 2015, DTE Gas Company (DTE Gas) filed an application with FERC in Docket No. CP16-24-000 seeking approval of a lease of capacity on DTE Gas's system to NEXUS. On March 11, 2016, Vector Pipeline L.P. (Vector) filed an application with FERC in Docket No. CP16-102-000 seeking approval of a lease of capacity on Vector's system to NEXUS. Any new or modified facilities associated with these actions are proposed to be constructed under an existing Blanket Certificate or are under the jurisdiction of another agency or country.

² "We," "us," and "our" refer to the environmental staff of FERC's Office of Energy Projects.

³ A cooperating agency has jurisdiction by law or special expertise with respect to environmental impacts involved with the proposed project and is involved in the NEPA analysis.

- Texas Eastern’s pipeline loop, which comprises about 4.4 miles of new 36-inch-diameter loop pipeline in Ohio; and
- Texas Eastern’s connecting pipeline, which comprises about 0.3 mile of new 30-inch-diameter interconnecting pipeline in Ohio.

The Projects’ aboveground facilities include:

- NEXUS’ 4 new compressor stations, 6 new metering and regulating (M&R) stations, and 16 new mainline valves;
- Texas Eastern’s new compressor station, modifications of an existing compressor station, two new pig⁴ launchers/receivers, and temporary pig launcher/receiver; and
- additional new facilities and modifications, such as pig launchers/receivers, communication towers, and regulators, installed at other aboveground facility sites.

Subject to the receipt of FERC authorization and all other applicable permits, authorizations, and approvals, the applicants anticipate starting construction as soon as possible, with an in-service date of November 2017, except for Texas Eastern’s modifications to its existing compressor station, which has an in-service date of October 2018.

The Projects would provide for the transportation of 1.5 million dekatherms per day of natural gas from the Appalachian Basin to consuming markets in Northern Ohio and Southeastern Michigan as well as the Dawn Hub in Ontario, Canada. Supply also would be able to reach the Chicago Hub in northern Illinois and other Midwestern markets through interconnections with other pipelines. NEXUS indicated that the need for the Projects originates from an increase in demand for natural gas in the region for electric generation, home heating, and industrial use, coupled with a decrease of imports of natural gas to the region by traditional supply sources, mainly western Canada and the Gulf Coast. The Projects would meet this need by importing natural gas to the region from newly available sources, mainly the Appalachian Basin.

PUBLIC INVOLVEMENT

On January 9, 2015, and January 26, 2015, FERC began its pre-filing review of the NGT Project and TEAL Project, respectively, and established pre-filing Docket Nos. PF15-10-000 and PF15-11-000 to place information related to the Projects into the public record.

On April 8, 2015, FERC issued a *Notice of Intent to Prepare an Environmental Impact Statement for the Planned Nexus Gas Transmission Project and Texas Eastern Appalachian Lease Project, Request for Comments on Environmental Issues, and Notice of Public Scoping Meetings (NOI)*. The *NOI* was published in the Federal Register on April 15, 2015, and mailed to 4,319 interested parties, including federal, state, and local agencies; elected officials; environmental and public interest groups; Native American tribes; potentially affected landowners; local libraries and newspapers; and other stakeholders who had indicated an interest in the NGT and TEAL Projects. Publication of the *NOI* established a 30-day public comment period for the submission of comments, concerns, and issues related to the environmental aspects of the Projects.

Between April 28, 2015 and May 7, 2015, FERC conducted public scoping meetings in Grafton, Wadsworth, Louisville, Swanton, and Fremont, Ohio; and Tecumseh, Michigan to provide an opportunity

⁴ A pig is an internal tool that can be used to clean and dry a pipeline and/or to inspect it for damage or corrosion. A pig launcher/receiver is an aboveground facility where pigs are inserted into or received from the pipeline.

for agencies, stakeholders, and the general public to learn more about the planned pipeline Project and participate in the environmental analysis by commenting on the issues to be addressed in the draft EIS.

On April 15, 2016, the Commission issued a letter to certain affected landowners describing route modifications on the NGT Project, inviting newly affected landowners to participate in the environmental review process, and opening an additional 30-day scoping period.

On July 8, 2016, we issued a *Notice of Availability of the Draft Environmental Impact Statement for the Proposed NEXUS Gas Transmission Project and Texas Eastern Appalachian Lease Project* on July 8, 2016. The notice of availability was published in the Federal Register on July 14, 2016, and mailed to 5,786 parties, including federal, state, and local agencies; elected officials; Native American tribes; newspapers; public libraries; intervenors; and other interested parties (i.e., affected landowners, miscellaneous individuals, and environmental groups who provided scoping comments or asked to remain on the mailing list). The Federal Register notice established a 45-day comment period on the draft EIS that ended on August 29, 2016.

Between August 10, 2016 and August 18, 2016, FERC conducted public comment meetings in Swanton, Fremont, Elyria, Wadsworth, and Uniontown, Ohio; and Tecumseh, Michigan to provide an opportunity for agencies, stakeholders, and the general public to provide comments on the draft EIS.

On October 6, the Commission issued a letter to landowners along the Chippewa Lake D Route Variation opening a special 30-day comment period. The letter explained that NEXUS was proposing to modify a route variation recommended by the FERC in the draft EIS, and requested comments and concerns from the newly affected landowners

Substantive environmental issues identified through this public review process are addressed in this EIS. The transcripts of the public scoping meetings and all written comments are part of FERC's public record for each Project and are available for viewing using the appropriate docket number.

ENVIRONMENTAL IMPACTS AND MITIGATION

We evaluated the potential impacts of construction and operation of the Projects on geology; soils; water resources; wetlands; vegetation; wildlife and aquatic resources; threatened, endangered, and special status species; land use, recreation, and visual resources; socioeconomics; cultural resources; air quality and noise; reliability and safety; and cumulative impacts. Where necessary, we recommend additional mitigation measures to minimize or avoid these impacts. In section 3.0 of this EIS, we summarize the evaluation of alternatives to the Projects, including the no-action alternative, system alternatives, major route alternatives, and minor route variations. Sections 5.1 and 5.2 of the EIS contain our conclusions and a compilation of our recommended mitigation measures, respectively.

Construction of the Projects would affect a total of 5,223.7 acres of land, including land for the pipeline facilities, aboveground facilities, contractor yards, staging areas and access roads. Permanent operations would require about 1,741.9 acres of land, including land for the new permanent pipeline rights-of-way, aboveground facility sites, and permanent access roads. The remaining 3,481.8 acres of land disturbed during construction would be restored and allowed to revert to its former use.

Important issues identified as a result of our analyses, scoping comments, comments on the draft EIS, and agency consultations include impacts on geology; water resources, and wetlands; vegetation, wildlife, and aquatic species; special status species; land use, recreation, and visual resources; cultural resources; air quality and noise; safety and reliability; and cumulative impacts.

Geology

The overall effect of the Projects on geologic resources would be minor. Geologic impacts would be limited to disturbance to the existing topography within the Project areas. All areas disturbed during construction, including in rugged terrain, would be returned as closely as possible to preconstruction contours during cleanup and restoration.

The removal of bedrock, including by blasting, may be required if bedrock is encountered within the pipeline trench or at aboveground facility sites. NEXUS and Texas Eastern would comply with all federal, state, and local blasting regulations and have developed *Blasting Plans* that describe the measures that would be implemented to minimize potential blasting-related impacts. We have reviewed the applicants' *Blasting Plans* and find them acceptable.

The potential for seismic activity, active faults, or soil liquefaction to adversely affect the Projects is low due to the low probability of significant earthquakes in the area. The Projects would not impact active mineral resource operations.

The potential for landslides to adversely affect the NGT Project also is low; however, the TEAL Project is in an area of elevated landslide risk. During final design, Texas Eastern has committed to conducting geotechnical investigations to further evaluate landslide risk in areas of steep slopes, and would implement best management practices as outlined in its *Erosion and Sediment Control Plan (E&SCP)* to manage surface water and maintain slope stability. We have reviewed the *E&SCP* and found it consistent with our *Upland Erosion Control, Revegetation, and Maintenance Plan* and *Wetland and Waterbody Construction and Mitigation Procedures*. Where the *E&SCP* differed from our plans, we found the modifications acceptable. To ensure landslide risks are appropriately mitigated, Texas Eastern would file the results of the geotechnical studies and final landslide mitigation measures with the Commission for review and approval prior to construction.

There are areas along the NGT Project where a karst hazard may be present; no karst hazards exist along the TEAL Project. NEXUS has routed the NGT Project to avoid known sinkholes and conducted electromagnetic geophysical surveys to identify additional karst. The survey data are currently being analyzed to identify additional karst features along the alignment that might warrant further investigation and engineering design. NEXUS has indicated that all construction supervisory staff and inspectors would be trained to recognize the signs of sinkhole formation. If previously undocumented karst features are encountered during construction, NEXUS would implement a minor reroute if possible to avoid the feature, or stabilize the feature to avoid further sinkhole development. To further minimize risk associated with karst, we recommend that prior to construction NEXUS should file with the Commission the results of geophysical surveys. If previously unidentified karst features are found, NEXUS also should file for review and written approval of the Commission its plans to avoid or mitigate the features prior to construction.

Ground subsidence could occur in areas where abandoned underground mines are crossed. NEXUS has routed the NGT Project to avoid all known abandoned underground mines. Texas Eastern has routed the TEAL Project above abandoned underground mines at the same location as its existing facilities, which have been unaffected by mine subsidence. NEXUS would implement additional investigation (and mitigation, if necessary) in the event that a previously undocumented abandoned underground mine is discovered prior to, or during construction. Comments received during draft EIS comment period identified possible recent mine subsidence in Summit County, Ohio. Because of the recent nature of this possible subsidence, and the presence of mapped abandoned underground mines nearby, we recommend that prior to construction NEXUS should conduct a geophysical investigation at Summit County parcel number 2400603 and file the report, including appropriate avoidance and mitigation measures, with the Commission for review and written approval.

Flash flooding is a potential hazard in the Project areas. NEXUS and Texas Eastern would bury the pipeline to a depth that would provide at least 5 feet of cover below the existing streambed to minimize impacts from flash flooding, scouring, and high flow velocities. In addition, NEXUS and Texas Eastern would implement the measures in their respective *E&SCPs* to reduce the likelihood of sedimentation and erosion during flash flood events.

With the implementation of NEXUS' and Texas Eastern's *E&SCPs*, *Blasting Plans*, plans to further evaluate landslide risk, procedures to be followed in the event of discovery of previously undocumented karst features or abandoned underground mines, and our recommendations, we conclude that impacts on geological resources would be adequately minimized and would not be significant.

Soils

The Projects would traverse a variety of soil types and conditions. The applicants would implement the mitigation measures contained in their respective *E&SCPs* to control erosion, segregate topsoil, enhance successful revegetation, and minimize any potential adverse impacts on soil resources, including impacts on crop productivity. Additionally, the applicants would implement their respective *Spill Prevention, Containment, and Countermeasure Plans (SPCC Plans)* during construction and operation to prevent and contain, and if necessary clean up, accidental spills of any material that may contaminate soils. We have reviewed the *SPCC Plans* and find them acceptable. We received comments during the draft EIS comment period concerning the adequacy of soil handling on the Projects, particularly in agricultural land. To address these concerns, we recommended that NEXUS file with the Secretary an *Agricultural Impact Mitigation Plan* detailing construction and restoration measures to be implemented on the NGT Project to address agricultural issues unique to Ohio and Michigan. We also recommended that NEXUS file a 5-year post-construction monitoring program to evaluate crop productivity in areas impacted by construction. Given these measures, we conclude that construction of the Projects would not significantly alter the soils of the region.

Groundwater, Surface Water, Water Use, and Wetlands

Construction of the Projects could result in increased turbidity and alteration of flow in shallow aquifers if encountered within trench depth or during grading and excavation at aboveground facilities. These impacts would be minimized by measures included in the applicants' *E&SCPs*. An inadvertent release of fuel, lubricants, and other substances would be minimized and mitigated by implementing the applicants' Project-specific *SPCC Plans* that identify contractor training; the use of environmental inspectors; procedures for the safe storage and use of hazardous materials; and remedial actions that would be taken to address a spill.

The NGT Project would cross 16 Wellhead Protection Areas (WHPA) at 26 locations. The TEAL Project would not cross any WHPAs. Implementation of NEXUS' *E&SCP* and *SPCC Plan* would be mitigating factors protecting WHPAs, as would our recommendation for NEXUS to consult with water suppliers in the WHPAs regarding recommended mitigation.

A total of 245 wells and 6 springs were identified within 150 feet of the Projects. Additionally, the NGT Project would cross 16 wellhead protection areas; the TEAL Project would not cross any wellhead protection areas. To mitigate impacts on wells, springs, and wellhead protection areas, the applicants would implement their *SPCC Plans* to avoid, minimize, and mitigate any chemical spills, and would prohibit fueling within 200 feet of a private well and within 400 feet of a public well. The applicants also would offer to conduct pre- and post-construction testing of water quality and yield in all wells within 150 feet of the construction workspace, and would repair or replace any wells that are adversely affected, or would otherwise compensate the owner. Additionally, NEXUS has committed to conduct pre-and post-construction testing at springs if requested by a landowner, and we have recommended that Texas Eastern

conduct similar pre- and post-construction testing. We also have recommended that NEXUS and Texas Eastern repair or replace the water supply of any springs that are damaged by construction, or otherwise compensate the owner of the spring. We conclude that these measures would be protective of nearby wells and springs.

NEXUS proposes to use the horizontal directional drill (HDD) construction method at 18 locations, whereas Texas Eastern would not use the HDD method. An inadvertent release of drilling mud could occur during drilling operations, affecting groundwater turbidity, which would diminish with time and distance from the point of release. NEXUS would implement measures detailed in its Project-specific *HDD Design Report* and *HDD Monitoring and Inadvertent Return Contingency Plan* to avoid or minimize the inadvertent release of drilling mud. We have reviewed the plans and find that it would be protective of groundwater resources in the NGT Project area.

The Projects would not significantly affect groundwater resources because the majority of construction would involve shallow, temporary, and localized excavation. Potential impacts would be avoided or further minimized by the use of construction techniques and mitigation measures described in the applicants' *E&SCPs* and *SPCC Plans*, and NEXUS' *HDD Design Report* and *HDD Monitoring and Inadvertent Return Contingency Plan*, as well as our recommendations.

The Projects would cross a total of 478 waterbodies (216 perennial, 155 intermittent, 93 ephemeral, 11 ponds, and 3 reservoirs). The applicants would use the HDD method to cross 30 waterbodies at 16 HDD locations, including all Section 10 navigable, National River Inventory-designated, and Ohio Environmental Protection Agency (Ohio EPA) -designated outstanding and superior water quality streams. The applicants would use the conventional bore method to cross 69 waterbodies. The remaining waterbodies would be crossed using dry (dam-and-pump or flume) and open-cut wet crossing methods. Successful implementation of HDD or bore methods would avoid impacts on waterbodies. Impacts on waterbodies that would be crossed using dry and open-cut wet crossing methods would be minimized by implementing mitigation measures outlined in the applicants' *E&SCPs* and other project-specific plans. We further recommend that, prior to starting each HDD, NEXUS file with the Commission for review and approval a site-specific contingency crossing plan.

The Projects would cross 12 surface water protection areas and 5 waterbodies that have public water intakes within 3 miles downstream. The applicants would avoid or minimize impacts by implementing the BMPs detailed in each Projects' *E&SCP* and *SPCC Plan*, and the NEXUS Project *Blasting Plan*, if needed, and would use HDD and conventional bore crossing methods for several stream crossings.

The applicants requested use of additional temporary workspace (ATWS) in several areas where it concluded that site-specific conditions do not allow for a 50-foot setback of extra workspace from waterbodies. Based on our review, we believe that the applicants have provided adequate justification for the need of the ATWS at all locations on the Projects.

No long-term effects on surface waters would result from construction and operation of the Project. No designated water uses would be permanently affected. During maintenance activities in or near streams, the applicants would employ protective measures similar to those proposed for construction of the Projects. Consequently, we conclude that any maintenance-related effects would be short term.

The applicants would use both surface water and water trucks as sources for hydrostatic testing (about 68.3 million gallons), the HDD construction method (about 1.8 million gallons), and dust suppression (amount would be highly variable based on the conditions at the time of construction). The source of water transported by trucks could be from municipal or groundwater sources. Impacts associated with the withdrawal of surface water would be effectively minimized by using pumps placed adjacent to the waterbody with hoses placed into the waterbody with floating intake structures that would be screened

to prevent the uptake of aquatic organisms and fish. Additionally, water withdrawals would be conducted in compliance with all necessary permits required for surface water extraction. Discharge of water to upland areas could contribute to erosion, which would be minimized by adhering to the measures contained in the Projects' *E&SCPs*.

Based on the mitigation measures developed by the applicants as described in this summary, as well as our recommendations, we conclude that the Projects would not have a significant adverse impact on surface water resources.

Construction of the pipeline facilities associated with the Projects would temporarily affect a total of 199.7 acres of wetlands. No wetlands would be permanently filled. Impacts on emergent wetlands would be relatively brief because the emergent vegetation would regenerate quickly, typically within one to three years. Impacts on scrub-shrub and forested wetlands would be long-term or permanent because the woody vegetation would take several years to grow back. Additionally, the applicants would maintain a 10-foot-wide corridor centered over the pipeline in an herbaceous state and would selectively cut trees within 15 feet of the pipeline centerline. Approximately 41.1 acres would be converted from forested or scrub-shrub wetland to emergent or scrub-shrub wetland.

Construction and operation-related impacts on wetlands would be mitigated by the applicants. NEXUS would create a project-specific *Wetland Mitigation Plan* in consultation with the USACE, Michigan Department of Environmental Quality (MDEQ), and Ohio EPA, where mitigation would include the purchase of wetland mitigation credits from established wetland mitigation banks, the use of an in-lieu fee program, or a combination of the two. Texas Eastern would create a project-specific *Wetland Mitigation Plan* in consultation with USACE and Ohio EPA. Mitigation would include the purchase of wetland mitigation credits from established wetland mitigation banks, the use of an in-lieu fee program, or a combination of the two. We recommend that each applicant file its final *Wetland Mitigation Plan* with the Commission prior to construction.

The applicants requested use of ATWS in several areas where they concluded that site-specific conditions do not allow for a 50-foot setback of extra workspace from wetlands. Based on our review, we believe that the applicants have provided adequate justification for the need of the ATWS at all locations on the Projects.

Based on the types and amounts of wetlands that would be impacted and the applicants' measures to avoid, minimize, and mitigate wetlands impacts as described in their construction and restoration plans, as well as our recommendations, we conclude that impacts on wetlands would be effectively minimized or mitigated. These impacts would be further minimized and mitigated by the applicants' compliance with USACE Section 404 and state permit requirements, including the purchase of wetland mitigation credits and use of in-lieu fee programs.

Vegetation, Wildlife, and Aquatic Resources

Construction of the Projects would affect 371.5 acres of forested upland, 43.3 acres of forested wetland, 571.8 acres of open upland, 43.8 acres of emergent wetland, and 19.5 acres of scrub-shrub wetland. The remaining 4,202.7 acres are agricultural land, developed land, or open water. Operation of the Projects would affect 148.0 acres of forested upland, 26.7 acres of forested wetland, 154.5 acres of open upland, 21.0 acres of emergent wetland, and 10.0 acres of scrub-shrub wetland. The remaining 1,347.4 acres are agricultural land, developed land, or open water.

Impacts on upland open land, emergent wetlands, and agricultural lands would be short-term as these vegetation cover types would likely return to their pre-construction states within one to three growing seasons after restoration is complete and typically not require maintenance mowing. The exception would

be at aboveground facilities where construction would permanently convert existing vegetation cover into an industrial site.

Impacts on forested uplands, forested wetlands, and scrub-shrub wetlands would be long-term or permanent. However, due to the prevalence of forested habitats within the Projects area, the ability to co-locate the proposed facilities adjacent to existing rights-of-way (46 percent of the route would be co-located), and the eventual regrowth of forested areas outside of the permanent right-of-way, we conclude that the permanent conversion of forested lands would not result in a significant impact. In addition, impacts on forested and non-forested vegetation types would be further mitigated through implementation of the applicants' construction and restoration plans and our recommendations.

The NGT Project would cross approximately 9.7 miles of the Oak Openings Region in Henry and Fulton Counties, Ohio. Roughly 99 percent of the ecosystem has been altered and fragmented by agricultural development, primarily through tree clearing and wetland draining. Botanical surveys confirmed two remnant communities totaling about 0.5 miles in length would be crossed by the NGT Project: the Swamp White Oak-Pin Oak Flatwoods and the Black Oak-White Oak/Blueberry Forest Plant communities. Neither of these areas contained all of the indicative species that would be present in high-quality remnant communities, and most of the clearing would be adjacent to the existing forest edge. Therefore, based on our review, impacts on the Oak Openings Region would be minor.

Construction of the Projects would temporarily impact about 1,049.9 acres of pollinator habitat (including upland forest, forested wetland, upland open land, emergent wetland, and scrub-shrub wetland). The applicants would revegetate both the temporary workspaces and permanent rights-of-way immediately after the pipeline facilities are installed with herbaceous and riparian seed mixes in consultation with the Natural Resources Conservation Service. Once revegetated, the restored workspaces and permanent rights-of-way would provide pollinator habitat after the first or second growing season, and may naturally improve pollinator habitat along the Project areas. We recommended prior to construction of the Projects, the applicants should provide plans describing the feasibility of incorporating plant seeds that support pollinators into the seed mixes used for restoration of construction workspaces.

The applicants have identified several areas where noxious weeds or invasive species are present or are located near the construction right-of-way. NEXUS and Texas Eastern have each developed *Invasive Species Management Plans* to minimize and control the spread of the noxious and invasive species, which we reviewed and find acceptable.

The Projects could have both direct and indirect impacts on wildlife species and their habitats, including the displacement of wildlife, potential individual mortality, and reduction in habitat. Forest fragmentation would increase in certain locations due to clearing, thus reducing the amount of habitat available for interior forest species (i.e. movement and dispersal corridors). With habitat conversion and forest fragmentation, there is also a risk of intrusion by invasive or noxious species. To minimize wildlife impacts, the applicants have routed the pipelines to avoid a number of sensitive areas, co-locate with existing rights-of-way where practical, and reduce workspace in wetlands and interior forest areas. The applicants also would adhere to their *E&SCPs* and respective *Invasive Species Management Plans*.

A variety of migratory bird species, including Birds of Conservation Concern, are associated with the habitats that would be affected by the Projects. NEXUS has prepared a final *Migratory Bird Conservation Plan* in coordination with the FWS Region 3 office for the NGT Project. The purpose of the plan is to reduce direct and indirect effects on migratory birds and their habitats. During operations, the applicants would avoid mortalities or injuries of breeding birds and their eggs or young by conducting vegetation clearing and maintenance activities outside of the breeding season to the extent practicable, particularly in key habitat areas. Vegetative maintenance in the permanent right-of-way would take place

no more than once every 3 years, and impacts on ground-nesting birds in upland areas would be minimized by conducting maintenance activities outside the nesting season (March 31 to August 1).

The Projects would involve 478 waterbody crossings, many of which support fisheries and aquatic habitat. All of the waterbodies are classified as warmwater fisheries. To minimize impacts on fisheries and aquatic habitat, the applicants would follow their respective *E&SCPs*. Further, all waterbodies identified as fisheries of concern (potentially containing federal or state-listed species) would be crossed using dry crossing methods or HDDs. Based on our review of the potential impacts, we conclude that construction and operation of the Projects would not significantly impact fisheries or aquatic resources.

Based on the presence of suitable adjacent habitat available for use and given the impact avoidance, minimization, and mitigation measures proposed by NEXUS, as well as our recommendations, we conclude that the construction and operation of the Projects would not have a significant adverse effect on vegetation, wildlife, or aquatic species.

Threatened, Endangered, and Other Special Status Species

To comply with Section 7 of the ESA, we consulted either directly or indirectly (through the applicants' informal consultation) with the FWS and state resource agencies regarding the presence of federally listed, proposed for listing, or state-listed species in the Project areas. Based on these consultations, we identified 11 federally listed or proposed species as potentially occurring in the Project areas. We determined that the northern riffleshell, the snuffbox mussel, Mitchell's satyr butterfly, the Poweshiek skipperling, the Karner blue butterfly, Kirtland's warbler, eastern massasauga rattlesnake, and the eastern prairie fringed orchid would not be affected by construction and operation of the Projects. We also determined that the Projects may affect, but would not likely adversely affect the rayed bean mussel. The Projects may affect, and are likely to adversely affect the northern long-eared bat and Indiana bat. These determinations are based on consultations with the FWS and our own analyses. Based on our analyses we have concluded that Projects-related impacts on federally listed species would be reduced to levels that would not threaten a species population viability, or contribute to trends toward extinction.

FERC has prepared a Biological Assessment (BA) for the NGT Project as a contingency for adjustments to construction schedules and constraints regarding access to properties. The BA defines anticipated impacts to both Indiana bats and northern long-eared bats in the event that spring and/or summer clearing may be required, and would provide the data necessary for the FWS to calculate levels of take for both species. FERC and the FWS entered into formal consultation for the Indiana bat and the northern long-eared bat on October 21, 2016. The FWS will prepare a Biological Opinion for these species for the NGT Project. Texas Eastern would utilize the final 4(d) rule for the northern long-eared bat in the event that it cannot adhere to winter clearing timelines, and would institute the summer clearing restrictions as defined in the final 4(d) rule. FERC, as the lead federal agency, has chosen to rely upon the finding of the programmatic Biological Opinion developed by FWS on January 5, 2016 to complete its Section 7 consultation obligations for this species for the TEAL Project. Because consultations are ongoing for federally listed species for the NGT Project, we recommend that NEXUS should not begin construction until FERC staff receives comments from the FWS regarding the proposed actions; FERC staff completes formal consultation with the FWS; and NEXUS has received written notification from the Commission that construction or use of mitigation may begin.

The bald eagle retains federal protection under the Bald and Golden Eagle Protection Act and the MBTA, which prohibit the taking of eagles, their eggs, or their nests. NEXUS conducted aerial bald eagle nest surveys along the NGT Project route in spring 2015. No bald eagle nests were identified within 660 feet of the NGT Project area; therefore, no impact on bald eagles is anticipated.

A total of 91 state-listed species may occur in the Project areas. Seventy-seven species are listed at the state level only; 11 species are also listed as federally protected, while 3 are listed as federally protected, but are not present in the Project areas. Of these species, 58 species either do not have suitable habitat within the Project areas or have habitat would be avoided by implementing special construction techniques (e.g., HDD). For the remaining 19 species, the applicants have proposed measures to reduce habitat and species impacts, and continue to consult with resource agencies to identify and develop additional conservation and mitigation measures to further minimize impacts on state-listed species. After evaluating potential impacts to Michigan listed species, we have concluded that no impacts are anticipated to Michigan state-listed species, and that impacts to habitat will be temporary and minor. The MIDNR concurred with this conclusion on October 13, 2016. Ohio permitting agencies have further opportunity during their permit review and authorization processes to require additional conservation and mitigation measures that would further protect and conserve sensitive species and their habitats according to each agencies' mission and conservation goals. Because additional mitigation may be developed through ongoing consultations with Ohio agencies, we recommend that the NEXUS and Texas Eastern file with the Commission prior to construction any additional mitigation measures for state-protected species in Ohio developed in consultation with the applicable state agencies.

Although a number of other candidate, state-listed, or special concern species were identified as potentially present in the Project areas, none were detected during surveys and we do not expect any adverse effects given the applicants' proposed measures and our recommendations. Based on implementation of these measures and our recommendations, we conclude that impacts on special-status species would be adequately avoided or minimized.

Land Use, Recreation, and Visual Resources

Construction of the Projects would affect a total of 5,223.7 acres of land. About 85.6 percent of this acreage would be utilized for the pipeline facilities, including the construction right-of-way (59.1 percent) and additional temporary workspace (26.5 percent). The remaining acreage affected during construction would be associated with contractor yards (4.5 percent), staging areas (0.9 percent), new and modified aboveground facilities (7.7 percent), and access roads (1.3 percent). During operation, the new permanent pipeline right-of-way, aboveground facilities, and permanent access roads would affect 1,741.9 acres of land.

The land retained as new permanent right-of-way would generally be allowed to revert to its former use, except for forest/woodland and tree crops. Certain activities, such as the construction of permanent structures or the planting of trees, would be prohibited within the permanent right-of-way. To facilitate pipeline inspection, operation, and maintenance, the entire permanent right-of-way in upland areas would be maintained in an herbaceous vegetated state. This maintained right-of-way would be mowed no more than once every 3 years, but a 10-foot-wide strip centered over the pipeline might be mowed more frequently to facilitate corrosion and other operational surveys.

The NGT Project's proposed construction work area is within 50 feet of 178 residential structures (including homes, garages, and associated structures). NEXUS has developed site-specific residential construction plans for the residential structures within 50 feet of the construction work area. We reviewed these plans and find them acceptable. To further minimize effects on residences, we recommend that for the seven residences located within 10 feet of the construction work area, NEXUS provide evidence of landowner concurrence with the site-specific residential construction plans prior to construction. NEXUS has also developed an *Issue Resolution Plan* that identifies how stakeholders can contact pipeline company representatives with questions, concerns, and complaints prior to, during, and after construction. We have reviewed this plan and find it acceptable. The TEAL Project is not within 50 feet of any structure.

The NGT pipeline and FirstEnergy's transmission line generally follow similar linear routes for about 21 miles in Erie and Sandusky counties, Ohio. There are five locations where the NGT Project would cross the transmission line right-of-way and NEXUS has indicated it would work with FirstEnergy to coordinate construction activities at these locations. Because consultations are ongoing, we recommend that, prior to construction, NEXUS should provide updated documentation of consultation with FirstEnergy regarding coordination of construction activities in these five areas.

Sixty-two planned or ongoing residential and commercial/industrial development projects have been identified within 0.25 mile of the proposed NGT Project facilities. We recommend that NEXUS continue discussions with developers and file updated correspondence with the Commission prior to construction for review and approval. No planned or ongoing residential or commercial/industrial development projects were identified within 0.25 mile of the proposed TEAL Project facilities.

Construction of the Projects would affect a total of 4,016.3 acres of agricultural land, and 1,331.8 acres would be retained during operation of the Project. Agricultural land in the construction rights-of-way would generally be taken out of production for one growing season and would be restored to previous use following construction (except fruit and tree crops). NEXUS would provide agricultural monitors that would be on site to monitor construction activities within agricultural lands.

NEXUS developed a *Drain Tile Mitigation Plan*, which provides a general overview of the types of drain tile systems potentially encountered during construction, and describes NEXUS' drain tile mitigation strategy during pre-construction, construction, and post-construction. If drain tiles are damaged during construction, temporary repairs would be conducted immediately and permanent repairs would be completed following construction. Repairs and restoration to these systems conducted by NEXUS would be monitored for three years, or until restoration is considered successful, to ensure the system functions properly. We have reviewed this plan and recommend that NEXUS file a revised *Drain Tile Mitigation Plan* with the Commission for review and approval prior to construction that would require a depth of burial of four feet in cultivated or rotated croplands, if requested by the landowner.

The NGT Project crosses four certified organic farms and several specialty crop lands. The TEAL Project does not cross any certified organic farms or specialty crop lands. NEXUS developed an *Organic Farm Protection Plan* to address prohibitions on substances allowed on farm property (both during construction and operation); soil handling procedures; erosion control and buffers; off right-of-way water migration; noxious weed and invasive species control; mitigation/restoration methods; post-construction monitoring; compensation for construction-related damages; and damages due to decertification. We have reviewed this plan and find it acceptable. Operation of the NGT Project would affect 96.8 acres of specialty crops. NEXUS would compensate landowners for any project-related damages and lost production on organic farms and specialty crop lands.

The NGT Project crosses several parcels of land enrolled in the Current Agricultural Use Value program, the Ohio Forest Tax Law program, or are protected by conservation easements. The NGT Project also crosses a number of areas enrolled in a variety of Farm Service Agency (FSA) enrolled land including CRP/CREP lands. On program lands where tree clearing is necessary, NEXUS would reimburse the landowner the fair market value for any loss of crop or timber for any area disturbed due to the construction of the pipeline. Also, NEXUS would work with landowners and local program officials to determine how the crossing of enrolled lands by the NGT Project affects the continued participation in the program by landowners. We recommend that NEXUS file with the Commission for review and approval its revised *E&SCPs* to commit to ensuring lands crossed that are under conservation practices, such as CRP lands, would be restored to pre-construction conditions, or in accordance with the landowner's request. The TEAL Project would not cross any land enrolled in a conservation program.

The NGT Project would directly affect numerous trails, conservation and recreation areas, sports facilities, state parks and forests, nature and heritage areas, municipal parks, and federal- and state-designated recreation areas. The TEAL Project would not cross or be located within 0.25 mile of any public or private lands that support recreation or special interests. In general, effects of the NGT Project on recreational and special interest areas would be temporary and limited to the period of active construction, which typically lasts several days to several weeks in any one area. These effects would be minimized by implementing the measures in NEXUS' *E&SCP* and site-specific crossing plans. Both the Iron Horse Trail and the North Country National Scenic Trail would be temporarily closed during construction. However, site-specific mitigation measures, such as a detour, have not yet been identified. Therefore, we recommend that NEXUS file with the Commission for review and approval prior to construction site-specific crossing plans for these trail that identifies the location(s) of a detour, public notification procedures, signage, and consideration of avoiding days of peak usage.

Portions of the NGT Project are subject to a federal Coastal Zone Consistency Review in Ohio; designated coastal zones in Michigan would not be affected. A consistency determination was received from the ODNR on April 8, 2016 concurring that the NGT Project is consistent with the Coastal Zone Management Act.

The NGT Project would be within 0.25 mile of 127 sites listed as potential or known sources of contamination and hazardous wastes. Based on the facility type, regulatory status, distance from the construction work area, and other site-specific information, the potential to encounter contamination that may be associated with 124 of the 127 sites during Project construction is low. Contamination may be encountered at 3 sites: Country View Apartment Complex, the Ford Motor Company – Rawson Plant, and the RACER site. There are no properties within 0.25 mile of the TEAL Project facilities that are listed as potential or known sources of contamination. In the event that construction activities encounter contaminated or hazardous wastes, NEXUS has committed to develop construction practices that include proper handling of contaminated soil and groundwater that may be encountered during construction in compliance with Part 201 of Michigan's Natural Resources and Environmental Protection Act of 1994. Additionally, we recommend that NEXUS file with the Commission for review and approval prior to construction an updated *SPCC Plan* and *E&SCP* that address pre-existing contamination at Country View Apartment Complex, the Ford Motor Company – Rawson Plant, and the RACER site. NEXUS also would file a report detailing the July 2016 investigation of the RACER site workspaces, including a comparison of the sampling results to applicable regulatory standards. We also recommend that NEXUS coordinate with the landowner(s) near MP 51.2, where the dumping of unknown contaminants occurred, and file with the Commission a site-specific plan to properly manage any contaminated soil or groundwater in compliance with applicable regulations or demonstrate that a site-specific plan is not needed.

Impacts on visual resources would be greatest where the pipeline routes parallel or cross roads and the pipeline rights-of-way may be seen by passing motorists; from residences where vegetation used for visual screening or for ornamental value is removed; and where the pipelines are routed through forested areas. A portion of pipelines (about 45 percent) would be installed within or parallel to existing rights-of-way. As a result, the visual resources along this portion of the Projects have been previously affected by other similar activities. In other areas, the visual effects of construction in forests would be permanent on the maintained right-of-way where the regrowth of trees would not be allowed, and would be long term in the temporary workspaces. After construction, all disturbed areas, including forested areas, would be restored in compliance with NEXUS and Texas Eastern's *E&SCPs*; federal, state, and local permits; landowner agreements; and easement requirements. Generally this would include seeding the restored areas with grasses and other herbaceous vegetation, after which trees would be allowed to regenerate within the temporary workspaces.

Visual effects also would occur at rivers, trails, railroads, roads, and historic properties that are valued for their scenic quality. These include the Maumee River, North Country National Scenic Trail, Cuyahoga Valley Scenic Railroad, America's Byway, Lincoln Highway Historic Byway, Maumee Valley Scenic Byway, and the Abbott-Page house. Visual impacts on these areas would be minimized by co-location with an existing corridor or use of HDD or bore construction method.

NEXUS has designed aboveground facilities to preserve existing tree buffers within purchased parcels to the extent practicable. To further mitigate visual impacts, NEXUS would install perimeter fences, directionally controlled lighting, and slatted fencing at its compressor station sites. Several residents expressed concern about the visual impacts of the Hanoverton, Wadsworth, and Waterville compressor stations. NEXUS has developed visual screening plans for these stations. We have reviewed these plans and find them acceptable.

Cultural Resources

Surveys have been completed for about 95 percent of the NGT Project area and 100 percent of the TEAL Project area. The applicants identified 212 archaeological sites within the study areas. Of the sites, 10 are recommended as eligible for listing on the NRHP, 197 are recommended as not eligible, and 5 were not assessed. The applicants also identified 230 historic architectural properties within the study areas. Of the properties, 3 are NRHP-listed districts, 42 are recommended as eligible for listing on the NRHP, 184 are recommended as not eligible, and 1 was not assessed. Consultation with the Ohio and Michigan SHPOs is ongoing.

Both we and NEXUS consulted with 42 federally recognized Native American tribes, as well as several other non-governmental organizations, local historical societies, historic preservation and heritage organizations, conservation districts, and other potential interested parties to provide them an opportunity to comment on the proposed Projects. TEAL consulted with 8 of the 42 federally recognized Native American tribes that we also contacted. Michigan's Washtenaw County Office of Community and Economic Development requested information on three historic properties within proximity to the NGT Project. NEXUS confirmed all three properties would not be affected. Several tribes requested additional consultation or information, and the Delaware Nation, Miami Tribe of Oklahoma, Peoria Tribe of Indians of Oklahoma, Delaware Tribe of Indians, and Nottawaseppi Huron Band of the Potawatomi requested notification if unanticipated discoveries are encountered during construction. The Chippewa-Cree Indians of the Rocky Boy's Reservation responded with a request to be consulted on the NGT Project due to the potential to affect properties of traditional and cultural significance. We will continue to consult with the tribes.

The applicants have planned the Projects to avoid impacting resources eligible for listing on the National Register of Historic Places (NRHP). If NRHP-eligible resources are identified that cannot be avoided, the applicants would prepare treatment plans. Implementation of a treatment plan would only occur after certification of the Project(s) and after the FERC provides written notification to proceed. Compliance with Section 106 of the NHPA has not been completed for the Projects. To ensure that our responsibilities under Section 106 of the NHPA are met, we recommend that applicants not begin construction until any additional required surveys are completed, survey reports and treatment plans (if necessary) have been reviewed by the appropriate parties, and we provide written notification to proceed. The studies and impact avoidance, minimization, and measures proposed by NEXUS and Texas Eastern, and our recommendation, would ensure that any adverse effects on cultural resources would be appropriately mitigated.

Air Quality and Noise

Air quality impacts associated with construction of the Projects would include emissions from fossil-fueled construction equipment and fugitive dust. Local emissions may be elevated, and nearby residents may notice elevated levels of fugitive dust, but these would not be significant, and air quality impacts would be temporary and localized. NEXUS and TEAL would implement their respective *Fugitive Dust Control Plans*. We have reviewed this plan and find it acceptable. In nonattainment and maintenance areas, estimated construction emission would not exceed general conformity applicability thresholds.

Operation of the Projects would result in long-term air emissions from stationary equipment (e.g., turbines, emergency generators, and heaters at compressor and M&R stations), including emissions of NO_x, CO, particulate matter, SO₂, VOCs, GHGs (including fugitive methane), and HAPs. The proposed and modified compressor stations and M&R stations would be a minor source of air emissions under federal air quality programs and would not have a significant impact on local or regional air quality.

We received comments requesting that we consider cumulative air quality impacts while taking into account the Ohio E-Check requirements. As discussed in section 4.12.1, the E-Check system was established specifically for passenger vehicles and would not be applicable to industrial-type projects.

Based on the analysis in the EIS and compliance with federal and state air quality regulations, we conclude that operational emissions would not have a significant impact on local or regional air quality.

Noise would be generated during construction of the pipeline and aboveground facilities. Construction noise associated with the pipeline would be spread over the length of the pipeline route and would not be concentrated at any one location for an extended period of time, except at the proposed HDD sites. Construction noise associated with aboveground facilities would be more concentrated in the vicinity of compressor and M&R stations and would extend for several months, but would vary depending on the specific activities taking place at any given time.

At HDD sites, construction activity and noise may be prolonged (several days to several weeks depending on site-specific conditions) and extend overnight. However, noise impacts on surrounding NSAs are not expected to be significant because mitigated noise levels attributable to the proposed HDDs are anticipated to be below the FERC 55 A-weighted decibels (dBA) day-night sound level (L_{dn}) sound criterion at all noise sensitive areas (NSA) within a 0.5-mile radius of the HDD entry and exit points. Further, NEXUS indicated that landowners within 0.5 mile of the NGT Project would be notified in advance of planned nighttime HDD construction activities. We further recommend that NEXUS and Texas Eastern file the results of noise measurements for each HDD entry and exit site at the start of drilling operations. If the noise measurements exceed 55 dBA or results in a noise increase greater than 10 dB over ambient levels, NEXUS and Texas Eastern should implement additional mitigation measures to attenuate noise below those levels.

The Projects would likely require blasting in some areas of the proposed route to dislodge bedrock resulting in potential noise and vibration impacts. NEXUS' and Texas Eastern's *Blasting Plans* include mitigation measures related to blasting activity. Blasting would be conducted in accordance with applicable agency regulations, including advance public notification and mitigation measures as necessary.

To ensure that the noise levels during operation of the compressor stations and M&R stations do not exceed the FERC 55 dBA L_{dn} sound criterion, we recommend that NEXUS and Texas Eastern file noise surveys at full load conditions and install additional noise controls if the levels are exceeded.

We received comments regarding the potential for low frequency vibrations from compressor stations to cause or exacerbate health issues. FERC regulations require that applicants show that proposed compressor station facilities should not result in a perceptible increase in vibration at any NSA. This would apply to both the NGT and TEAL Project compressor stations. FERC staff would investigate vibration complaints and, to the extent that a violation is documented, each company would be required to address the issue.

We received comments about potential impacts on residents due to low frequency sounds waves generated by high pressure natural gas flowing through a pipeline. This type of noise is typically associated with reciprocating engines. The proposed compressor units at all compressor stations are turbines, and this issue would not occur.

Based on the analyses conducted, the proposed mitigation measures, and our recommendations, we concluded that construction and operation of the Projects would not result in significant noise impacts on residents and the surrounding environment.

Safety and Reliability

The pipeline and aboveground facilities associated with the Projects would be designed, constructed, operated, and maintained to meet the U.S. Department of Transportation (DOT) Minimum Federal Safety Standards in 49 Code of Federal Regulations (CFR) 192 and other applicable federal and state regulations. These regulations include specifications for material selection and qualification; minimum design requirements; and protection of the pipeline from internal, external, and atmospheric corrosion. Each compressor station would be enclosed within a chain-linked fence and equipped with security cameras, an alarm system, ventilating equipment, automatic shutdown systems, and relief valves. Several commenters expressed concern about how the pipeline would be maintained over time and the long-term safety of operations. The DOT rules require regular inspection and maintenance, including repairs as necessary, to ensure the pipeline has adequate strength to transport the natural gas safely. Based on NEXUS' and Texas Eastern's compliance with federal design and safety standards and their implementation of safety measures, we conclude that constructing and operating the pipeline facilities would not significantly impact public safety.

We received several comments about the safety of homes, schools, hospitals, etc., within the potential impact radius for the NGT Project. The potential impact radius for the NGT Project would be 1,100 feet. For the NGT Project compressor stations, the potential impact radius would be 943 feet. DOT safety standards specify more rigorous safety requirements for populated areas and areas where a gas pipeline accident could do considerable harm to people and their property (e.g., near multiple residences, schools, churches, retirement homes, airports). The pipelines and aboveground facilities associated with the Projects must be designed, constructed, operated, and maintained in accordance with these safety standards.

NEXUS would develop a *Public Awareness Program* for its system, which would provide outreach measures to the affected public, emergency responders, and public officials. NEXUS would also mail informational brochures to landowners, businesses, potential excavators, and public officials along the pipeline system each year to inform them of the presence of the pipeline and instruct them on how to recognize and react to unusual activity in the area. Texas Eastern already has a similar program in place.

We received comments regarding the potential for accidents resulting from pipeline leaks, particularly leaks near electric power lines. Pipeline leaks typically occur at valve sites, fittings, etc., where the gas disperses into the atmosphere (e.g., the gas does not accumulate as it would in an enclosed space). As a result, the concentration of gas is not likely to result in impacts on power lines.

Cumulative Impacts

Three types of projects (past, present, and reasonably foreseeable projects) could potentially contribute to a cumulative impact when considered with the proposed Projects. These projects include Marcellus Shale development (wells and gathering systems); FERC-jurisdictional natural gas pipelines; other natural gas facilities that are not under the Commission's jurisdiction; and other actions including electric transmission and generation projects, transportation projects, and residential and commercial developments.

A majority of the impacts associated with the proposed Projects in combination with other projects such as residential developments, wind farms, utility lines, and transportation projects, would be temporary and relatively minor overall, and we included recommendations in the EIS to further reduce the environmental impacts associated with the Projects. However, some long-term cumulative impacts would occur on wetland and forested vegetation and associated wildlife habitats. Also, some long-term cumulative benefits to the community would be realized from the increased tax revenues, jobs, wages, and purchases of goods and materials. Emissions associated with the Projects would contribute to cumulative air quality impacts. There is also the potential, however, that the Projects would contribute to a cumulative improvement in regional air quality if a portion of the natural gas associated with the Projects displaces the use of other more polluting fossil fuels.

We received comments regarding the NGT and TEAL Projects' impacts on climate change. We also received comments stating that our climate change analysis should include a lifecycle analysis of the NGT and TEAL Projects (i.e. upstream and downstream emissions). The Commission staff's longstanding practice is to conduct an environmental review for each proposed project, or a number of proposed projects that are interdependent or otherwise interrelated or connected. NEPA does not, however, require us to engage in speculative lifecycle analyses or provide information that will not meaningfully inform the decision-making process. As such, we do not find upstream or downstream emissions to be causally connected to the Project and are not considered indirect impacts. However, the EIS discloses the GHG emissions from end-use combustion of the gas, using reasonably available EPA methodology. We received comments stating that the proposed Projects are not in line with the U.S. goal of GHG reduction and that FERC must ensure national GHG goals are met. Regulations at 40 CFR 60 indicate that available strategies include, but are not limited to, increasing use of existing natural gas-fired electric generating units and lower use of existing coal-fired generators. The U.S. Energy Information Administration (EIA) projects that the power sector CO₂ emissions would fall to about 1,500 million metric tpy by 2025, a level not seen since the early 1980s, in the Base Policy case from its 2015 Annual Energy Outlook (EIA, 2015). A report by the U.S. Global Change Research Program explains that natural gas projects in the Midwest region may result in the displacement of some coal use or encourage the use of lower carbon fuel for new growth areas, thereby regionally offsetting some GHG emissions.

We received comments concerning the development of natural gas reserves in the Marcellus and Utica Shale. Development of the Marcellus and Utica Shale natural gas resource is not the subject of this EIS nor is the issue directly related to the Projects. Production and gathering activities, and the pipelines and facilities used for these activities, are not regulated by FERC but are overseen by the affected region's state and local agencies with jurisdiction over the management and extraction of the Marcellus Shale gas resource. Production and gathering activities that fell within the cumulative geographic scope were analyzed accordingly. FERC's jurisdiction is further restricted to facilities used for the transportation of natural gas in interstate commerce and does not typically extend to facilities used for intrastate transportation.

Alternatives

We evaluated the no-action alternative, system alternatives, major route alternatives, aboveground facility site alternatives, minor route variations, and alternative compressor station locations as alternatives to the proposed action. While the no-action alternative would eliminate the short- and long-term environmental impacts identified in the EIS, the stated objectives of the applicants' proposals would not be met.

Our analysis of system alternatives included an evaluation of whether existing or proposed natural gas pipeline systems could meet the Projects' objectives while offering an environmental advantage. We determined that six existing and three proposed systems potentially could be used in various combinations to transport natural gas to and from the markets served by the Projects. However, none of existing pipelines have capacity available for transporting the required volumes of natural gas proposed by the applicants, nor do they service all the required receipt and delivery points. Consequently, there are no practicable existing or proposed system alternatives that are preferable to the proposed Projects.

During project planning, NEXUS incorporated many route alternatives and variations into its original route. In total, NEXUS adopted a total of 239 route changes totaling about 231 miles (91 percent of the pipeline route) for various reasons, including landowner requests, avoidance of sensitive resources, or engineering considerations. Texas Eastern did not incorporate route alternatives or variations because nearly all the pipeline is loop line.

We evaluated 15 major route alternatives to the proposed pipeline route, which include three versions of the City of Green Route Alternative. We found that none of these would offer a major environmental advantage over the proposed route, and we eliminated them from further consideration. We did not evaluate major route alternatives to the TEAL pipeline route because nearly all the pipeline is loop line and we did not receive stakeholder comments on the loop line route.

We evaluated 27 minor route variations to the proposed pipeline route, which include four versions of the Chippewa Lake Route Variation, two versions of the Butler Road Route Variation, two versions of the Luckey Road Route Variation, and two versions of the Wadsworth Road Route Variation. We determined that 25 of these minor route variations would not offer an environmental advantage over the proposed pipeline route and eliminated them from further consideration. We concluded that 1 of the minor route variation may have an environmental advantage and recommend that NEXUS incorporate the variation into its route. We also concluded that 1 of the minor route variation, which consists of minor centerline adjustments and workspace modifications at a series of locations along the proposed route, be incorporated into the proposed route because the centerline adjustments and workspace modification have insignificant environmental impacts and were proposed by NEXUS to respond to landowner requests, reduce environmental impacts, and/or address engineering constraints. We did not evaluate minor route variations to the TEAL pipeline route because nearly all the pipeline is loop line and we did not receive stakeholder comments on the loop line route.

Numerous stakeholders commented that the pipeline should be routed in less populated areas further to the south to minimize the risk of a pipeline incident on the public. DOT safety standards are intended to ensure adequate protection of the public, including more stringent design requirements in increasingly populated areas. Pipelines must be designed, constructed, operated, and maintained in accordance with these safety standards. Further, the EIS demonstrates that the likelihood of an incident is very low at any given location, regardless of population density. Instead, a relevant issue for consideration in the various alternative analyses is with respect to residential land use impacts, which is a factor considered in the EIS for the alternatives.

The City of Green submitted an alternative route to the south of the proposed NEXUS pipeline route that would minimize the impacts of the pipeline on development in the vicinity of the city. During the draft EIS comment period, both NEXUS and city officials suggested revisions to the alternative. We conclude that the proposed route and all three variations of the City of Green Route Alternative are environmentally acceptable, although we do not find that any of the three versions of the alternative provide a significant environmental advantage when compared to the corresponding segment of the proposed route and did not recommend that any of them be incorporated into the NGT Project.

NEXUS proposes to construct four new compressor stations, and Texas Eastern proposes to construct one new compressor station. We reviewed two or more alternative sites for each new compressor station and did not find a substantial environmental advantage over the proposed site in any of the cases; therefore, the alternative sites were eliminated from further consideration. We reviewed one alternative site for metering and regulation station, MR06, and recommend that NEXUS incorporate the alternative site into the NGT Project plans in order to minimize the agriculture land permanently taken out of services.

We received comments suggesting that some of the compressor stations should be relocated to less populated area because of concerns about air and noise pollution; however, our analyses concluded that locating the compressor stations at the proposed sites would not have a significant impact on air quality or noise.

CONCLUSIONS

We determined that construction and operation of the Projects would result in some adverse environmental impacts, but impacts would be reduced to less-than-significant levels with the implementation of the applicants' proposed and our recommended mitigation measures. This determination is based on a review of the information provided by the applicants and further developed from data requests, field investigations, scoping, literature research, alternatives analysis, and contacts with federal, state, and local agencies as well as Indian tribes and individual members of the public.

Although many factors were considered in this determination, the principal reasons are:

- About 119.2 miles (46 percent) of the 261.4 miles of project pipeline facilities would be within or adjacent to existing rights-of-way, consisting of existing pipelines and/or electric transmission line rights-of-way.
- The applicants would minimize impacts on natural and cultural resources during construction and operation of the Projects by implementing, as required, their respective *E&SCPs, SPCC Plan, Blasting Plan, HDD Monitoring and Inadvertent Return Contingency Plan, Wetland Mitigation Plan, Invasive Species Management Plan, Migratory Bird Conservation Plan, Site-specific Residential Construction Plans, Issue Resolution Plan, Drain Tile Mitigation Plan, Organic Farm Protection Plan, Hazardous Waste Management Plan, Fugitive Dust Control Plans, and Public Awareness Program.*
- FERC staff would complete the process of complying with Section 7 of the ESA prior to construction.
- FERC staff would complete consultation under Section 106 of the NHPA and implementing regulations at 36 CFR 800 prior to construction.
- The applicants would comply with all applicable DOT safety standards for transportation of natural gas by pipeline.

- The applicants would comply with all applicable air and noise regulatory requirements during construction and operation of the Projects.
- An environmental inspection program would be implemented to ensure compliance with the mitigation measures that become conditions of FERC's authorization.

In addition, we recommend 38 project-specific mitigation measures that the applicants should implement to further reduce the environmental impacts that would otherwise result from construction and operation of the Projects. We are recommending that certain conditions be met prior to construction. We conclude that these measures are necessary to reduce adverse impacts associated with the Projects and, in part, are basing our conclusions on implementation of these measures. Therefore, we recommend that these mitigation measures be attached as conditions to any authorization issued by the Commission. These recommended mitigation measures are presented in section 5.2 of the draft EIS.

1.0 INTRODUCTION

The Federal Energy Regulatory Commission (FERC or Commission) is responsible for authorizing the construction of interstate natural gas transmission pipeline facilities. As part of its decision-making process, the Commission is required by the National Environmental Policy Act (NEPA) and its implementing regulations to consider the environmental impacts resulting from the construction and operation of a proposed project. The Commission's environmental staff has prepared this final Environmental Impact Statement (EIS) to assess the potential environmental impacts that could result from the construction and operation of the NEXUS Gas Transmission Project (NGT Project) proposed by NEXUS Gas Transmission, LLC (NEXUS) and the Texas Eastern Appalachian Lease Project (TEAL Project) proposed by Texas Eastern Transmission, LP (Texas Eastern). NEXUS is owned by affiliates of Spectra Energy Partners, LP and DTE Energy Company, while Texas Eastern is an indirect wholly owned subsidiary of Spectra Energy Partners, LP. Throughout this EIS, NEXUS and Texas Eastern are collectively referred to as the "applicants," and the NGT and TEAL Projects are collectively referred to as the "Projects."

On November 20, 2015, NEXUS filed an application with the FERC in Docket No. CP16-22-000 pursuant to Section 7(c) of the Natural Gas Act (NGA), and Parts 157 and 284 of the Commission's regulations. NEXUS is seeking a Certificate of Public Convenience and Necessity (Certificate) to construct, own, and operate a new natural gas pipeline utilizing third-party pipelines and greenfield pipeline construction to provide for the transportation of 1.5 million dekatherms per day (Dth/d) of shale gas from the Appalachian Basin to consuming markets in Northern Ohio and Southeastern Michigan as well as the Dawn Hub in Ontario, Canada. According to NEXUS, supply also would be able to reach the Chicago Hub in northern Illinois and other Midwestern markets through interconnections with other pipelines.

The NGT Project includes the construction of approximately 255.7 miles of new 36-inch-diameter natural gas transmission mainline pipeline running from Columbiana County, Ohio and connecting to DTE Gas Company (DTE Gas) in Ypsilanti Township, Michigan; as well as approximately 0.9 mile of new 36-inch-diameter interconnecting pipeline connecting to Tennessee Gas Pipeline Company, LLC (TGP) near Hanover Township, Ohio. The NGT Project also includes the installation of 4 new gas turbine compressor stations, 6 new metering and regulating (M&R)¹ stations, 4 new pig² launchers and receiver facilities, and 13 new tee-taps.³ A detailed description of the NGT Project is presented in section 2.0.

NEXUS is also seeking a Certificate to acquire capacity in lease from Texas Eastern in Pennsylvania, West Virginia, and Ohio; from DTE Gas in southeastern Michigan; and from Vector Pipeline, L.P. (Vector) in southeastern Michigan. Outside the United States, NEXUS would use existing capacity on the Vector system in western Ontario, Canada to access the Dawn Hub. This EIS is specific to the U.S. portion of the pipeline facilities. The use of facilities in Canada would require approval from the National Energy Board of Canada.

The vertical line in the margin identifies text that has been modified in this final EIS and materially differs from the corresponding text in the draft EIS.

¹ A metering and regulating station is an aboveground facility that contains the equipment necessary to measure the volume of gas flowing in a pipeline.

² A pig is an internal tool that can be used to clean and dry a pipeline and/or to inspect it for damage or corrosion. A pig launcher/receiver is an aboveground facility where pigs are inserted into or received from the pipeline.

³ A tee-tap typically is an underground fitting installed on a pipeline to facilitate a potential future customer connection, which may or may not include aboveground components at that location at a later date.

NEXUS is also asking for a blanket Certificate to construct, operate, acquire, and abandon certain facilities as described in Part 157, Subpart F and pursuant to Part 284, Subpart G of the Commission's regulations authorizing NEXUS to provide open-access firm and interruptible interstate natural gas transportation services on a self-implementing basis with pre-granted abandonment for such services.

NEXUS requested that FERC issue an order to grant authorizations by November 1, 2016. The FERC review process will require more time than requested by NEXUS, and a decision on the Projects will be issued after that date.

On November 20, 2015, Texas Eastern filed an Abbreviated Application with the FERC in Docket No. CP16-23-000 pursuant to Section 7(b) and 7(c) of the NGA, and Parts 157 and 284 of the Commission's regulations for a Certificate to construct, own, and operate a natural gas pipeline and related facilities as well as approval to abandon by lease to NEXUS the capacity created by the TEAL Project facilities. The TEAL Project would involve the construction of 4.4 miles of 36-inch-diameter pipeline loop;⁴ 0.3 miles of connecting pipeline to connect Texas Eastern's Line 73 with the NGT Project; an 18,000 horsepower (hp) Salineville Compressor Station in Franklin Township, Ohio; an additional 9,400 hp of compression at the existing Colerain Compressor Station in Belmont County, Ohio; piping and other modifications to permit bi-directional flow on Line 73; and various other related auxiliary facilities. A detailed description of the TEAL Project is presented in section 2.0.

In a related matter, on November 24, 2015, DTE Gas filed an application with FERC in Docket No. CP16-24-000 seeking approval of a lease of capacity on DTE Gas's system to NEXUS. The capacity lease would utilize existing capacity on DTE Gas' system as well as expansion capacity created by additional compression at existing DTE Gas compressor stations. Construction of the expansion capacity is subject to the jurisdiction of the Michigan Public Service Commission, not FERC, because DTE Gas is a state-regulated gas utility providing limited interstate transportation service pursuant to Title 18 Code of Federal Regulations (CFR) Section 284.224. Additional discussion of these non-jurisdictional facilities is included in section 1.4.

Also in a related matter, on March 11, 2016, Vector filed an application with FERC in Docket No. CP16-102-000 seeking approval of a lease of capacity on Vector's system to NEXUS. To accommodate the lease, Vector intends to modify the existing Milford Meter Station, located in Oakland County, Michigan. The modifications would include replacing an existing 30-inch ultrasonic meter and replacing it with two 20-inch ultrasonic, bi-directional meters, as well as adding various yard piping and valves. Vector also would construct approximately 0.6 mile of 30-inch-diameter pipeline to enable gas originating from the NGT Project to move to the suction side of Vector's existing Highland Compressor Station. The proposed modifications are to be conducted under Vector's blanket Certificate, which was issued by the Commission in Docket No. CP98-135-000 using the automatic authorization per 18 CFR 157.203(b). Vector would provide notice of the modifications after construction is complete and the facilities are placed in-service.

With regard to Vector's other facilities in Canada, any planned facilities are subject to the jurisdiction of Canadian regulators. There is no jurisdictional basis for the Commission to approve, mitigate, or reject any of the Canada facilities. Not only are these facilities non-jurisdictional to the FERC and other agencies of the United States federal government, they are extraterritorial and subject to the sovereign rule of another nation. There is simply no basis we⁵ are aware of under FERC's organic legislation, the NGA,

⁴ A loop is a segment of pipe that is installed adjacent to an existing pipeline and connected to it at both ends. A loop generally allows more gas to move through the system.

⁵ "We," "us," and "our" refer to the environmental staff of the FERC's Office of Energy Projects.

for evaluating these facilities. Neither NEPA nor the Council on Environmental Quality (CEQ) regulations implementing the procedural provisions of NEPA define agencies' obligations to analyze the effects of actions as being limited by administrative boundaries (CEQ, 1997). Based on CEQ Guidance on NEPA Analyses for Transboundary Effects, it is noted that the entire body of NEPA law directs federal agencies to analyze the effects of proposed actions to the extent they are reasonably foreseeable consequences of the proposed action, regardless of where those impacts might occur. CEQ guidance suggests that agencies must include an analysis of reasonably foreseeable transboundary effects of proposed actions in their analysis of proposed actions in the United States. It does not suggest, however, that agencies must include an analysis of effects of proposed actions in another country on the United States. That would be the responsibility of the other country, which is Canada in this case.

1.1 PROJECT PURPOSE AND NEED

The Commission's purpose for reviewing the Projects is based on its obligations under the NGA. Because the applicants propose facilities for the transportation of natural gas in interstate commerce that are subject to the jurisdiction of the Commission, their applications must be considered by the Commission. In deciding whether to authorize major new natural gas transportation facilities, the Commission balances public benefits against potential adverse consequences. The Commission's goal is to give appropriate consideration in evaluating proposals for new facilities to the enhancement of competitive transportation alternatives, the possibility of overbuilding, subsidization by existing customers, the applicants' responsibility for unsubscribed capacity, and the avoidance of unnecessary disruptions to the environment and the exercise of eminent domain. While this EIS will briefly discuss NEXUS' and Texas Eastern's stated purposes, it will not determine whether the need for the Projects exists, as this will be determined separately by the Commission when it makes a decision on the Projects (sometime after the final EIS is issued).

1.1.1 NGT Project

According to NEXUS, the purpose of the NGT Project would be to transport 1.5 Dth/d of Appalachian Basin shale gas, including Utica and Marcellus shale gas, to markets in northern Ohio, southeastern Michigan, and Dawn, Ontario. According to NEXUS, part of the purpose of the NGT Project is also to supply natural gas to northern Illinois and other Midwestern markets through interconnections with other pipelines. NEXUS indicates that the need for the NGT Project originates from an increase in demand for natural gas in the region for electric generation, home heating, and industrial use, coupled with a decrease of imports of natural gas by traditional supply sources, mainly from western Canada and the Gulf Coast. The NGT Project would meet this need by importing natural gas to the region from newly available sources, mainly in the Appalachian Basin.

According to NEXUS, the NGT Project design is based on the contractual commitments generated during open seasons held with customers, market connections, and other parties that expressed interest in obtaining natural gas. Open seasons were held October 15 to November 30, 2012; July 23 to August 21, 2014; and January 14 to February 12, 2015 to provide interested bidders an opportunity to obtain capacity in the NGT Project. The result of the open seasons was for NEXUS to propose construction of facilities to provide 1.5 million Dth/d of capacity to markets by November 1, 2017. Approximately 885,000 Dth/d of this capacity (59 percent) has been signed in precedent agreements⁶ by NEXUS, as summarized in table 1.1.1-1. NEXUS is requesting an in-service date of November 1, 2017 to meet the firm transportation service requirements of the NGT Project shippers.

⁶ A precedent agreement is a binding contract under which one or both parties has the ability to terminate the agreement if certain conditions, such as receipt of regulatory approvals, are not met.

TABLE 1.1.1-1
Contracted Volumes for the NGT Project

Shipper	Volume (Dth/d)	Term (years)
Confidential Shipper A	200,000	15
Confidential Shipper B	150,000	15
Confidential Shipper C	150,000	15
Confidential Shipper D	110,000	15
Confidential Shipper E	75,000	15
Confidential Shipper F	75,000	15
Confidential Shipper G	75,000	15
Columbia Gas of Ohio, Inc.	50,000	15
Total	885,000	

Several comments were received during the scoping period questioning the market for natural gas and suggesting that a market does not exist at the receipt and delivery points proposed by NEXUS, and requesting that other receipt and delivery points be considered, particularly so the proposed pipeline could be moved to a different location. It is important to understand that FERC’s mission is to employ competitive market forces to establish just, reasonable, and not unduly discriminatory or preferential service. The Commission’s position is that marketplace competition benefits energy consumers by encouraging diverse resources, spurring innovation and deployment of new technologies, improving operating performance, and exerting downward pressure on costs (FERC, 2014). Therefore, the Commission does not direct development of the gas industry’s infrastructure, neither on a broad regional basis nor a narrow localized basis. Instead, the Commission responds to the marketplace when an application is filed to provide new or modified service, and in each application the parameters of the project are determined by the applicant.

Because NEXUS has contractual commitments with customers, we disagree with the commenters who suggest that a market does not exist at the receipt and delivery points proposed by NEXUS. However, for the purposes of our analysis we recognize the difference between definitive receipt and delivery points based on binding precedent agreements and speculative receipt and delivery points based on the potential for future customers.

All receipt and delivery points, regardless of whether they are definitive or speculative, can have legitimate business purpose; however, definitive elements of a project may be afforded different consideration than speculative elements. In the draft EIS, we considered the 6 definitive receipt and delivery points on the NGT Project to be essential to the Project’s objective, whereas we did not consider the 13 tee-tap sites to be essential. This was an important distinction because we did not evaluate alternatives in section 3.0 of the draft EIS if they did not meet the Project’s essential objectives. As such, all alternatives discussed in the draft EIS met the objective of serving the 6 definitive receipt and delivery points, but they did not need to serve the 13 tee-tap sites. It is important to note that receipt and delivery points typically do not have the same siting flexibility as other aspects of a project. Receipt and delivery points often connect to existing customer facilities that are designed to receive or deliver natural gas at a particular location.

We received comments from NEXUS during the draft EIS period disagreeing with our position that the 13 tee-tap sites are not essential to the Project objective. NEXUS contends that, under the Commission’s Certificate Policy Statement, contracts and precedent agreements are not required to demonstrate market need for a project, and that the Commission must consider all relevant factors reflecting on the need for a project, including demand projections and market studies. NEXUS indicates that, in addition to serving customers at six receipt and delivery points, it also has designed its NGT Project to serve future demand in the vicinity of the tee-taps as projected in market studies. NEXUS states that the tee-taps represent the market’s message to NEXUS of future natural gas demand in the region and warrant consideration when

assessing route alternatives. NEXUS points to letters filed with the Commission by Dominion East Ohio (DEO) and NRG Energy, Inc. indicating that the tee-taps would enhance natural gas supply in the area. NEXUS states that the Projects would help ensure that northern Ohio markets would be served more economically and without the environmental impacts associated with lateral pipelines that would be necessary if the Projects were authorized along a route further to the south.

Ultimately, the Commission will decide if the tee-taps are essential to the Projects' objectives and whether alternatives that do not serve the tee-tap locations would not be viable without modification. Accordingly, this EIS evaluates alternatives that would not necessarily serve any or some of the 13 tee-tap sites identified by NEXUS.

1.1.2 TEAL Project

According to the Texas Eastern, the TEAL Project would be able to deliver 950,155 Dth/d of natural gas from Texas Eastern's system in the Appalachian Basin to NEXUS' proposed system in Columbiana County, Ohio. The need for the TEAL Project aligns closely to that of the NGT Project, in that it is necessary to provide natural gas required by the NGT Project.

1.2 PURPOSE AND SCOPE OF THIS EIS

Our principal purposes in preparing this EIS were to:

- identify and assess potential impacts on the natural and human environment that would result from constructing and operating the NGT and TEAL Projects;
- describe and evaluate reasonable alternatives to the NGT and TEAL Projects that would avoid or substantially reduce adverse effects of the Projects on the environment while still meeting the Projects' objectives;
- identify and recommend specific mitigation measures, as necessary, to avoid or further reduce/minimize environmental impacts; and
- encourage and facilitate involvement by the public and interested agencies in the environmental review process.

The environmental topics addressed in this EIS include geology; soils; groundwater and surface water; wetlands; vegetation; fish and wildlife; threatened, endangered, and other special-status species; land use and recreation; visual resources; socioeconomics, including environmental justice; cultural resources; air quality and noise; reliability and safety; and cumulative impacts. This EIS describes the affected environment as it currently exists based on available information, addresses the environmental consequences of the NGT and TEAL Projects, and compares the Projects' potential impacts to those of the alternatives. The EIS also presents our conclusions and recommended mitigation measures. A subject index is provided in appendix Q.

Our description of the affected environment is based on a combination of data sources, including desktop resources such as scientific literature and regulatory agency reports as well as field data collected by NEXUS and Texas Eastern. At the time the applications were filed with FERC, NEXUS had field surveyed about 90 percent of the total NGT Project route (about 230 linear miles) and Texas Eastern had field surveyed its entire route (about 5 linear miles). Completion of field surveys is primarily dependent upon acquisition of survey permission from landowners. If the necessary access cannot be obtained through coordination with landowners and the proposed Projects are certificated by FERC, the applicants may use

the right of eminent domain granted to them under Section 7(h) of the NGA to obtain a right-of-way. Therefore, if the Projects are certificated by the Commission, then it is likely that a portion of the outstanding surveys for the Projects (and associated agency permitting) would have to be completed after issuance of the Certificate.

The U.S. Environmental Protection Agency (EPA), U.S. Fish and Wildlife Service (FWS), and U.S. Army Corps of Engineers (USACE) are participating as cooperating agencies in the preparation of this EIS.⁷ The roles of FERC and the cooperating agencies in the review process is described in the following sections.

1.2.1 Federal Energy Regulatory Commission

FERC is an independent federal regulatory agency responsible for evaluating applications for authorization to construct and operate interstate natural gas pipeline facilities. If the Commission determines that a project is required by the public convenience and necessity, a Certificate would be issued under Section 7(c) of the NGA and part 157 of the Commission's regulations. The Commission bases its decision not only on environmental impact, but also technical competence, financing, rates, market demand, gas supply, long-term feasibility, and other issues concerning a proposed project. As such, FERC is the lead federal agency for the preparation of this EIS in compliance with the requirements of NEPA, the CEQ regulations for implementing the procedural provisions of NEPA (Title 40 CFR Parts 1500–1508), and FERC's regulations implementing NEPA (18 CFR 380).

This EIS presents our review of potential environmental impacts and reasonable recommendations to avoid or mitigate impacts. This EIS will be used as one element in the Commission's review of the Projects to determine whether a Certificate for each project would be issued. FERC will also consider non-environmental issues in its review of the NEXUS and Texas Eastern applications. A Certificate will be granted if the Commission finds that the evidence produced on financing, rates, market demand, gas supply, existing facilities and service, environmental impacts, long-term feasibility, and other issues demonstrates that the NGT and TEAL Projects are required by the public convenience and necessity. Environmental impact assessment and mitigation development are important factors in the overall public interest determination.

FERC may impose conditions on any Certificate granted for the NGT and TEAL Projects. These conditions could include requirements and mitigation measures identified in this EIS to minimize environmental impacts associated with the NGT and TEAL Projects (see section 5.0). We will recommend to the Commission that these requirements and mitigation measures (indicated with bold type in the text) be included as conditions to any approving Certificate issued for the NGT and TEAL Projects. Further, NEXUS and Texas Eastern would be required to implement the construction procedures and mitigation measures it has proposed in its filings with FERC, including those in appendices of this EIS, unless specifically modified by other Certificate conditions.

As applicable, this EIS is also intended to fulfill any cooperating federal agency's NEPA obligations in accordance with NEPA and CEQ regulations in 40 CFR 1501.6 (see section 1.2.2). Other regulatory agencies also may include terms and conditions or stipulations as part of their permits or approvals. While there would be jurisdictional differences between FERC's and other agencies' conditions, the environmental inspection program for the NGT and TEAL Projects would address all environmental or

⁷ A cooperating agency has jurisdiction by law or special expertise with respect to environmental impacts involved with a proposed project and is involved in the NEPA analysis.

construction-related conditions, or other permit requirements placed on the NGT and TEAL Projects by all regulatory agencies.

1.2.2 U.S. Environmental Protection Agency Purpose and Role

The EPA is an independent federal agency responsible for protecting human health and safeguarding the natural environment. The EPA has delegated water quality certifications under Section 401 of the Clean Water Act (CWA) to the jurisdiction of individual state agencies, but the EPA may assume this authority if no state program exists, if the state program is not functioning adequately, or at the request of a state.

The EPA also oversees the issuance of a National Pollutant Discharge Elimination System (NPDES) permit by the state agency, under Section 402 of the CWA, for point-source discharge of water used for hydrostatic testing of pipelines into waterbodies. Although the USACE and Michigan Department of Environmental Quality (MDEQ) are responsible for Section 404 permits in Ohio and Michigan respectively, the EPA has the authority to review and veto the decisions on Section 404 permits. The EPA also has jurisdictional authority to control air pollution under the Clean Air Act (CAA) (Title 42 United States Code [USC] Chapter 85) by developing and enforcing rules and regulations for all entities that emit toxic substances into the air. Under this authority, the EPA has developed regulations for major sources of air pollution. The EPA has delegated the authority to implement these regulations to state and local agencies, who are also allowed to develop their own regulations for non-major sources. The EPA also establishes general conformity applicability thresholds, with which a federal agency can determine whether a specific action requires a general conformity assessment.

In addition to its permitting responsibilities, the EPA is required under Section 309 of the CAA to review and publicly comment on the environmental impacts of major federal actions including actions that are the subject of draft and final EISs, and is responsible for implementing certain procedural provisions of NEPA (e.g., publishing the Notices of Availability of the draft and final EISs in the Federal Register) to establish statutory timeframes for the environmental review process.

1.2.3 U.S. Fish and Wildlife Service Purpose and Role

The FWS is responsible for ensuring compliance with the Endangered Species Act of 1973 (ESA). Section 7 of the ESA, as amended, states that any project authorized, funded, or conducted by any federal agencies should not “jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species which is determined...to be critical” (16 USC 1536[a][2]). The FWS also reviews project plans and provides comments regarding protection of fish and wildlife resources under the provisions of the Fish and Wildlife Coordination Act (16 USC 661 et seq.). The FWS is responsible for the implementation of the provisions of the Migratory Bird Treaty Act (MBTA) (16 USC 703) and the Bald and Golden Eagle Protection Act (BGEPA) (16 USC 688).

Section 7 of the ESA requires identification of and consultation on aspects of any federal action that may have effects on federally listed species, species proposed for federal listing, or their habitat. The ultimate responsibility for compliance with Section 7 remains with the lead federal agency (i.e., FERC for these Projects).

As the lead federal agency for the Projects, FERC consulted with the FWS pursuant to Section 7 of the ESA to determine whether federally listed endangered or threatened species or designated critical habitat are found in the vicinity of the Projects, and to evaluate the proposed action’s potential effects on those species or critical habitats. FERC coordinated with the FWS regarding other federal trust wildlife

resources, such as migratory birds. The FWS elected to cooperate in preparing this EIS because it has special expertise with respect to environmental impacts associated with the Projects.

1.2.4 U.S. Army Corps of Engineers Purpose and Role

The USACE has jurisdictional authority pursuant to Section 404 of the CWA (33 USC 1344), which governs the discharge of dredged or fill material into waters of the United States (including wetlands), except in Michigan where the USACE has delegated authority to the MDEQ, and Section 10 of the Rivers and Harbors Act (33 USC 403), which regulates any work or structures that potentially affect the navigable capacity of a waterbody. Because the USACE must comply with the requirements of NEPA before issuing permits under this statute, it has elected to cooperate in the preparation of this EIS. The USACE would adopt this EIS per 40 CFR 1506.3 if, after an independent review of the document, it concludes that its comments and suggestions have been satisfied.

As an element of its review, the USACE must consider whether the proposed Projects represent the least environmentally damaging practicable alternative pursuant to the CWA Section 404(b)(1) guidelines. The term “practicable” means available and capable of being done after taking into consideration cost, existing technology, and logistics in light of the overall purposes of the Projects.

Although this document addresses environmental impacts associated with the proposed Projects as they relate to Section 404, it does not serve as a public notice for any of the USACE’s permits. NEXUS filed an application for a Department of the Army Permit under Section 404 of the CWA on December 18, 2015.

1.3 PUBLIC REVIEW AND COMMENT

NEXUS filed a request on December 30, 2014 and Texas Eastern filed a request on January 16, 2015 to implement the Commission’s pre-filing process for the NGT and TEAL Projects, respectively. FERC established the pre-filing process to encourage early involvement of interested stakeholders, facilitate interagency cooperation, and identify and resolve environmental issues before an application is filed with FERC and facility locations are formally proposed. On January 9, 2015, FERC granted NEXUS the pre-filing Docket No. PF15-10-000 for the NGT Project. On January 26, 2015, FERC granted Texas Eastern’s pre-filing Docket No. PF15-11-000 for the TEAL Project.

Prior to and during the pre-filing process, NEXUS and Texas Eastern contacted federal, state, and local agencies to inform them about their respective Projects and discuss project-specific issues and concerns. Each applicant also developed a *Public and Agency Participation Plan* to facilitate stakeholder communications and make information available to the public and regulatory agencies. The *Public and Agency Participation Plans* established:

- a single point of contact within the NEXUS and Texas Eastern organizations for the public or agencies to call or e-mail with questions or concerns;
- a publicly accessible website with information about their Projects (including overview maps) and project status;
- regular newsletter mailings for affected landowners and other interested parties; and
- a schedule for public open house meetings in the vicinity of the NGT and TEAL Projects.

NEXUS initiated contact in August 2014 with potentially affected landowners prior to entering the FERC pre-filing process. These initial contacts were in the form of a letter describing the NGT Project and seeking permission to conduct environmental and cultural resource surveys on landowner property. Texas Eastern began notifying potential stakeholders, government officials, and other interested persons about the TEAL Project in January 2015.

NEXUS hosted nine informational meetings for stakeholders in October and November 2014. NEXUS hosted an additional 10 public open houses along the proposed route in February 2015. Eight of the NEXUS meetings were held in Ohio in the vicinity of the NGT Project in Columbiana, Erie, Fulton, Lorain, Lucas, Medina, Sandusky, and Stark Counties. Two were held in Michigan in Lenawee and Washtenaw Counties. Texas Eastern also held public open houses in February 2015 in Columbiana and Monroe Counties in Ohio. The purpose of the public open house meetings was to inform landowners, government officials, and the general public about the NGT and TEAL Projects and invite them to ask questions and express their concerns. FERC staff participated in the meetings and provided information regarding NEPA and the FERC's environmental review process.

On April 8 2015, the FERC issued, in the pre-filing docket, a *Notice of Intent to Prepare an Environmental Impact Statement for the Planned Nexus Gas Transmission Project and Texas Eastern Appalachian Lease Project, Request for Comments on Environmental Issues, and Notice of Public Scoping Meetings (NOI)*. The *NOI* was published in the Federal Register on April 15, 2015⁸ and mailed to 4,319 interested parties, including federal, state, and local agencies; elected officials; environmental and public interest groups; Native American tribes; potentially affected landowners; local libraries and newspapers; and other stakeholders who had indicated an interest in the NGT and TEAL Projects. The *NOI* briefly explained the pre-filing process, generally described the planned NGT and TEAL Projects, provided a preliminary list of issues identified by the FERC staff, requested written comments from the public, announced the time and location of six public scoping comment meetings, and asked other federal, state, and local agencies with jurisdiction and/or special expertise to cooperate with the FERC in the preparation of the EIS, as well as established May 22, 2015 as the closing date for receipt of comments.

We held six public scoping meetings to provide an opportunity for agencies, stakeholders, and the general public to learn more about the planned pipeline Projects and participate in the environmental analysis by commenting on the issues to be addressed in the draft EIS. Meetings were held in April and May 2015 in the following locations:

- Grafton, Ohio on April 28;
- Wadsworth, Ohio on April 29;
- Louisville, Ohio on April 30;
- Tecumseh, Michigan on May 5;
- Swanton, Ohio on May 6; and
- Fremont, Ohio on May 7.

Each meeting was documented by a court reporter and the transcripts were placed into the public record for the Projects.

⁸ 80 Fed. Reg. 20219 (2015).

On July 10, 2015, the Commission mailed to stakeholders a *Project Update for the Nexus Gas Transmission Project and Texas Eastern Appalachian Lease Project*. The purpose of the mailing was to provide stakeholders with an update on the status of environmental review, the major issues gathered during scoping, next steps in the review process, and how interested parties can stay informed.

On April 15, 2016, the Commission issued a letter to certain affected landowners briefly describing a number route modifications on the NGT Project, inviting newly affected landowners to participate in the environmental review process, and opening a special 30-day limited scoping period.

In addition, during the pre-filing process, we conducted conference calls on an approximately bi-weekly basis with representatives from NEXUS and Texas Eastern as well as interested agencies to discuss the pipeline Projects' progress and issues.

Written scoping comments, transcripts of the public scoping meetings, and any written comments received after the filing of the applications are part of the public record for the Projects and are available for viewing on the FERC internet website (<http://www.ferc.gov>).⁹

We issued a *Notice of Availability of the Draft Environmental Impact Statement for the Proposed NEXUS Gas Transmission Project and Texas Eastern Appalachian Lease Project* on July 8, 2016. The draft EIS was filed with the EPA, and a formal notice of availability was issued in the Federal Register on July 14, 2016, indicating that the draft EIS was available. The draft EIS was mailed to 5,786 parties, including federal, state, and local agencies; elected officials; Native American tribes; newspapers; public libraries; intervenors; and other interested parties (i.e., affected landowners, miscellaneous individuals, and environmental groups who provided scoping comments or asked to remain on the mailing list). The distribution list was included as appendix A of the draft EIS. The Federal Register notice established a 45-day comment period on the draft EIS that ended on August 29, 2016. The notice described the procedures for filing comments on the draft EIS and how information about the Project could be found on the FERC's website.

We held six public comment meetings during the draft EIS comment period in August 2016 at the following locations:

- Swanton, Ohio on August 10;
- Tecumseh, Michigan on August 11;
- Fremont, Ohio on August 15;
- Elyria, Ohio on August 16;
- Wadsworth, Ohio on August 17; and
- Uniontown, Ohio on August 18.

On August 4, 2016, we posted a memorandum to the public docket clarifying the meeting format and explaining that comments on the draft EIS could be provided in a written format or verbally on a one-

⁹ Using the "eLibrary" link, select "General Search" from the eLibrary menu and enter the docket number excluding the last three digits in the "Docket Number" field (i.e., PF15-10, PF15-11, CP16-22, or CP16-23). Be sure to select an appropriate date range.

on-one basis to a court reporter. We received a number of comments during the draft EIS comment period objecting to the meeting format. We note that the meeting format is consistent with the NEPA as well as FERC regulations for implementing NEPA.

The meetings provided interested parties with an opportunity to present oral comments on our analysis of the environmental impacts of the Projects as described in the draft EIS. A total of 246 people commented at the meetings. In addition, we received 2,413 letters in response to the draft EIS. All timely environmental comments on the draft EIS have been addressed in this final EIS. A transcript of each meeting and copies of each written comment are part of the public record for the Projects. Our responses to relevant comments are provided in appendix R of this final EIS. Substantive changes in the final EIS are indicated by vertical bars that appear in the margins. The changes were made both in response to comments received on the draft EIS and as a result of updated information that became available after the issuance of the draft EIS.

On October 6, 2016, the Commission issued a letter to landowners along the Chippewa Lake D Route Variation (see section 3.4.11) opening a special 30-day comment period. The letter explained that NEXUS was proposing to modify a route variation recommended by the FERC in the draft EIS, and requested comments and concerns from the newly affected landowners.

This final EIS is being mailed to federal, state, and local agencies; elected officials; Native American tribes; newspapers; public libraries; intervenors; and other interested parties (i.e., affected landowners, miscellaneous individuals, and environmental groups), and will be filed with the EPA for issuance of a formal public notice of availability in the Federal Register. In accordance with CEQ's regulations implementing NEPA, no agency decision on a proposed action may be made until 30 days after the EPA publishes a notice of availability for a final EIS. However, the CEQ regulations provide an exception to this rule when an agency decision is subject to a formal internal process that allows other agencies or the public to make their views known. In such cases, the agency decision may be made at the same time the notice of the final EIS is published, allowing both periods to run concurrently. Should the Commission issue NEXUS and Texas Eastern Certificates for their respective actions, they would be subject to a 30-day rehearing period. Therefore, the Commission could issue its decision concurrently with issuance of the final EIS.

Table 1.3-1 lists the environmental issues that were identified during scoping and indicates the section of the EIS in which each issue is addressed. Including comments received at the public scoping meetings, nearly 2,000 written comment submissions and over 50 motions to intervene were filed with the FERC and placed in the public record for the Projects. Table 1.3-1 also lists issues that were identified after the formal scoping period closed, including the relevant environmental comments raised by individuals requesting to be intervenors in the Commission's proceeding.¹⁰ Additional issues we independently identified are also addressed in the EIS.

¹⁰ The FERC's *Notice of Application* for the Projects was issued in the Federal Register on March 9, 2015, which opened the 21-day period for intervention. A total of 80 groups and individuals for the NGT Project and 0 for the TEAL Project requested intervenor status. Intervenors are official parties to the proceeding and have the right to receive copies of case-related Commission documents and filings by other intervenors.

TABLE 1.3-1

Environmental Issues and Concerns Raised During Public Scoping for the NGT and TEAL Projects	
Issue/Concern	EIS Section Addressing Issue
GENERAL	
Project purpose and need	1.1
Availability of project-related information to the public	1.3
Exportation and production of natural gas and impacts associated with fracking	2.1, &1.4
Design and location of the pipeline, land requirements, construction techniques	2.1, 2.2 & 2.3
Future pipelines and other utilities	2.1.1.2 & 2.7
Timeframe and schedule for the proposed facilities	2.4
GEOLOGY	
Potential for earthquakes to compromise the integrity of the pipeline after construction	4.1.3.1
Potential for landslides to compromise the integrity of the pipeline after construction	4.1.3.4
Potential for surface subsidence from underground mine or karst feature collapse to compromise the integrity of the pipeline after construction	4.1.5.6
Impacts from blasting	4.1.5.1
Impacts on waterbodies from clearing and stormwater runoff, including potential for increased flooding and impacts on flood control structures	4.1.5.7
SOILS	
Potential for severe erosion	4.2.1.1 & 4.2.2
Impacts of soil compaction during construction and long-term effects on crop yields	4.2.1.4 & 4.2.2
Impacts on topsoil	4.2.2
Impacts of construction on soil drainage and drainage tiles	4.2.2 & 4.9
WATER RESOURCES	
Impacts on groundwater and hydrology from trenching, blasting, drilling, and dewatering	4.3.1.2
Impacts on groundwater from the pipeline coating, a pipeline rupture, or compressor station release	4.3.1.2
Impacts on drinking water wells and septic systems	4.3.1.2
Impacts on waterbodies from construction through the waterbodies	4.3.2.2
Impacts on water sources used for hydrostatic testing	4.3.1.1 & 4.3.2.3
Potential for existing contamination to be encountered and spread during construction	4.3.1.1
Spill prevention and response measures	4.3.1.2 & 4.3.2.2
WETLANDS	
Impacts on wetlands	4.4.2.2
Restoration of wetlands including topsoil segregation, vegetation restoration, and invasive species	4.4.2.2
Impacts to fen habitat	4.4.3.1
Wetland impacts to Singer Lake Bog, to Creek Bend Farm Park, and to the Schleman Nature Preserve	4.4.3.1
Impacts to Category III wetlands (including fen, peatland, bog, and forested habitats)	4.4.2.2
VEGETATION	
Impacts on vegetation, including the spread of undesirable vegetation and noxious weeds during and after construction	4.5.4
Impacts on old-growth trees and forests	4.5.2.1
Impacts on rare or sensitive plant habitats	4.5.1.1 & 4.6.3
Impacts on threatened and endangered plant species	4.5.1
WILDLIFE	
Impacts on wildlife from noise during construction and operation	4.6.2.1
Impacts on wildlife and wildlife habitat from forest fragmentation	4.6.4

TABLE 1.3-1 (cont'd)

Environmental Issues and Concerns Raised During Public Scoping for the NGT and TEAL Projects	
Issue/Concern	EIS Section Addressing Issue
Impacts on rare or sensitive habitats	4.6.3
Impacts on migratory birds	4.6.6
Impacts on rare or sensitive wildlife habitats	4.6.2
SPECIAL-STATUS SPECIES	
Impacts on federally listed or proposed threatened or endangered species or their critical habitat	4.8.1
Impacts on state-listed species	4.8.2
Agency coordination on special-status species	4.8.1.3 & 4.8.2.1
LAND USE, RECREATION, AND VISUAL RESOURCES	
Impacts on densely populated areas (esp. schools, churches, ball fields, parks, day care centers, gun ranges)	4.9.3.1
Impacts on existing residences and structures	4.9.3.1
Impacts on planned future development	4.9.3.1
Impacts on agricultural lands, including drain tiles and crop damage	4.9.3.2
Impacts on specialty crop production (orchards) and organic farms	4.9.3.2
Impacts on lands enrolled in tax incentive programs, including for timber production and maple trees for syrup	4.9.3.3
Impacts on recreational and special interest areas, including wetland mitigation/preservation areas	4.9.4
Potential for existing contamination to be encountered at city parks and the RACER site	4.9.6
Eminent domain and compensation process	4.9.2
Compatibility with local and regional land use and zoning plans	4.9.3.1
Visual impacts of the pipeline right-of-way and aboveground facilities	4.9.7
SOCIOECONOMICS	
Impacts on traffic and roads	4.10.5 & 4.10.7
Impacts on public safety and emergency response services	4.10.5 & 4.10.7
Impacts on homes and property values, including ability to obtain and afford homeowner's insurance	4.10.8
Impacts on businesses	4.10.6 & 4.10.9
Impacts on local economies, including agriculture and tourism	4.10.6
Impacts on minority and low-income populations	4.10.10
Potential tax revenue benefits to local communities	4.10.9
CULTURAL RESOURCES	
Impacts on culturally and historically significant properties	4.11.4
AIR QUALITY AND NOISE	
Impacts on air quality during construction and operation	4.12.1.3
Health impacts from fugitive dust generated during construction and operation	4.12.1.3
Noise impacts during construction and operation	4.12.2.1
Consistency with emissions limits and standards	4.12.1.3
Methane leaks/blowdowns and greenhouse gas emissions/climate change	4.12.1.3

TABLE 1.3-1 (cont'd)

Environmental Issues and Concerns Raised During Public Scoping for the NGT and TEAL Projects	
Issue/Concern	EIS Section Addressing Issue
Emissions from all compressors stations analyzed as a single source	4.12.1.3
Pre- and post-construction testing and air quality monitoring	4.12.1.2
Low frequency vibrations	4.12.2.1
RELIABILITY AND SAFETY	
Emergency response plans and coordination with community public safety services	4.13.1
Safety and reliability of pipeline construction and operation/maintenance, particularly given the recent incident in western Pennsylvania	4.13.2
Potential for third-party damage to the pipeline	4.13.2
Who is responsible for damage caused by a pipeline accident	4.13.3
Potential impacts from locating near electrical transmission lines	4.13.3
Hazards associated with living, recreating, going to school, etc. near a natural gas pipeline and the potential for natural gas leaks, spills, and explosions	4.13.3
Impacts of blasting at local quarries on integrity of pipeline	4.13.3
Safety of high-pressure pipelines in or near population centers and/or near schools and child daycare and elderly facilities	4.13.1
ALTERNATIVES	
Co-locate with existing utilities	3.0
Creation of a pipeline safety corridor	3.0
Avoidance of populated areas and planned development, including the City of Green	3.0 & 3.3.3
No Action alternative	3.1
Alternative energy sources	3.1
Use of existing pipeline systems	3.2.1
Stakeholder proposed alternative routes	3.3, 3.4
Avoidance of sensitive resources, including Oak Openings	3.3, 3.4 & 3.5
Alternative compressor station sites	3.5
CUMULATIVE IMPACTS	
Analysis of cumulative impacts when combining the Projects with other actions in the region	4.14.8 & 4.14.9
Potential for the cleared pipeline right-of-way to contribute to increased erosion and loss of vegetation in the vicinity of the Projects	4.14.3 & 4.14.7
Potential for increased greenhouse gas emissions associated with the natural gas transported in the pipeline to contribute toward climate change	4.14.8
Induced natural gas development	4.14.3

Several of the issues identified both during and after the pre-filing process involved alternative pipeline routes requested to avoid localized resources such as water wells or wetlands, as well as larger resource areas such as aquifers, watersheds, and other environmentally sensitive areas (e.g., natural habitat management areas or designated scenic areas). These concerns were identified by property owners, stakeholders, FERC staff, and other agency staff. Many of these alternative routes that avoided sensitive resources were developed early in the process and voluntarily incorporated by NEXUS into its proposed route. Given this process, subsequent alternative route comparisons often were not necessary if the resource was avoided or the stakeholder's concerns were otherwise resolved; however, other alternative routes, both minor (as in a variation) and major (as in a route alternative), remained viable throughout the course of

planning. Section 3.0 presents our analysis of the alternatives that we evaluated since the beginning of our review in December 2014.

1.4 NON-JURISDICTIONAL FACILITIES

Under Section 7 of the NGA, FERC is required to consider, as part of its decision to authorize interstate natural gas facilities, all factors bearing on the public convenience and necessity. Occasionally, proposed projects have associated facilities that do not come under the jurisdiction of FERC. These “non-jurisdictional” facilities may be integral to the project objective (e.g., a new or expanded power plant that is not under the jurisdiction of FERC at the end of a pipeline) or they may be merely associated as minor, non-integral components of the jurisdictional facilities that would be constructed and operated with the proposed facilities (e.g., a meter station constructed by a customer of the pipeline to measure gas off-take).

Non-jurisdictional facilities associated with the NGT and TEAL Projects include the proposed construction and operation of new compressor units at two existing DTE Gas compressor facilities in Michigan, a short interconnecting pipeline and tee-tap with Columbia Gas of Ohio, and short connections to distribution lines to secure power to serve compressor stations, M&R stations, and mainline valves (MLV)¹¹ proposed for the NGT and TEAL Projects.

DTE Gas, in support of the NGT Project, proposes to modify existing facilities including the Willow Gate Station and the Willow Run Compressor Station located in Ypsilanti Township, Washtenaw County, Michigan; and the Milford Compressor Station located in Milford Township, Oakland County, Michigan. All modifications would be constructed entirely within property currently owned by DTE Gas. The Willow Gate Station would be modified with pipe additions of approximately 2,000 feet of 36-, 30-, 24-, 16-, and 12-inch-diameter pipe and necessary valves along with three new 10 million British thermal units per hour (MMBtu/hr) water bath line heaters. The Willow Run Compressor Station would be modified with compressor building and miscellaneous station/unit piping to provide an additional 17,700 hp of new gas compression that would discharge to the Willow Gate Station with an addition of approximately 2,500 feet of 30-inch-diameter pipe. Modifications to the Milford Compressor station would include an additional 45,000 hp of new gas compression that includes an associated compressor building and miscellaneous station/unit piping, and would be sent through an additional 2,000 feet of 36-inch suction/discharge header pipe to an existing DTE Gas transmission pipeline valve nest.

All three facilities are scheduled to be available for the NGT Project on November 1, 2017. The Willow Gate Station is being scheduled in two phases with the first phase in the summer of 2016 and the second in the summer of 2017. Both the Willow Run and Milford Compressor Stations are scheduled to begin construction in the fall of 2016.

Columbia Gas of Ohio is proposing to install approximately 110 feet of buried interconnecting 20-inch-diameter pipeline and a tee-tap on its existing pipeline system located just west of the proposed MR06 meter station at MP 159.3. The tap would consist of a buried tee and valve with aboveground valve operator or hand wheel.

The only non-jurisdictional facility associated with the TEAL Project would be the electrical power needed for the Salineville Compressor Station, which would require a connection to the local electrical distribution grid. Texas Eastern has sited the compressor station near existing roads with existing electrical lines to minimize the length of connections to the electrical distribution lines. These facilities, and others, are addressed in our cumulative impacts analysis in section 4.14 of this EIS.

¹¹ A mainline valve is an aboveground facility that is capable of controlling the flow of gas in a pipeline.

We received numerous comments during scoping requesting that we consider oil and gas production facilities in the Projects area as related facilities. The permitting of oil and gas production facilities is under the jurisdiction of various state and federal agencies where those facilities are located. Thus, the facilities associated with the production of natural gas are not under FERC jurisdiction. Commenters during scoping and the draft EIS comment period suggested that the impacts associated with producing natural gas (including fracking) be included in our environmental review of the Projects. The development of the Appalachian Basin natural gas, which is regulated by the states, continues to drive the need for takeaway interstate pipeline capacity to allow the gas to reach markets; therefore, companies are planning and building interstate transmission facilities in response to this gas supply. In addition, many production facilities have already been permitted and/or constructed in the region, creating a network through which natural gas may flow along various pathways to local users or interstate pipeline systems. That is not to say that the environmental impact of individual production facilities is not assessed. The permitting of oil and gas production facilities is under the jurisdiction of other agencies, such as the USACE or state agencies. Although we do not examine the impacts of natural gas production facilities or fracking to the same extent as the Projects' facilities in this EIS, we have identified existing and proposed production facilities in proximity to the Projects and have considered them within the context of cumulative impacts in section 4.14 of this EIS.

1.5 PERMITS, APPROVALS, AND REGULATORY REQUIREMENTS

FERC and other federal agencies that must make a decision on whether the NGT and TEAL Projects are required to comply with federal statutes, including the CAA, CWA, ESA, MBTA, BGEPA, Coastal Zone Management Act (CZMA), and the National Historic Preservation Act (NHPA). Each of these statutes has been taken into account in the preparation of this EIS.

A list of major environmental permits, approvals, and consultations for the NGT and TEAL Projects is provided in table 1.5-1. NEXUS and Texas Eastern would be responsible for obtaining all permits and approvals required to construct and operate the Projects, regardless of whether or not they appear in this table. FERC encourages cooperation between NEXUS and Texas Eastern and state and local authorities; however, state and local agencies, through the application of state and local laws, may not prohibit or unreasonably delay the construction or operation of facilities approved by FERC. Any state or local permits issued with respect to jurisdictional facilities must be consistent with the conditions of any authorization issued by FERC.¹²

TABLE 1.5-1				
Major Environmental Permits, Licenses, Approvals, and Consultations for the NGT and TEAL Projects				
Agency/Permit or Approval	NGT Project		TEAL Project	
	Submittal	Receipt	Submittal	Receipt
FEDERAL				
FERC				
Certificate under Section 7(c) of the NGA	20-Nov-15	(Dec-16)	20-Nov-15	(Dec-16)
U.S. Army Corps of Engineers				
Permits under Section 404 of the CWA and Section 10 of the Rivers and Harbors Act	18-Dec-15	(Nov/Dec-16)	(TBD)	(Nov/Dec-16)

¹² See 15 U.S.C. § 717r(d) (state or federal agency's failure to act on a permit considered to be inconsistent with Federal law); see also *Schneidewind v. ANR Pipeline Co.*, 485 U.S. 293, 310 (1988) (state regulation that interferes with FERC's regulatory authority over the transportation of natural gas is preempted) and *Dominion Transmission, Inc. v. Summers*, 723 F.3d 238, 245 (D.C. Cir. 2013) (noting that state and local regulation is preempted by the NGA to the extent it conflicts with federal regulation, or would delay the construction and operation of facilities approved by the Commission).

TABLE 1.5-1 (cont'd)

Major Environmental Permits, Licenses, Approvals, and Consultations for the NGT and TEAL Projects				
Agency/Permit or Approval	NGT Project		TEAL Project	
	Submittal	Receipt	Submittal	Receipt
FWS				
Consultation under Section 7 of the ESA and coordination under the MBTA	20-Nov-15	<i>(Oct/Nov-16)</i>	20-Nov-15	<i>(Oct/Nov-16)</i>
U.S. National Park Service				
Wild and Scenic Rivers Act Section 7(a) Determination	20-Nov-15	N/A	20-Nov-15	N/A
Advisory Council on Historic Properties				
Consultation under Section 106 of the NHPA	20-Nov-15	<i>(Nov/Dec-16)</i>	20-Nov-15	<i>(Nov/Dec-16)</i>
OHIO				
Ohio Environmental Protection Agency				
Section 401 Water Quality Certification	17-Dec-15	<i>(Nov/Dec-16)</i>	<i>(TBD)</i>	<i>(Nov/Dec-16)</i>
CAA, Air Permit-to-Install-and-Operate	14-Jul-15	<i>(Nov-16)</i>	<i>(TBD)</i>	<i>(Nov-16)</i>
NPDES hydrostatic test water discharge permit	<i>(Dec-16)</i>	<i>(Jan-17)</i>	<i>(2016)</i>	<i>(Jan-17)</i>
Ohio Department of Natural Resources				
Consultation on threatened and endangered species	20-Nov-15	<i>(Sep/Oct-16)</i>	20-Nov-15	<i>(Sep/Oct-16)</i>
Water withdrawal facility registration	<i>(Dec-16)</i>	<i>(Jan-17)</i>	N/A	N/A
Coastal management zone determination	22-Dec-15	<i>(Aug/Sep-16)</i>	N/A	N/A
Ohio Historic Preservation Office				
Section 106 NHPA consultation	20-Nov-15	<i>(Nov/Dec-16)</i>	20-Nov-15	<i>(Nov/Dec-16)</i>
MICHIGAN				
Michigan Department of Natural Resources				
State-listed species consultation	20-Nov-15	<i>(Sep/Oct-16)</i>	N/A	N/A
Michigan Department of Environmental Quality				
Joint permit for impacts on wetlands, inland lakes, streams and floodplains;	18-Dec-15	<i>(Nov/Dec-16)</i>	N/A	N/A
NPDES hydrostatic test water discharge permit	18-Dec-15	<i>(Nov/Dec-16)</i>	N/A	N/A
NPDES permit for storm water discharge from construction activities	18-Dec-15	<i>(Nov/Dec-16)</i>	N/A	N/A
Water withdrawal authorization	18-Dec-15	<i>(Nov/Dec-16)</i>	N/A	N/A
Michigan Office of Historic Preservation				
Section 106 NHPA Consultation	20-Nov-15	<i>(Nov/Dec-16)</i>	N/A	N/A
Michigan Natural Resources Inventory				
State-listed species consultation	20-Nov-15	N/A	N/A	N/A
Lenawee County				
Soil Erosion and Sediment Control Permit	<i>(TBD)</i>	<i>(TBD)</i>	N/A	N/A
Monroe County				
Soil Erosion and Sediment Control Permit	<i>(TBD)</i>	<i>(TBD)</i>	N/A	N/A
Washtenaw County				
Soil Erosion and Sediment Control Permit	<i>(TBD)</i>	<i>(TBD)</i>	N/A	N/A
Wayne County				
Soil Erosion and Sediment Control Permit	<i>(TBD)</i>	<i>(TBD)</i>	N/A	N/A
TBD = To be determined.				
Note: Future/anticipated dates are identified in <i>italic</i> font and parentheses.				

2.0 DESCRIPTION OF PROPOSED ACTION

2.1 PROPOSED FACILITIES

The proposed Projects evaluated in this EIS include the NGT Project and TEAL Project. The NGT Project would involve construction and operation of new pipeline, four new compressor stations, six new M&R stations, and associated aboveground facilities as described in the following sections.¹ The TEAL Project would involve construction of loop pipeline, connecting pipeline, one new compressor station, and associated aboveground facilities, as well as modifications at one existing compressor station, as described in the following sections. Overview maps depicting the locations of these facilities are provided in figures 2.1-1 and 2.1-2. Detailed maps showing the pipeline routes and aboveground facilities are included in appendix B.² The non-jurisdictional facilities associated with the Projects are addressed in section 1.4.

2.1.1 NGT Project

2.1.1.1 Pipeline Facilities

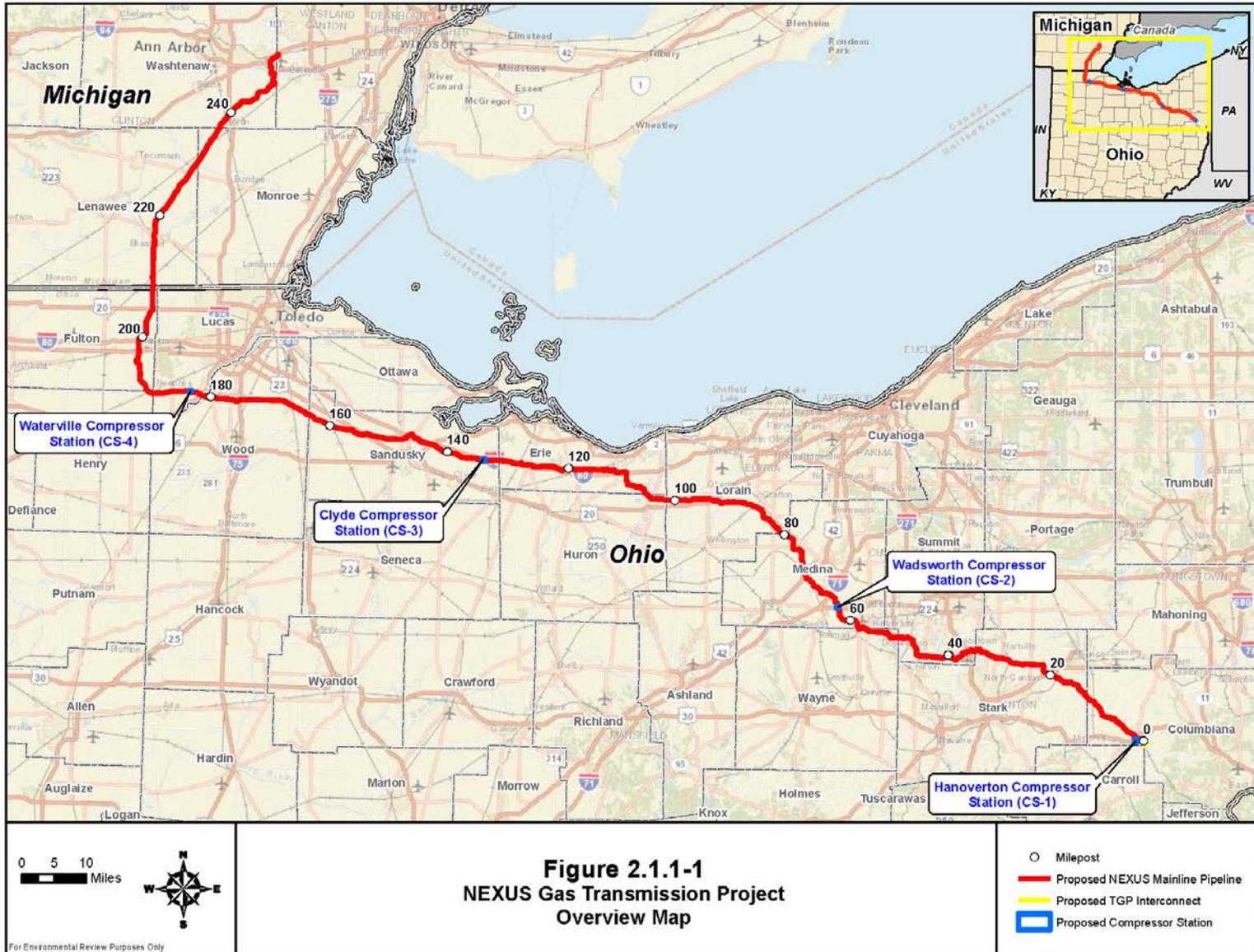
The proposed NGT Project pipeline facilities would include two main components:

- the NGT mainline, which consists of about 255.7 miles of new 36-inch-diameter mainline pipeline, including about 208.9 miles of new pipeline in Columbiana, Stark, Summit, Medina, Lorain, Huron, Erie, Sandusky, Wood, Lucas, Henry, and Fulton Counties, Ohio; and about 46.8 miles of new pipeline in Lenawee, Monroe, and Washtenaw Counties, Michigan; and
- the Tennessee Gas Pipeline Company, LLC (TGP) interconnecting pipeline, which consists of about 0.9 mile of new 36-inch-diameter interconnecting pipeline between the NGT mainline and TGP in Columbiana County, Ohio.

The pipeline facilities would be constructed of steel and installed underground for their entire length, except for small segments of aboveground piping at aboveground facilities. A summary of NGT Project pipeline facilities is provided in table 2.1.1-1.

¹ NEXUS proposed several minor route variations and workspace modifications during the comment period for the draft EIS. These minor route variations and workspaces modifications are discussed in section 3.0 of this final EIS.

² More detailed aerial photo-based alignment sheets can be downloaded from the FERC website (www.ferc.gov) using the eLibrary link. Click the eLibrary link, then click on “Advanced Search”, and enter “20151120-5253” in the “Accession Number” field.



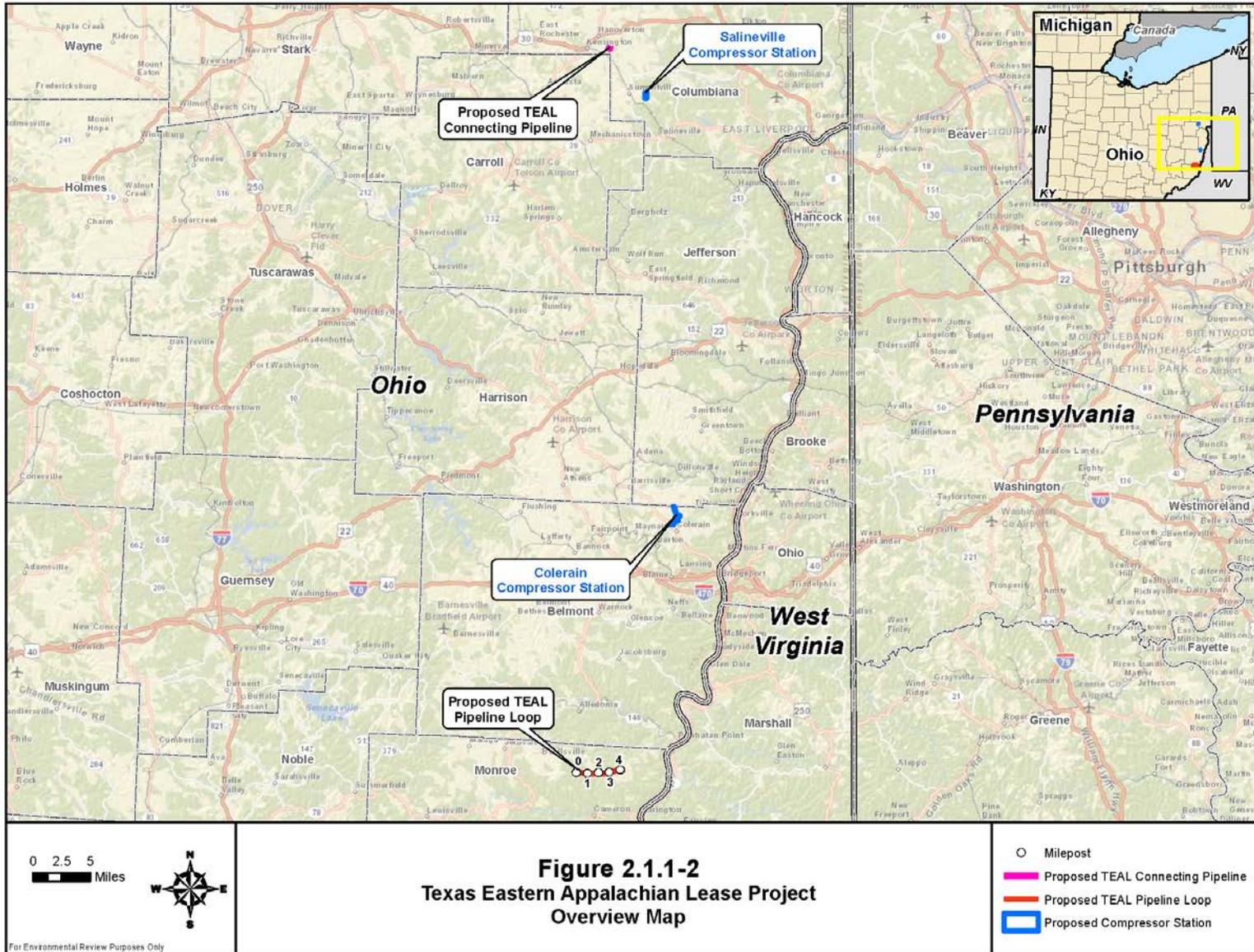


TABLE 2.1.1-1				
NGT Project Pipeline Facilities				
State/County	Component	Pipe Diameter (inches)	Milepost Range ^a	Length (miles) ^b
OHIO				
Columbiana	TGP Interconnecting Pipeline	36	0.0 - 0.9 TGP	0.9
	NGT Mainline	36	0 - 12.5	12.6
Stark	NGT Mainline	36	12.5 - 34.2	21.7
Summit	NGT Mainline	36	34.2 - 50.4	16.3
Wayne	NGT Mainline	36	50.4 - 56.6	6.2
	NGT Mainline	36	57.2 - 57.7	0.6
Medina	NGT Mainline	36	56.6 - 57.2	0.6
	NGT Mainline	36	57.7 - 80.5	22.9
Lorain	NGT Mainline	36	80.5 - 101.3	21.0
Huron	NGT Mainline	36	101.3 - 104.7	3.4
Erie	NGT Mainline	36	104.7 - 131.5	26.7
Sandusky	NGT Mainline	36	131.5 - 163.7	32.4
Wood	NGT Mainline	36	163.7 - 181.4	17.7
Lucas	NGT Mainline	36	181.4 - 189.3	7.9
Henry	NGT Mainline	36	189.3 - 190.2	0.9
Fulton	NGT Mainline	36	190.2 - 208.3	18.0
			Ohio Total	209.8
MICHIGAN				
Lenawee	NGT Mainline	36	208.3 - 230.4	22.1
Monroe	NGT Mainline	36	230.4 - 236.9	6.5
Washtenaw	NGT Mainline	36	236.9 - 255.0	18.2
			Michigan Total	46.8
			NGT Project Total	256.6
a	Mileposts followed by a "TGP" indicate the facility is on the TGP Interconnecting Pipeline. Mileposts without a "TGP" indicate the facility is on the NGT mainline.			
b	Lengths listed may not correspond exactly to the milepost range due to route variations that have altered the pipeline length.			

2.1.1.2 Aboveground Facilities

The proposed NGT Project would include construction of new aboveground facilities, including 4 compressor stations, 6 M&R stations, 16 MLVs, 4 pig launchers, 4 pig receivers, and 5 communication towers. A summary of NGT Project aboveground facilities is provided in table 2.1.1-2.

TABLE 2.1.1-2			
NGT Project Aboveground Facilities			
Facility Name	County, State	Milepost ^a	Description ^b
COMPRESSOR STATIONS			
CS 1 – Hanoverton	Columbiana, OH	1.4	Construct compressor station and communication tower.
CS 2 – Wadsworth	Medina, OH	63.5	Construct compressor station, pig launcher, pig receiver, and communication tower.
CS 3 – Clyde	Sandusky, OH	134.0	Construct compressor station and communication tower.
CS 4 – Waterville	Lucas, OH	183.5	Construct compressor station, pig launcher, pig receiver, and communication tower.
METERING AND REGULATING STATIONS			
MR01 – TGP	Columbiana, OH	0.0 TGP	Construct M&R station and pig launcher at beginning of TGP interconnecting pipeline.

TABLE 2.1.1-2 (cont'd)

NGT Project Aboveground Facilities			
Facility Name	County, State	Milepost ^a	Description ^b
MR03 – Texas Eastern	Columbiana, OH	0.9 TGP	Construct M&R station and pig receiver at end of TGP interconnecting pipeline.
MR02 – Kensington	Columbiana, OH	0.0	Construct M&R station and pig launcher at beginning of NGT mainline.
MR05 – Dominion East Ohio	Erie, OH	128.8	Construct M&R station delivery point with Dominion East Ohio Gas.
MR06 – Columbia Gas Ohio	Sandusky, OH	159.3	Construct M&R station delivery point with Columbia Gas Ohio
MR04 – Willow Run	Washtenaw, MI	255.0	Construct M&R station and pig receiver at end of NGT Mainline.
MAINLINE VALVES			
MLV 1	Stark, OH	16.7	Construct new MLV.
MLV 2	Stark, OH	32.6	Construct new MLV.
MLV 3	Summit, OH	40.2	Construct new MLV.
MLV 4	Wayne, OH	50.4	Construct new MLV.
MLV 5	Medina, OH	58.0	Construct new MLV.
MLV 6	Medina, OH	71.9	Construct new MLV.
MLV 7	Lorain, OH	89.3	Construct new MLV.
MLV 8	Lorain, OH	96.7	Construct new MLV.
MLV 9	Erie, OH	116.3	Construct new MLV.
MLV 10	Erie, OH	124.8	Construct new MLV.
MLV 11	Sandusky, OH	151.8	Construct new MLV.
MLV 12	Wood, OH	167.8	Construct new MLV.
MLV 13	Lucas, OH	189.2	Construct new MLV.
MLV 14	Lenawee, MI	208.9	Construct new MLV.
MLV 15	Lenawee, MI	228.2	Construct new MLV and communication tower.
MLV 16	Washtenaw, MI	247.4	Construct new MLV.
a	Mileposts followed by a "TGP" indicate the facility is on the TGP Interconnecting Pipeline. Mileposts without a "TGP" indicate the facility is on the NGT mainline.		
b	Pig launchers, pig receivers, and communication towers would be co-located with other facilities.		
CS = Compressor station			
MR = M&R station			

Compressor Stations

NEXUS would construct four new compressor stations for the NGT Project. Compressor stations utilize engines to maintain pressure within the pipeline in order to deliver the contracted volumes of natural gas to specific points at specific pressures. Compressors are housed in acoustically insulated buildings that are designed to attenuate noise and allow for operation and maintenance activities. Auxiliary equipment typically includes a turbine exhaust system with exhaust stack, turbine air intake system, gas piping, and a unit blowdown silencer for the compressor unit. Compressor stations also include administrative, maintenance, storage, and communications buildings, and can include metering, pig launching, and pig receiving facilities, as discussed in the following sections. Stations consist of a developed, fenced area within a larger parcel of land that remains undeveloped. The location of the compressor station and amount of compression needed are determined primarily by hydraulic modeling. The general construction procedures for the compressor stations are discussed in section 2.3.3. Regulatory requirements and impacts on air quality and noise associated with compressor stations are discussed in section 4.12.

The Hanoverton Compressor Station (CS1) would be located in Columbiana County, Ohio and consist of two natural gas turbine-driven compressor packages totaling 52,000 hp. The facility would be located on 27.7 acres within a 119.6-acre parcel of agriculture and open lands that NEXUS would acquire.

The Wadsworth Compressor Station (CS2) would be located in Medina County, Ohio and consist of a single natural gas turbine-driven compressor package totaling 26,000 hp. The facility would be located on 22.0 acres within a 76.5-acre parcel of agricultural, open, and residential lands that NEXUS would acquire.

The Clyde Compressor Station (CS3) would be located in Sandusky County, Ohio and consist of a single natural gas turbine-driven compressor package totaling 26,000 hp. The facility would be located on 37.2 acres within a 50.4-acre parcel of agricultural, open, industrial/commercial that NEXUS would acquire.

The Waterville Compressor Station (CS4) would be located in Lucas County, Ohio and consist of a single natural gas turbine-driven compressor package totaling 26,000 hp. The facility would be located on 33.0 acres within a 48.8-acre parcel of agricultural, open, and industrial/commercial lands that NEXUS would acquire.

Metering and Regulating Stations

NEXUS would construct six new M&R stations. M&R stations measure the volume of gas added to or removed from a pipeline system. Most M&R stations consist of a small, fenced, graveled area with small building(s) that enclose the measurement equipment.

TGP M&R Receipt Station (MR01) is proposed at the beginning of the TGP Interconnecting Pipeline and would tie-in with TGP's mainline in Columbiana County, Ohio.³ The facility would be located on 3.6 acres within a 35.1-acre parcel of agricultural, open, and industrial/commercial land that NEXUS would acquire.

Texas Eastern M&R Receipt Station (MR03) is proposed at the end of the TGP interconnecting pipeline in Columbiana County, Ohio. The MR03 facilities would be located on 5.2 acres of land within a 117.2-acre parcel of agricultural, forested, and industrial/commercial land that NEXUS would acquire.

The Kensington M&R Receipt Station (MR02) is proposed at the beginning of the NGT mainline and would be immediately adjacent to MR03 in Columbiana County, Ohio. The MR02 facilities would be co-located on the same 5.2 acres of land within the same 117.2-acre parcel that NEXUS would acquire for MR03.

The DEO M&R Delivery Station (MR05) is proposed at the delivery point with DEO Gas in Erie County, Ohio. The facility would be located on 1.8 acres of land within a 20.2-acre parcel of agricultural land that NEXUS would acquire.

The Columbia Gas Ohio Delivery Station (MR06) is proposed at the delivery point with Columbia Gas Ohio in Sandusky County, Ohio. The facility would be located on 1.0 acre of land within a 76.9-acre parcel of agricultural land that NEXUS would acquire.

The Willow Run M&R Delivery Station (MR04) is proposed at the terminus of the NGT mainline and would tie-in with DTE facilities in Washtenaw County, Michigan. The facility would be located on 0.7 acre of land within a 3.7-acre parcel of open and industrial/commercial that NEXUS would acquire.

³ In this EIS, we generally present information in milepost order. This may be confusing for M&R stations because the M&R station numbers assigned by NEXUS and Texas Eastern do not represent the milepost order in which they occur on the Projects.

Mainline Valves

The NGT Project would include construction and operation of 16 remote-controlled MLVs. MLVs consist of a system of aboveground and underground piping and valves that control the flow of gas within the pipeline. MLVs are monitored at a gas control center and can be closed remotely with an electronic command to stop the flow of gas if necessary. MLVs would be installed within other aboveground facilities or in areas already disturbed by pipeline construction and would be primarily located within the permanent operational right-of-way.

Pig Launcher and Receivers

The NGT Project would include construction and operation of four pig launchers and four pig receivers. Launchers and receivers are facilities where internal pipeline cleaning and inspection tools, referred to as “pigs,” can be inserted or retrieved from the pipeline. Pig launchers and receivers consist of aboveground piping within the pipeline right-of-way or other aboveground facility boundaries. Pig launchers and receivers would be installed at the Wadsworth and Waterville compressor stations. Launcher facilities also would be installed at MR01 and at MR02, and receiver facilities would be installed at MR03 and MR04.

Communications Towers

The NGT Project would include construction and operation of five communications towers. Communications towers support licensed very high frequency mobile radio transmission equipment for voice communications. One tower would be installed at each of the compressor stations, and one tower would be installed at MLV 15. All of the towers would be 190 feet tall, except the tower at the Wadsworth Compressor Station, which would be 140 feet tall.

Tee-Taps

The NGT Project would include construction of 13 tee-taps along the proposed pipeline, as listed in table 2.1.1-3. Tee-taps typically are underground fittings installed on a pipeline to facilitate potential future connections, which may or may not include aboveground components at that location at a later date. Installing tee-taps during initial construction eliminates the need to make connections to an operational pipeline while natural gas is flowing (also known as a hot tap) at a later time. The tee-tap locations on the NGT Project represent locations where NEXUS is presently negotiating gas delivery contracts with potential customers. These locations do not necessarily represent the locations where gas will eventually be delivered because negotiations may not be successful and result in a gas delivery contract.

Facility Name	County, State	Milepost	Comments
Dominion East Ohio (DEO) TPL 15 Tap	Columbiana, OH	3.2	
DEO TPL 13 Tap	Wayne, OH	52.4	
Brickyard & Rittman Industrial Tap	Medina, OH	56.7	
Columbia Gas Ohio S Medina Tap	Medina, OH	65.8	
Columbia Gas Ohio N Medina Tap	Medina, OH	75.0	
NRG Avon Lake Tap	Lorain, OH	88.0	
Erie County Industrial Park Tap	Erie, OH	120.3	
MR05 DEO Delivery	Erie, OH	128.8	Co-located with MR05.
Columbia Gas Ohio 1 Tap	Sandusky, OH	159.3	Co-located with MR06.
GDF Suez Troy Energy Tap	Wood, OH	166.3	
Oregon Clean Energy Tap	Wood, OH	170.4	
Waterville Tap	Lucas, OH	182.1	
Ohio Gas Tap	Fulton, OH	199.3	

2.1.2 TEAL Project

2.1.2.1 Pipeline Facilities

The TEAL Project pipeline facilities would include two main components:

- the TEAL pipeline loop, which comprises about 4.4 miles of new 36-inch-diameter loop pipeline on Texas Eastern’s Line 15 in Monroe County, Ohio; and
- the TEAL connecting pipeline, which comprises about 0.3 mile of new 30-inch-diameter interconnecting pipeline from Texas Eastern’s Line 73 to the NGT Project pipeline near MR02 in Columbiana County, Ohio.

As with the NGT Project, the pipeline facilities would be constructed of steel and installed underground for their entire length, except for small segments of aboveground piping at aboveground facilities.

2.1.2.2 Aboveground Facilities

The TEAL Project would include one new compressor station, one new communication tower, two new pig launchers/receivers,⁴ one temporary pig launcher/receiver, modifications at an existing compressor station, and modifications at other existing aboveground facility sites. A summary of TEAL Project aboveground facilities is provided in table 2.1.2-1.

Facility Name	County, State	Description
NEW FACILITIES		
Salineville Compressor Station	Columbiana, OH	Construct new compressor station and communication tower.
Pig Launcher/Receiver	Columbiana, OH	Install new pig launcher/receiver at beginning of TEAL connecting pipeline.
Pig Launcher/Receiver	Columbiana, OH	Install new pig launcher/receiver at end of TEAL connecting pipeline.
Pig Launcher/Receiver	Monroe, OH	Install temporary pig launcher/receiver at beginning of TEAL pipeline loop.
MODIFICATIONS AT EXISTING FACILITIES		
Colerain Compressor Station Site	Belmont, OH	Install new compressor unit and modify piping for bi-directional flow.
Line 30 Launcher/Receiver Site	Monroe, OH	Remove existing pig launcher/receiver at end of TEAL pipeline loop.
Line 73 Launcher/Receiver Site	Monroe, OH	Modify piping and install filter separator for bi-directional flow.
Line 73 Regulator Site	Monroe, OH	Modify piping and install filter separator for bi-directional flow.

Compressor Stations

Texas Eastern would construct and operate one new compressor station. The Salineville Compressor Station would be located in Columbiana County, Ohio and consist of natural gas turbine-driven compressor

⁴ A “pig launcher/receiver,” as distinguished from either a “pig launcher” or “pig receiver,” indicates that the facility is capable of both launching and receiving pigs.

packages totaling 18,800 hp. The facility would be located on 11.5 acres within a 48.8-acre parcel of agricultural and open lands that Texas Eastern would acquire.

Texas Eastern would modify its existing Colerain Compressor Station in Belmont County, Ohio by installing a new natural gas turbine-driven compressor package providing an additional 9,400 hp of compression. Texas Eastern also would conduct piping modifications at the compressor station to accommodate bi-directional flow. All work would occur within the existing compressor station site or adjacent areas previously disturbed by construction of the station.

Pig Launcher/Receivers

Texas Eastern would construct and operate two new pig launcher/receivers and one temporary pig launcher/receiver, and would remove one existing launcher/receiver. New pig launcher/receiver facilities would be installed at the beginning and end of the TEAL connecting pipeline. A temporary pig launcher/receiver facility would be installed at the beginning of the TEAL pipeline loop and an existing pig launcher/receiver would be removed from the end of the TEAL pipeline loop. Also, Texas Eastern would conduct piping modifications and install filter separators at one additional existing launcher/receiver site and at one existing regulator site.

Communications Towers

Texas Eastern would construct and operate one new communication tower. The tower would be installed at the Salineville Compressor Station site and would be 300 feet tall.

2.2 LAND REQUIREMENTS

Table 2.2-1 summarizes the land use requirements for the pipelines and associated facilities, including compressor and M&R stations, additional temporary workspace (ATWS), pipe/contractor yards, staging areas, and access roads that are described in sections 2.2.1 through 2.2.4. A more detailed description of the land use requirements for the Projects is presented in section 4.9.1. If the Projects are approved, the applicants' construction and operational work areas would be limited to those described in the final EIS and any subsequent Commission authorizations as described in section 2.5.3.

TABLE 2.2-1		
Summary of Land Requirements Associated with the Projects		
Project Component	Construction Area (acres)	Operation Area (acres)
NGT PROJECT		
Pipeline Right-of-Way	3,007.2	1,559.8
Additional Temporary Workspace	1,358.1	0.0
Aboveground Facilities	293.8	132.2
Access Roads	68.9	4.0
Pipe/Contractor Yards & Staging Areas	282.8	0.0
NGT Project Total	5,010.8	1,696.0
TEAL PROJECT		
Pipeline Right-of-Way	53.3	26.7
Additional Temporary Workspace	34.3	0.0
Aboveground Facilities	113.6	16.2
Access Roads	4.9	1.0
Pipe/Contractor Yards & Staging Areas	0.0	0.0
TEAL Project Total	213.0	45.9
Grand Total	5,223.7	1,741.9
Note: The totals shown in this table may not equal the sum of addends due to rounding.		

2.2.1 NGT Project

2.2.1.1 Pipeline Facilities

Construction of the NGT Project would disturb 5,010.8 acres of land, including pipeline facilities, ATWS, aboveground facilities, pipe/contractor yards, staging areas, and access roads. Permanent operation of the NGT Project would require 1,559.8 acres for the permanent right-of-way, 132.2 acres for aboveground facilities, and 4.0 acres for permanent access roads. The remaining 3,314.8 acres of land disturbed during construction would be restored and allowed to revert to its pre-construction use.

Co-location with Existing Rights-of-Way

The Commission's policy encourages the use, enlargement, or extension of existing rights-of-way over developing new rights-of-way in order to reduce potential impacts on sensitive resources. In general, the co-location of new pipeline along existing rights-of-way or other linear corridors that have been previously cleared or used (e.g., pipelines, power lines, roads, or railroads) may be environmentally preferable to the development of new rights-of-way. Construction-related impacts and cumulative impacts can normally be reduced by use of previously cleared or disturbed rights-of-way; however, in congested or environmentally sensitive areas, it may be advantageous to deviate from an existing right-of-way. Additionally, co-location may be infeasible in some areas due to a lack of or unsuitably oriented existing corridors, engineering and design considerations, or constructability or permitting issues.

Approximately 45 percent of NGT's pipeline rights-of-way would be co-located or adjacent to existing pipeline, roadway, railway, and/or utility rights-of-way. A summary of areas where the NGT Project would be adjacent to existing rights-of-way is presented in appendix C-1. In these areas, the pipeline would not be installed within an existing right-of-way, but may utilize the existing utility right-of-way for temporary construction workspace.

Right-of-Way Configurations

NEXUS proposes to use a 100-foot-wide construction right-of-way. In certain sensitive areas, such as wetlands and residential lands, NEXUS proposes to reduce its construction right-of-way width to 75 feet. In areas where full construction right-of-way topsoil stripping would be conducted⁵ and at steep side-slopes, NEXUS proposes to increase its construction right-of-way width to 125 to 145 feet. Following construction, NEXUS would retain a 50-foot-wide permanent right-of-way to operate the pipeline facilities. Appendix D depicts the typical right-of-way configurations for NEXUS' pipeline construction.

Additional Temporary Workspace

In addition to the various construction right-of-way configurations described above, NEXUS has requested 1,358.1 acres of ATWS in several locations due to the presence of wetlands, waterbodies, roads, railroads, and utilities, and for other site-specific, construction-related reasons. Appendix C-2 identifies where NEXUS has requested ATWS as well as justification for the use of each.

ATWS beyond those currently identified could be required during construction. Prior to construction, NEXUS would be required to file a complete and updated list of all extra work areas

⁵ We note that full construction right-of-way topsoil stripping would be conducted in agricultural land and where the proposed pipeline is co-located with existing pipeline and powerline easements in accordance with the typical right-of-way configurations included in appendix D.

(including pipe/contractor yards and staging areas) for review and approval (see Post-Approval Variance Process in section 2.5.3).

Aboveground Facilities

The proposed aboveground facilities for the NGT Project include 4 new compressor stations, 6 new M&R stations, 16 MLVs, 4 pig launcher, 4 pig receivers, and 5 communication towers (see table 2.2.1-1).

Construction of the compressor and M&R stations would require 292.7 acres of land, 131.5 acres of which would be used permanently during operation (see table 2.2.1-1). MLVs would be located entirely within the construction and permanent right-of-way for the pipeline and therefore would not encumber any additional acreage. Pig launchers, pig receivers, and communication towers would be co-located with other aboveground facilities and also would not encumber any additional acreage.

State/Facility ^a	Milepost ^b	Construction Area (acres)	Operation Area (acres)
OHIO			
New Compressor Stations			
CS 1 – Hanoverton	1.4	93.3	27.7
CS 2 – Wadsworth	63.5	64.0	22.0
CS 3 – Clyde	134.0	59.6	37.2
CS 4 – Waterville	183.5	37.3	33.0
Metering and Regulating Stations			
MR01 – TGP	0.0 TGP	10.3	3.6
MR02 – Kensington & MR03 – Texas Eastern ^c	0.9 TGP / 0.0	10.3	5.2
MR05 – Dominion East Ohio	128.8	10.1	1.8
MR06 – Columbia Gas Ohio	159.3	7.8	1.0
	Ohio Total ^d	292.7	131.5
MICHIGAN			
Meter and Regulating Stations			
MR04 – Willow Run	255.0	1.0	0.7
	NGT Project Total ^d	293.7	132.2
a	MLVs, pig launchers, pig receivers, and communication towers are not included in this table. MLVs would be located entirely within the construction and permanent rights-of-way for the pipeline and therefore would not encumber any additional acreage. Pig launchers, pig receivers, and communication towers would be co-located with other aboveground facilities and also would not encumber any additional acreage.		
b	Mileposts followed by a “TGP” indicate the facility is on the TGP Interconnecting Pipeline. Mileposts without a “TGP” indicate the facility is on the NGT mainline.		
c	The MR02 and MR03 facilities would be co-located on the same 5.2 acres of land within a 10.3-acre parcel		
d	The totals shown in this table may not equal the sum of addends due to rounding		

Pipe/Contractor Yards and Staging Areas

To support construction activities, NEXUS proposes to use eight pipe/contractor yards (also termed “wareyards” by NEXUS) on a temporary basis. The pipe/contractor yards would be used for equipment, pipe sections, and construction material and supply storage, as well as for temporary field offices, parking, and pipe preparation and pre-assembly. The use of these sites would temporarily affect about 282.8 acres of land (see appendix C-3). These yards are depicted on the maps in appendix B-1.

Access Roads

NEXUS would use existing public and private roads to gain access to the Project area. Many of the existing roads are presently in a condition that can accommodate construction traffic without modification or improvement. Some roads, however, are dirt or gravel roads that currently are not suitable for construction traffic. Where necessary, NEXUS would build new roads or improve existing roads through grading, widening, realigning, graveling, paving, and installing culverts. Access roads would temporarily impact 0.1 acre of wetland habitat. No permanent wetland impacts due to access roads would occur. NEXUS is proposing to build 73 new roads and modify 68 existing roads; of these, 22 new roads and 4 modified roads would be maintained on a permanent basis as access roads to aboveground facilities. Appendix C-4 identifies access road and road improvements proposed for the NGT Project.

2.2.2 TEAL Project

2.2.2.1 Pipeline Facilities

Construction of the TEAL Project would disturb 213.0 acres of land, which includes pipeline facilities, ATWS, aboveground facilities, pipe/contractor yards, and access roads. Permanent operation of the TEAL Project would require 26.7 acres for permanent right-of-way, 16.2 acres for aboveground facilities, and 1.0 acre for permanent access roads. The remaining 169.1 acres of land disturbed during construction would be restored and allowed to revert to its pre-construction use.

Co-location with Existing Rights-of-Way

Approximately 94 percent of the TEAL pipeline rights-of-way would be co-located with Texas Eastern's existing pipeline. Specifically, the entire 4.4-mile-long TEAL pipeline loop in Monroe County, Ohio would be co-located with Texas Eastern's Line 15. Conversely, the 0.3-mile-long TEAL connecting pipeline in Columbiana County, Ohio would not be co-located with existing right-of-way.

Right-of-Way Configurations

Texas Eastern proposes to use a 100-foot-wide construction right-of-way. In wetlands, Texas Eastern proposes to reduce its construction right-of-way width to 75 feet. Following construction, Texas Eastern would retain a 50-foot-wide permanent right-of-way to operate the pipeline facilities. The permanent right-of-way would overlap onto the existing Line 15 permanent right-of-way where co-located. Appendix D depicts the typical right-of-way configurations for Texas Eastern's pipeline construction.

Additional Temporary Workspace

In addition to the various construction right-of-way configurations described above, Texas Eastern has requested 39.5 acres of ATWS in several locations due to the presence of wetlands, waterbodies, roads, railroads, and utilities, and for other site-specific, construction-related reasons. Appendix C-5 identifies where Texas Eastern has requested ATWS as well as justification for the use of each.

ATWS beyond those currently identified could be required during construction. Prior to construction, Texas Eastern would be required to file a complete and updated list of all extra work areas (including pipe/contractor yards) for review and approval (see Post-Approval Variance Process in section 2.5.3).

Aboveground Facilities

The proposed aboveground facilities for the TEAL Project include one new compressor station, one new communication tower, two new pig launchers/receivers, one temporary pig launcher/receiver, modifications at an existing compressor station, and modifications at other existing aboveground facility sites (see table 2.2.2-1).

Construction of the new compressor station and modification of the existing compressor station, pig launcher/receiver, and regulator would require 113.6 acres of land, 16.2 acres of which would be used permanently during operation (see table 2.2.2-1). Installation of the new pig launcher/receivers and removal of existing pig launcher/receivers would be located entirely within the construction and permanent rights-of-way for the pipelines and therefore would not encumber any additional acreage. The new communication tower would be co-located with the new compressor station and also would not encumber any additional acreage.

Facility Name	County, State	Construction Area (acres)	Operation Area (acres)
NEW FACILITIES			
New Salineville Compressor Station	Columbiana, OH	41.0	11.5
New Pig Launcher/Receiver	Columbiana, OH	0.0	0.0
New Pig Launcher/Receiver	Columbiana, OH	0.0	0.0
New Pig Launcher/Receiver (temporary)	Monroe, OH	0.0	0.0
	New Facilities Total	41.0	11.5
MODIFICATIONS AT EXISTING FACILITIES			
Modify Colerain Compressor Station	Belmont, OH	62.1	0.0
Remove Line 30 Launcher/Receiver	Monroe, OH	0.0	0.0
Modify Line 73 Launcher/Receiver Site	Monroe, OH	1.1	0.0
Modify Line 73 Regulator Site	Monroe, OH	9.4	4.7
	Modifications at Existing Facilities Total	72.6	4.7
	TEAL Project Total	113.6	16.2

Pipe/Contractor Yards and Staging Areas

Texas Eastern is not proposing to use pipe/contractor yards and would stage construction within its existing and proposed facility sites.

Access Roads

Texas Eastern is proposing to modify six existing roads. Of the six roads, two would be maintained on a permanent basis as access roads to aboveground facilities. No road improvements would be conducted in wetlands. Appendix C-4 identifies access road and road improvements proposed on the TEAL Project.

2.3 CONSTRUCTION PROCEDURES

The NGT and TEAL Projects would be designed, constructed, tested, and operated in accordance with all applicable requirements included in the U.S. Department of Transportation's (DOT) Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards regulations in 49 CFR 192,⁶ and

⁶ Pipe design regulations for steel pipe are contained in CFR subpart C, Part 192. Section 192.105 contains a design formula for the pipeline's design pressure. Sections 192.107 through 192.115 contain the components of the design formula,

other applicable federal and state regulations, including U.S. Department of Labor Occupational Safety and Health Administration requirements. These regulations are intended to ensure adequate protection for the public. Among other design standards, Part 192 specifies pipeline material and qualification; minimum design requirements; and protection from internal, external, and atmospheric corrosion.

To reduce construction impacts, NEXUS and Texas Eastern would implement their respective *Erosion and Sediment Control Plans (E&SCP)*. These plans are based on our *Upland Erosion Control, Revegetation, and Maintenance Plan (FERC Plan or Plan)* and *Wetland and Waterbody Construction and Mitigation Procedures (FERC Procedures or Procedures)*.⁷ The intent of NEXUS' and Texas Eastern's *E&SCPs* are to identify baseline mitigation measures and construction techniques that incorporate guidelines recommended by various resource agencies (such as proper disposal of construction materials and debris), as well as other guidelines and plans tailored to project-specific issues. The *E&SCPs* contain numerous measures designed to prevent or minimize potential impacts on resources. As indicated in table 2.3-1, the applicants' *E&SCPs* include some alternative measures that differ from the FERC's standard *Plan* and *Procedures*, such as the construction sequencing for minimizing duration of open trench and methods for disposing excess woody debris from clearing activities. The applicants' *E&SCPs* also include deviations from our standard *Plan* and *Procedures* not listed in table 2.3-1, but they are more protective than our requirements and we have found them to be acceptable.

Consistent with the FERC's standard *Plan* and *Procedures'* sections V.B.2.b and VI.B.1.a, NEXUS and Texas Eastern provided site-specific justification for each additional temporary workspace within 50 feet from the edge of a wetland or waterbody (unless the adjacent upland consists of cultivated or rotated cropland or other disturbed land, in which case no justification is required). We found most of the site-specific justifications provided by NEXUS to be acceptable. NEXUS moved additional temporary workspaces outside of the 50-foot setback where we did not find the justification to be acceptable. We have not found the site-specific justification provided by Texas Eastern to be acceptable and are requesting additional information from the applicant. Additional detail is provided in appendix H-6 and discussed in sections 4.3.2.2 and 4.4.3.

TABLE 2.3-1

Summary of Proposed Modifications to the FERC's Plan and Procedures				
Applicable FERC Plan/Procedures Section	Resource Issue	Description	FERC Recommendation	EIS Section Discussed
<i>Plan</i> , at Section III.A.3	Construction Sequencing	Proposal to trench prior to stringing, which increases the time a trench is open. NEXUS proposes to minimize open trench by managing crew spacing.	Acceptable.	2.2.1
<i>Procedures</i> , at Section IV.F.4.e	Wood Chipping	Proposal discusses hauling wood chips off site but does not specify that the location be FERC approved.	Acceptable.	4.4.4

In addition to their baseline *E&SCPs*, NEXUS and Texas Eastern prepared several other plans or developed and described other measures identified in table 2.3-2 that would be implemented to further

including yield strength, wall thickness, design factor, longitudinal joint factor, and temperature derating factor, which are adjusted according to the project design conditions, such as pipe manufacturing specifications, steel specifications, class location, and operating conditions. Pipeline operating regulations are contained in subpart L, Part 192.

⁷ FERC's *Plan* and *Procedures* are a set of construction and mitigation measures that were developed in collaboration with other federal and state agencies and the natural gas pipeline industry to minimize the potential environmental impacts of the construction of pipeline projects in general. The FERC *Plan* and *Procedures* can both be viewed on the FERC website at: <https://www.ferc.gov/industries/gas/enviro/guidelines.asp>

reduce potential environmental impacts. The *E&SCPs* and additional plans and procedures are collectively referred to in this EIS as NEXUS’ and Texas Eastern’s construction and restoration plans.

TABLE 2.3-2 Construction, Restoration, and Mitigation Plans Associated with the NGT and TEAL Projects		
General Plan Name ^a	NGT Project-specific Plan Name	TEAL Project-specific Plan Name
E&SCP	<i>Erosion & Sediment Control Plan</i> (Resource Report [RR] 1, appendix 1B1; Accession No. 20151120-5299)	<i>Erosion & Sediment Control Plan</i> (RR 1, appendix 1B1; Accession No. 20151120-5254)
SPCC Plan	<i>Spill Prevention Control and Countermeasure Plan</i> (RR 1, appendix 1B2; Accession No. 20151120-5299)	<i>Spill Prevention Control and Countermeasure Plan</i> (RR1, appendix 1B2; Accession No. 20151120-5254)
Blasting Plan	<i>NEXUS Project Blasting Plan</i> (appendix E-1)	<i>Texas Eastern Appalachian Lease Project Blasting Plan</i> (appendix E-2)
Drain Tile Mitigation Plan	<i>Drain Tile Mitigation Plan</i> (appendix E-3)	N/A
Dust Control Plan/Procedure	<i>Fugitive Dust Control Plan</i> (RR 1, appendix 1B5; Accession No. 20151120-5299)	<i>Fugitive Dust Plan</i> ; (RR1, appendix 1B4; Accession No. 20151120-5254)
Winter Construction Plan	<i>Winter Construction Plan</i> (RR 1, appendix 1B6; Accession No. 20151120-5299)	<i>Winter Construction Plan</i> (RR 1, appendix 1B5; Accession No. 20151120-5254)
Invasive Species Management Plan	<i>Invasive Plant Species Management Plan (IPSMP)</i> (RR1, appendix 1B7; Accession No. 20151120-5299)	<i>IPSMP</i> (RR1, appendix 1B6; Accession No. 20151120-5254)
HDD Design Reports and HDD Monitoring and Inadvertent Return Contingency Plan	<i>HDD Design Reports and HDD Monitoring and Inadvertent Return Contingency Plan</i> (appendix E-4)	N/A
Organic Farm Protection Plan	<i>Organic Farm Protection Plan</i> (Attachment 8 – Response, Accession No. 20160826-5230)	N/A
Unanticipated Discovery Plan	<i>Procedures Guiding the Discovery of Unanticipated Cultural Resources and Human Remains</i> (RR4, appendix 4.C; Accession No. 20151120-5299)	<i>Procedures Guiding the Discovery of Unanticipated Cultural Resources and Human Remains</i> (RR4, appendix 4C; Accession No. 20151120-5254)
Residential Construction Plan	Appendix E-5	N/A
Landowner Complaint Resolution Procedure	<i>Issue Resolution Plan for the NEXUS Project</i> (RR8, appendix 8D; Accession No. 20151120-5299)	<i>Issue Resolution Plan for the TEAL Project</i> (RR 8, appendix 8A; Accession No. 20151120-5254)
Migratory Bird Conservation Plan	<i>Migratory Bird Conservation Plan</i> (appendix E-6)	<i>Migratory Bird Conservation Plan</i> (appendix E-6)
<p>a The plans can be downloaded from the FERC website (www.ferc.gov) using the eLibrary link. Click the eLibrary link, then click on “Advanced Search”, and enter the appropriate accession number (i.e., “20151120-5299”) in the “Accession Number” field.</p> <p>N/A = Not applicable</p>		

2.3.1 General Pipeline Construction Procedures

Constructing the pipelines would generally be completed using sequential pipeline construction techniques, which include survey and staking; clearing and grading; trenching; pipe stringing, bending, and welding and coating; lowering-in and backfilling; hydrostatic testing; commissioning; and cleanup and restoration (see figure 2.3.1-1). These construction techniques would generally proceed in an assembly line fashion and construction crews would move down the construction right-of-way as work progresses. Construction at any single point along the pipelines, from surveying and staking to cleanup and restoration, could last from approximately 8 to 16 weeks. Survey and Staking

The first step of construction involves survey crews staking the limits of the construction right-of-way, the centerline of the proposed trench, ATWSs, and other approved work areas. NEXUS and Texas

Eastern would mark approved access roads using temporary signs or flagging as well as the limits of approved disturbance on any access roads requiring widening. NEXUS and Texas Eastern would mark other environmentally sensitive areas (e.g., waterbodies, cultural resources, sensitive species), where appropriate. NEXUS and Texas Eastern would contact the One Call system for each state to locate, identify, and flag existing underground utilities to prevent accidental damage during pipeline construction.

2.3.1.1 Clearing and Grading

Clearing and grading would remove trees, shrubs, brush, roots, and large rocks from the construction work area and would level the right-of-way surface to allow operation of construction equipment. Vegetation would generally be cut or scraped flush with the surface of the ground, leaving rootstock in place where possible. Brush and other materials cleared from the construction corridor would be burned, chipped, or mulched within the construction right-of-way, or hauled to an appropriate disposal location. Burning would be conducted in accordance with applicable state and local regulations and project plans.

Grading would be conducted where necessary to provide a reasonably level work surface. Extensive grading may be required in uneven terrain and where the right-of-way traverses steep slopes and side slopes. NEXUS and Texas Eastern have indicated that they would separate topsoil from subsoil in agricultural and residential areas. They would segregate at least the top 12 inches of topsoil where 12 or more inches of topsoil is present. In areas with less than 12 inches of topsoil, NEXUS and Texas Eastern would segregate the entire topsoil layer. During backfilling, subsoil would be returned to the trench first. Topsoil would follow such that spoil would be returned to its original horizon.

Temporary erosion controls would be installed along the construction right-of-way immediately after initial disturbance of the soil and would be maintained throughout construction. Temporary erosion control measures would remain in place until permanent erosion controls are installed or restoration is completed. NEXUS and Texas Eastern have committed to employing Environmental Inspectors (EI) during construction to help determine the need for erosion controls and ensure that they are properly installed and maintained. Additional discussion of EI responsibilities is provided in section 2.5.2.

2.3.1.2 Trenching

Soil and bedrock would be removed to create a trench into which the pipeline would be placed. A rotary trenching machine, track-mounted excavator, or similar equipment would be used to dig the pipeline trench. When rock is encountered, tractor-mounted mechanical rippers or rock trenchers would be used to fracture the rock prior to excavation. Blasting would be required in areas where mechanical equipment cannot break up or loosen the bedrock. Excavated materials would be stockpiled along the right-of-way on the side of the trench away from the construction traffic.

The trench would be excavated to a depth that would provide sufficient cover over the pipeline in accordance with DOT standards in 49 CFR 192.327. Typically, the trench would range from 6 to 8 feet deep, depending on the substrate and resource being crossed. Excavations could be deeper in certain locations, such as at road and stream crossings or where foreign lines are located. Generally, the pipeline would be installed with a minimum of 3 feet of cover, except where consolidated rock prevents this depth of cover from being achieved. Additional cover would be provided at road and waterbody crossings. Additional cover (above DOT standards) could also be negotiated at a landowner's request to accommodate land use practices. Additional depth of cover generally requires a wider construction right-of-way to store the additional spoil.

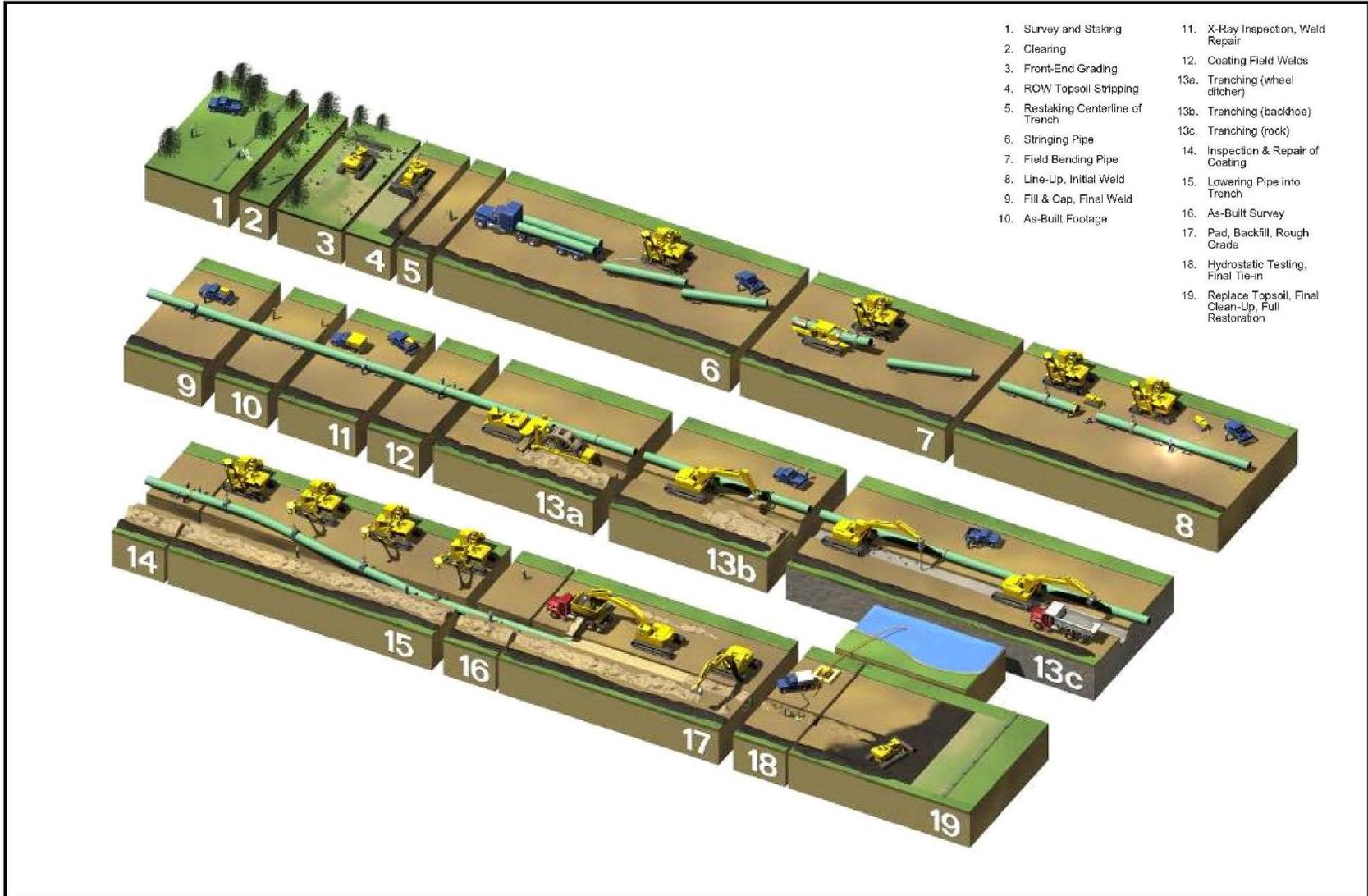


Figure 2.3.1-1
NGT and TEAL Pipeline Projects
 Construction Sequence Overview

NEXUS and Texas Eastern would each implement their project-specific *Blasting Plan* in accordance with industry accepted standards, applicable regulations, and permit requirements (see appendices E-1 and E-2). NEXUS and Texas Eastern would adhere to strict safety precautions during blasting and would exercise care to prevent damage to nearby structures, utilities, wells, springs, and other important resources. Blasting would only be conducted during daylight hours and would not begin until landowners and tenants have been provided sufficient advanced notice to protect property or livestock. Blasting mats or padding would be used where necessary to prevent fly rock from scattering. All blasting activities would be performed in compliance with federal, state, and local codes, ordinances, and permits; the manufacturers' prescribed safety procedures; and industry practices. Impacts of blasting on various resources and details about the measures to mitigate the impacts of blasting on these resources are discussed in sections 4.1, 4.3, 4.6, and 4.7.

2.3.1.3 Pipe Stringing, Bending, Welding, and Coating

After trenching, sections of pipe typically between 40 and 80 feet long (also referred to as "joints") would be transported to the right-of-way by truck and strung beside the trench in a continuous line. The pipe would be delivered to the job site with a protective coating of fusion-bonded epoxy or other approved coating that would inhibit corrosion by preventing moisture from coming into direct contact with the steel.

Individual sections of pipe would be bent to conform to the contours of the ground after the joints of pipe sections are strung alongside the trench. Workers would use a track-mounted, hydraulic pipe-bending machine to bend the pipe. Where multiple or complex bends are required, bending would be conducted at the pipe fabrication factory, and the pipe would be shipped to the Projects area pre-bent.

After the pipe joints are bent, they would be aligned, welded together into a long segment, and placed on temporary supports at the edge of the trench. NEXUS and Texas Eastern would use welders who are qualified according to applicable standards in 49 CFR 192 Subpart E, American Petroleum Standard 1104, and other requirements.

Once the welds are made, a coating crew would coat the area around the weld before the pipeline is lowered into the trench. Prior to application, the coating crew would thoroughly clean the bare pipe with a power wire brush or sandblast machine to remove dirt, mill scale, and debris. The crew would then apply the coating and allow the coating to dry. The pipeline would be inspected electronically (also referred to as "jeeped" because of the sound of the alarm on the testing equipment) for faults or voids in the coating and would be visually inspected for scratches and other defects. NEXUS and Texas Eastern would repair damage to the coating before the pipeline is lowered into the trench.

2.3.1.4 Lowering-In and Backfilling

The trench would be inspected to be sure it is free of rocks and other debris that could damage the pipe or protective coating before the pipe would be lowered into the trench. Trench dewatering may be necessary to inspect the bottom of the trench in areas where water has accumulated. Trench water discharges would be directed to well-vegetated areas and away from waterbodies to minimize the potential for runoff and sedimentation. The pipeline would then be lowered into the trench by a series of side-boom tractors (tracked vehicles with hoists on one side and counterweights on the other), which would carefully lift the pipeline and place it on the bottom of the trench.

Trench breakers (stacked sand bags or polyurethane foam) would then be installed in the trench on slopes at specified intervals to prevent subsurface water movement along the pipeline. The trench would then be backfilled using the excavated material. At locations where topsoil had been separated from subsoil during the clearing process, subsoil would be returned to the trench first, followed by topsoil. A crown of soil about the width of the trench and up to 1 foot high may be left over the trench in non-agricultural areas

to compensate for settling. Appropriately spaced breaks may be left in the crown to prevent interference with stormwater runoff.

In rocky areas or where the trench contains bedrock, padding material such as sand, approved foam, or other protective materials would be placed in the bottom of the trench to protect the pipeline. Once the pipe is sufficiently covered with suitable material, the excavated rocky soil would be used for backfill within the original rocky soil horizon. Topsoil would not be used for padding.

We received comments during the scoping period expressing concern that coal ash would be used to fill the trench following pipe installation. In accordance with the respective project *E&SCPs*, backfilling material would consist of the earth removed from the trench or with other fill material hauled to the site when the existing trench spoil is not adequate for backfill. Neither NEXUS nor Texas Eastern have stated that they would use coal ash during construction.

2.3.1.5 Hydrostatic Testing

NEXUS and Texas Eastern would hydrostatically test the pipeline after backfilling to ensure the system is capable of withstanding the operating pressure for which it was designed. Hydrostatic testing typically involves filling the pipeline with water to a designated test pressure and maintaining that pressure for approximately 8 hours. Actual test pressures and durations would be consistent with the requirements of 49 CFR 192. Any leaks would be repaired and the section of pipe retested until the required specifications are met.

Water for hydrostatic testing would be obtained from surface waterbodies and municipal water sources. Following satisfactory completion of hydrostatic testing, the test water would be discharged in vegetated upland areas through a dewatering structure designed to slow the flow of water. If discharging directly to receiving waters, NEXUS and Texas Eastern would use diffusers (energy diverters) to minimize the potential for stream scour. All testing activities would be conducted within the parameter of the applicable water withdrawal and discharge permits. Section 4.3.2.3 provides more information on hydrostatic testing.

2.3.1.6 Cleanup and Restoration

Within 20 days of backfilling the trench (10 days in residential areas) all work areas would be graded and restored to preconstruction contours and natural drainage patterns as closely as possible. If seasonal or other weather conditions prevent compliance with these timeframes, temporary erosion controls would be maintained until conditions allow completion of final cleanup. Topsoil and subsoil would be tested for compaction at regular intervals in agricultural and residential areas disturbed by construction activities. Severely compacted agricultural areas would be plowed and appropriate soil compaction mitigation would be performed in residential areas. Cut and scraped vegetation would be spread back across the right-of-way. Some large shrubs and trees cut during clearing may be spread back across the right-of-way to impede vehicular traffic and other unauthorized access, or hauled away for disposal in accordance with applicable laws. Surplus construction material and debris would be removed from the right-of-way unless the landowner or land-managing agency approves otherwise. Excess rock and stone would be removed from at least the top 12 inches of soils in agricultural and residential areas and, at the landowner's request, in other areas, such that the size, density, and distribution of rock on the construction right-of-way would be similar to adjacent non-right-of-way areas. Landowners may be able to negotiate certain specific construction requirements and restoration measures directly with NEXUS and Texas Eastern.

NEXUS and Texas Eastern would conduct restoration activities in accordance with landowner agreements, permit requirements, and written recommendations on seeding mixes, rates, and dates obtained

from the local conservation authority or other duly authorized agency and in accordance with NEXUS and Texas Eastern construction and restoration plans. The right-of-way would be seeded within 6 working days following final grading, weather and soil conditions permitting. Alternative seed mixes specifically requested by the landowner or required by agencies may be used. Any soil disturbance that occurs outside the permanent seeding season or any bare soil left unstabilized by vegetation would be mulched in accordance with NEXUS and Texas Eastern construction and restoration plans. Additional discussion of restoration activities is provided in section 4.2.2.

Markers showing the location of the pipeline would be installed at fence and road crossings to identify the owner of the pipeline and convey emergency information in accordance with applicable governmental regulations, including DOT safety requirements. Special markers providing information and guidance for aerial patrol pilots would also be installed.

NEXUS and Texas Eastern would install cathodic protection equipment along the pipeline to prevent the corrosion of metal surfaces over time. Cathodic protection equipment could consist of underground cased deep well or conventional ground beds, linear anode cable systems, aboveground junction boxes, and rectifiers. According to the applicants, construction and operation of cathodic protection beds would occur within the construction rights-of-way and permanent easements.

Landowners would be compensated for damages in accordance with individual landowner agreements. Following construction, temporary access roads would be restored to their preconstruction condition unless the landowner or land-managing agency requests that the improvements be left in place.

2.3.1.7 Commissioning

Test manifolds would be removed and final pipeline tie-ins would be completed after hydrostatic testing. The pipeline then would be cleaned and dried using mechanical tools (pigs) that are moved through the pipeline with pressurized dry air. Pigs also would be used to internally inspect the pipeline to detect any abnormalities or damage. Any problems or concerns would be addressed as appropriate. Pipeline commissioning would then commence. Commissioning involves verifying that equipment has been properly installed and is working, verifying that controls and communications systems are functioning, and confirming that the pipeline is ready for service. In the final step, the pipeline would be prepared for service by purging the pipeline of air and loading it with natural gas. NEXUS and Texas Eastern would not be authorized to place the pipeline facilities into service until they have received written permission from the Director of the FERC's Office of Energy Projects (OEP).

2.3.2 Special Pipeline Construction Procedures

Special construction techniques are required when a pipeline is installed across waterbodies, wetlands, roads, major utilities, steep slopes, residences, agricultural lands, and other sensitive environmental resources. In general, ATWS adjacent to the construction right-of-way would be used at most of these areas for staging construction, stockpiling spoil, storing materials, maneuvering equipment, and fabricating pipe.

2.3.2.1 Waterbody Crossings

Waterbody crossings would be completed in accordance with the measures described in NEXUS' and Texas Eastern's construction plans as summarized below and in accordance with federal, state, and local permits. The waterbodies that would be crossed, and NEXUS' and Texas Eastern's proposed crossing methods for each are discussed in sections 2.3 and 4.3.2.

ATWS necessary for waterbody crossings would be located a minimum of 50 feet from the waterbody edge, except where adjacent upland consists of actively cultivated or rotated cropland or other disturbed land. The 50-foot setback would be maintained unless site-specific approval for a reduced setback is granted by the FERC and other jurisdictional agencies (see section 4.3.2.2).

To prevent sedimentation caused by equipment traffic crossing through waterbodies, NEXUS and Texas Eastern would install temporary equipment bridges. Bridges may include clean rock fill over culverts, equipment pads, wooden mats, free-spanning bridges, and other types of spans. Equipment bridges would be maintained throughout construction. Each bridge would be designed to accommodate normal to high streamflow (from storm events) and would be maintained to prevent soil from entering the waterbody and to prevent restriction of flow during the period of time the bridge is in use.

Sediment barriers would be installed immediately after initial disturbance of the waterbody or adjacent upland. Sediment barriers would be properly maintained throughout construction and reinstalled as necessary until replaced by permanent erosion controls or restoration of adjacent upland areas is complete and revegetation has stabilized the disturbed areas.

For waterbodies without flow at the time of construction, NEXUS and Texas Eastern would utilize the general construction methods described in section 2.3.1. After backfilling, the streambanks would be re-established to approximate preconstruction contours and stabilized, and erosion and sediment control measures would be installed across the construction right-of-way to reduce streambank and upland erosion and sediment transport into the waterbody.

Flume Construction Method

The flume method is a standard dry waterbody crossing method that involves diverting the flow of water across the in-stream construction work area through one or more flume pipes placed in the waterbody. The first step in the flume crossing method would involve placing a sufficient number of adequately sized flume pipes in the waterbody to accommodate the highest anticipated flow during construction. After placing the pipe in the waterbody, sand bags or equivalent dam diversion structures would be placed in the waterbody upstream and downstream of the trench area. These devices would serve to dam the stream and divert the water flow through the flume pipes, thereby isolating the water flow from the construction area between the dams. Flume pipes would be left in place during pipeline installation until final cleanup of the streambed is complete.

Dam and Pump Construction Method

The dam and pump method is another dry crossing method similar to the flume crossing method except that pumps and hoses would be used instead of flumes to move water across the in-stream construction work area. The technique involves damming of the waterbody with sandbags and/or clean gravel with a plastic liner upstream and downstream of the trench area. Pumps would be set up at the upstream dam with the discharge line routed through the construction area to discharge water immediately downstream of the downstream dam. An energy dissipation device would be used to prevent scouring of the streambed at the discharge location. Water flow would be maintained through all but a short reach of the waterbody at the actual crossing. The pipeline would be installed and backfilled. After backfilling, the dams would be removed and the banks restored and stabilized.

Wet Open-cut Construction Method

The wet open-cut construction method involves trench excavation, pipeline installation, and backfilling in a waterbody without controlling or diverting streamflow (i.e., the stream would flow through the work area throughout the construction period). With the wet open-cut method, the trench would be

excavated across the flowing stream using trackhoes or draglines working within the waterbody, on equipment bridges, and/or from the streambanks. Once trench excavation across the entire waterbody is complete, a pre-fabricated section of pipe would be lowered into the trench. The trench would then be backfilled with the previously excavated material, and the pipe section tied-in to the pipeline. Following pipe installation and backfilling, the streambanks would be re-established to approximate preconstruction contours and stabilized. Erosion and sediment control measures would be installed across the right-of-way to reduce streambank and upland erosion and sediment transport into the waterbody.

Conventional Bore Method

The conventional bore method is a trenchless crossing method that involves excavating large bell holes on each side of a waterbody that are deep enough for the bore equipment to auger a hole horizontally from one bell hole to the other a minimum of 5 feet below the bed of a waterbody. Once the bore hole has been created, the pipeline would be pushed or pulled through the hole. Due to the depth of the bell holes and proximity to water resources, this method may require use of sheet pile to maintain the integrity of the bell holes, and use of well point dewatering systems to avoid flooding of the bell holes.

Horizontal Directional Drill Construction Method

A horizontal directional drill (HDD) is a trenchless crossing method that involves drilling a hole under the waterbody (or other sensitive feature) and installing a pre-fabricated pipe segment through the hole. NEXUS proposes to use the HDD method at 18 locations; the TEAL Project would not include HDD crossings (see table 2.3.2-1).

The first step in an HDD is to drill a small diameter pilot hole from one side of the crossing to the other using a drill rig. As the pilot hole progresses, segments of drill pipe are inserted into the hole to extend the length of the drill. The drill bit is steered and monitored throughout the process until the desired pilot hole had been completed. The pilot hole is then enlarged using several passes of successively larger reaming tools. Once reamed to a sufficient size, a pre-fabricated segment of pipe is attached to the drill string on the exit side of the hole and pulled back through the drill hole toward the drill rig. Depending on the substrate, drilling and pull back can last anywhere from a few days to a few weeks.

The HDD method utilizes a slurry referred to as drilling mud, which is composed of water and bentonite, a naturally occurring clay mineral that can absorb up to 10 times its weight in water. Bentonite-based drilling mud is a non-toxic, non-hazardous material that is also used to construct potable water wells throughout the United States. The drilling mud is pumped under pressure through the inside of the drill pipe, and flows back (returns) to the drill entry point along the outside of the drill pipe. The purpose of the drilling mud is to lubricate the drill bit and convey the drill cuttings back to the drill entry point where the mud is reconditioned and re-used in a closed, circulating process. It also forms a cake on the rock surface of the borehole, which helps to keep the drill hole open and maintain circulation of the drilling mud system. Because the drilling mud is pressurized, it can seep into the surrounding matrix, resulting in an inadvertent release of fluid if the drill path encounters fractures or fissures that offer a path of least resistance, or near the drill entry and exit points where the drill path has the least amount of ground cover.

The potential for an inadvertent release is typically greatest during drilling of the initial pilot hole, and decreases once the pilot hole has been completed. The volume of mud lost would be dependent on a number of factors, including the size of the fault, the permeability of the geologic material, the viscosity of the drilling mud, and the pressure of the drilling system. A drop in drilling pressure would indicate that an inadvertent release may be occurring and if the mud moves laterally, the release may not be evident from the ground surface. For a release to be evident there must be a fault or pathway extending vertically to the surface.

TABLE 2.3.2-1

NGT Project Horizontal Direction Drill Crossings					
State/Facility	Feature Crossed	Pipeline Diameter (inches)	Entry Milepost	Exit Milepost	Length (miles)
OHIO					
Mainline	Wetland	36	7.9	8.4	0.6
	Nimisila Reservoir	36	41.0	41.3	0.3
	Tuscarawas River	36	47.8	48.4	0.6
	Wetland	36	71.1	71.4	0.3
	East Branch Black River	36	86.9	86.5	0.3
	West Branch Black River	36	92.5	92.2	0.3
	Vermilion River	36	104.1	104.7	0.6
	Interstate 80	36	110.3	110.1	0.3
	Huron River	36	116.8	117.3	0.5
	Sandusky River	36	146.3	145.8	0.5
	Portage River	36	162.6	162.4	0.3
	Findlay Road	36	180.1	179.8	0.3
	Maumee River	36	181.2	181.9	0.8
				Ohio Total	5.7
MICHIGAN					
Mainline	River Raisin	36	215.0	215.3	0.3
	Saline River	36	237.4	237.7	0.3
	Hydro Park	36	250.7	251.1	0.4
	Interstate 94	36	251.5	251.8	0.3
	Highway 12/RACER Property	36	254.4	254.1	0.3
			Michigan Total	1.6	
			NGT Project Total	7.3	

In the event of a drilling mud release, pits or containment structures could be constructed to contain drilling mud released to the surface of the ground, and a pump may be required to transfer the drilling mud from the pit or the structure to a containment vessel. A release underground would be more difficult to contain and would be addressed by thickening the drilling mud, stopping drilling all together, or continuing to drill past the fault or blockage to re-establish the bore hole as the path of least resistance. In the event of lost drilling mud, NEXUS may introduce additives into the drilling mud to stop or reduce the amount of drilling mud loss. These additives could include walnut shells, paper, other biodegradable solids, or approved polymers that would increase the viscosity and gel strength of the drilling mud. The corrective actions and clean up measures that NEXUS would implement in the event of an inadvertent release of drilling mud, are outlined in NEXUS' *HDD Design Report and HDD Monitoring and Inadvertent Return Contingency Plan (HDD Plan)* and further discussed in section 4.3.2.2.

It is possible for HDD operations to fail, primarily due to encountering unexpected geologic conditions during drilling or the pipe becoming lodged in the hole during pullback operations. NEXUS would be required to seek approval from the Commission and other applicable agencies prior to abandoning any HDD crossing in favor of a new location, or using another construction method should a second attempt fail. If any of the HDD crossings are found to be infeasible, NEXUS would be required to submit specific proposed alternate construction methods for review and approval by the Commission and other applicable agencies.

2.3.2.2 Wetland Crossings

Wetland crossings would be completed in accordance with federal and state permits and follow the measures described in NEXUS' and Texas Eastern's construction plans. The wetlands that would be crossed are discussed further in section 4.4.1.

NEXUS and Texas Eastern would typically use a 75-foot-wide construction right-of-way through wetlands unless site-specific approval for an increased right-of-way width is granted by the FERC and other jurisdictional agencies (see section 4.4.2). ATWS may be required on both sides of wetlands to stage construction equipment, fabricate the pipeline, and store materials. ATWS for wetland crossings would be located in upland areas a minimum of 50 feet from the wetland edge unless site-specific approval for a reduced setback is granted by the FERC and other jurisdictional agencies (see section 4.4.2).

Clearing of vegetation in wetlands would be limited to trees and shrubs, which would be cut flush with the surface of the ground and removed from the wetland. Stump removal, grading, topsoil segregation, and excavation would be limited to the area immediately over the trenchline. A limited amount of stump removal and grading may be conducted in other areas to ensure a safe working environment.

During clearing, sediment barriers, such as silt fence and staked straw bales, would be installed and maintained adjacent to wetlands and within temporary extra workspaces as necessary to minimize the potential for sediment runoff. Sediment barriers would be installed across the full width of the construction right-of-way at the base of slopes adjacent to wetland boundaries. Silt fence or straw bales installed across the working side of the right-of-way would be removed during the day when vehicle traffic is present and would be replaced each night. Sediment barriers would also be installed within wetlands along the edge of the right-of-way, where necessary, to minimize the potential for sediment to run off the construction right-of-way and into wetland areas outside the construction work area. If trench dewatering is necessary in wetlands, the trench water would be discharged in stable, vegetated, upland areas and/or filtered through a filter bag or siltation barrier. No heavily silt-laden water would be allowed to flow into a wetland.

Construction equipment working in wetlands would be limited to that essential for right-of-way clearing, excavating the trench, fabricating and installing the pipeline, backfilling the trench, and restoring the right-of-way. The method of pipeline construction used in wetlands would depend largely on the stability of the soils at the time of construction. In areas of saturated soils or standing water, low-ground-weight construction equipment and/or timber riprap, pre-fabricated equipment mats, or terra mats would be used to reduce rutting and the mixing of topsoil and subsoil. In unsaturated wetlands, the top 12 inches of topsoil from the trenchline would be stripped and stored separately from the subsoil. Topsoil segregation generally would not be possible in saturated soils.

Where wetland soils are saturated and/or inundated, the pipeline may be installed using the push-pull technique. The push-pull technique would involve stringing and welding the pipeline outside of the wetland and excavating the trench through the wetland using a backhoe supported by equipment mats. The water that seeps into the trench would be used as the vehicle to "float" the pipeline into place together with a winch and flotation devices that would be attached to the pipe. After the pipeline is floated into place, the floats would be removed and the pipeline would sink into place. Pipe installed in saturated wetlands is typically coated with concrete or equipped with set-on weights to provide negative buoyancy. After the pipeline sinks to the bottom of the trench, a trackhoe working on equipment mats would backfill the trench and complete cleanup.

Prior to backfilling, trench breakers would be installed where necessary to prevent the subsurface drainage of water from wetlands. Where topsoil has been segregated from subsoil, the subsoil would be

backfilled first followed by the topsoil. Equipment mats, terra mats, and timber riprap would be removed from wetlands following backfilling.

Where wetlands are located at the base of slopes, permanent interceptor dikes and trench plugs would be installed in upland areas adjacent to the wetland boundary. Temporary sediment barriers would be installed where necessary until revegetation of adjacent upland areas is successful. Once revegetation is successful, sediment barriers would be removed from the right-of-way and disposed of properly.

2.3.2.3 Road and Railroad Crossings

Construction across roads would be conducted in accordance with the requirements of road and railroad crossing permits obtained by NEXUS and Texas Eastern and applicable laws and regulations. Generally, paved roads, unpaved roads where traffic cannot be detoured, and railroads would be crossed by boring beneath the road or railroad without disturbing the road or rail bed or disrupting traffic. Boring would involve excavating a pit on each side of the road or railroad, placing the boring equipment in the pit, and then boring a hole under the road or railroad that is at least equal to the diameter of the pipe. Once the hole is bored, a pre-fabricated section of pipe would be pushed through the borehole. At particularly long crossings, pipe sections may be welded onto the pipe string just before being pushed through. Borings would typically occur during normal construction work hours. However, if necessary as required by field conditions, borings could be conducted 24 hours per day, 7 days per week until completed. Each bore crossing typically would require between 2 and 10 days to complete from start to finish.

In addition to the conventional bore method, NEXUS has identified the cased crossing and hammer technique for road crossings. The cased crossing would be similar to a bored crossing; however, a section of steel casing pipe that is several inches in diameter greater than the pipeline width would be bored into place. The pipeline would then be pulled through the casing pipe. With the hammer technique, a casing pipe is driven under the roadway with a horizontal air operated reciprocating hammer. The material inside the casing pipe is then removed and the pipeline is pulled through the casing. Following installation, the casing pipe may be left in place or removed.

Most gravel and dirt roads would be crossed by the open-cut method, which would require temporary closure of the road and the establishment of detours. Roads would be closed only where allowed by permit or landowner/land-managing agency consent. Most open-cut road crossings require only 1 or 2 days to complete, although resurfacing could require several weeks to allow for soil settlement and compaction. In residential areas, landowners would be provided continued access to their properties throughout construction.

NEXUS and Texas Eastern would construct all road and railroad crossings in accordance with DOT safety standards and would coordinate traffic control measures with the appropriate state and local agencies. Where heavy equipment is known to use a road crossed by the pipeline, special safety measures, such as thicker-walled pipe or additional cover over the pipe, would be required.

2.3.2.4 Steep Slopes

Segments of the NGT and TEAL Projects pipeline facilities would cross areas with slopes greater than 5 percent. In these areas, NEXUS and Texas Eastern would install and maintain specific temporary and permanent controls to minimize erosion and sedimentation, which can increase due to clearing, grading, and trenching on steep slopes. During construction, temporary slope and trench breakers consisting of compacted earth, sandbags, or other materials would be placed to reduce runoff velocity and divert water off of the construction right-of-way. Temporary trench plugs consisting of compacted earth or similar low-permeability material would be installed at the entry and exit points of wetlands and waterbodies to

minimize channeling along the ditch and maintain subsurface hydrology patterns. Additional types of temporary erosion control such as super silt fence, erosion control matting, and hydro-mulching may be used. Upon installation of the pipeline, permanent trench breakers and plugs consisting of sandbags, gravel, foam, cement, or cement-filled sacks would be installed over and around the pipeline and permanent slope breakers generally consisting of compacted earth and rock would be installed across the right-of-way during grade restoration. Surface contours and topsoil would be returned to preconstruction conditions and revegetation of the right-of-way would commence. NEXUS and Texas Eastern would monitor the right-of-way during operation and take measures as necessary to ensure the effectiveness of erosion control and revegetation.

NEXUS and Texas Eastern may also implement the two-tone construction method in areas of steep side slopes. During grading, the upslope side of the right-of-way would be cut and the material placed on the downslope side to create a safe, level work area. This method could require additional ATWS to accommodate the downslope spoil. After installation of the pipeline, the spoil would be returned to the upslope cut and the overall grade restored. Any springs or seeps found in the upslope cut would be carried downslope through polyvinyl chloride (PVC) pipe and/or gravel French drains during restoration.

2.3.2.5 Agricultural Areas

Agricultural areas crossed by the NGT and TEAL Projects are identified in section 4.9. As discussed in their respective *E&SCPs*, NEXUS and Texas Eastern would conserve topsoil in all actively cultivated and rotated croplands, pastures, and hayfields. NEXUS and Texas Eastern would also segregate topsoil at the specific request of the landowner or land management agency. The topsoil would be stored in separate windrows on the construction right-of-way. The depth of the trench would vary with the stability of the soil, but in all cases it would be sufficiently deep to allow for at least 3 feet of cover over the pipe.

We received several comments during the scoping period expressing concern about agricultural drain tiles being damaged during construction and interrupting flow to agricultural fields. In areas where irrigation or drainage systems would be crossed, NEXUS and Texas Eastern would identify crossing locations during civil surveys and prior to construction. In the event irrigation and drainage systems are damaged as a result of construction, they would be permanently repaired during backfill and cleanup. Section 4.2.2 provides additional discussion of drain tiles and NEXUS' and Texas Eastern's proposed mitigation measures, including implementation of NEXUS' *Drain Tile Mitigation Plan*.

We received comments during the scoping period expressing concern about organic farm crossings and the Projects' potential to affect landowners' continued production of organic crops. Section 4.9.5.1 identifies the locations of where known organic farms would be crossed and NEXUS' and Texas Eastern's proposed mitigation measures at these locations.

2.3.2.6 Major Utilities

The pipelines would be constructed across or parallel to numerous utility lines. Prior to construction, NEXUS' and Texas Eastern's construction contractors would call the One Call systems in each state to identify and flag buried utilities before ground-disturbing activities. Where the pipeline is installed near a buried utility, NEXUS and Texas Eastern would install the pipeline with at least 12 inches of clearance from any other underground structure not associated with the pipeline, as required by 49 CFR 192.325. Section 4.9.1.1 discusses the major utilities that would be crossed by the NGT and TEAL Projects.

2.3.2.7 Residential Construction

Construction through or near residential areas would be done in a manner to ensure that all construction activities minimize adverse impacts on residences and that cleanup is prompt and thorough. Access to homes would be maintained, except for the brief periods essential for laying the new pipeline.

NEXUS and Texas Eastern would implement measures to minimize construction-related impacts on all residences and other structures located within 50 feet of the construction right-of-way, including:

- install safety fence at the edge of the construction right-of-way for a distance of 100 feet on either side of the residence or business establishment;
- fence the boundary of the construction work area to ensure that construction equipment and materials, including the spoil pile, remain within the construction work area;
- attempt to leave mature trees and landscaping intact within the construction work area unless the trees and landscaping interfere with the installation techniques or present unsafe working conditions;
- ensure piping is welded and installed as quickly as reasonably possible to minimize the amount of time a neighborhood is affected by construction;
- backfill the trench as soon as possible after the pipe is laid or temporarily place steel plates over the trench;
- complete final cleanup, grading, and installation of permanent erosion control devices within 10 days after backfilling the trench, weather permitting; and
- restore private property such as fences, gates, driveways, and roads disturbed by pipeline construction to original or better condition upon completion of construction activities.

In addition, NEXUS and Texas Eastern have provided site-specific *Residential Construction Plans (RCP)* to inform affected landowners of proposed measures to minimize disruption and to maintain access to the residences located within 50 feet of the construction work area. These plans are described in section 4.9.3.1 and included in appendix E-5.

2.3.2.8 Karst Sensitive Areas

The NGT Project would cross areas of karst geology in Ohio and Michigan between MPs 124.3 and 190.2 and MPs 224.5 and 247.7. Sections 4.1 and 4.3 detail the project-specific construction and restoration methods that would be implemented to address karst features encountered during trenching.

2.3.2.9 Winter Construction

NEXUS and Texas Eastern have proposed to place their Projects into service by November 2017, and would seek approval to begin construction by November 2016 as soon as all necessary federal, state, and local approvals can be obtained. Based on the schedule provided, construction during the winter of 2016/2017 would be required. Therefore, NEXUS and Texas Eastern have each developed a project-specific *Winter Construction Plan* to address specialized methods and procedures that would be used to protect resources during the winter season (see table 2.3-2 for accession numbers relating to both documents). The key elements of the *Winter Construction Plans* include:

- winter construction procedures (e.g., snow handling and removal, access road construction and maintenance, soil handling under saturated or frozen conditions, topsoil stripping);
- stabilization and monitoring procedures if ground conditions would delay restoration until the following spring (e.g., mulching and erosion controls, inspection and reporting, stormwater control during spring thaw conditions); and
- final restoration procedures (e.g., subsidence and compaction repair, topsoil replacement, seeding).

We have reviewed the *Winter Construction Plans* and have found them acceptable.

2.3.3 Aboveground Facility Construction

Construction activities at the proposed compressor station sites would include access road construction; site clearing; grading; installing concrete foundations; erecting metal buildings; and installing compressors, metering facilities, and appurtenances. Initial work at the compressor stations would focus on preparing foundations for the buildings and equipment. Building foundations and pipe trenches would be excavated with standard construction earthmoving equipment. Following foundation work, station equipment and buildings would be brought to the site and installed, using any necessary trailers or cranes for delivery and installation. Following installation of the buildings and primary facilities, associated equipment, piping, and electrical systems would be installed. Necessary equipment testing and start-up activities would occur on a concurrent basis.

Construction of the other proposed aboveground facilities, including the M&R stations, MLVs, and pig launchers/receivers, would involve site clearing and grading as needed to establish appropriate contours for the facilities. Following installation of the equipment, the sites would be graveled, as necessary, and fenced. MLVs would be installed at intervals specified by the DOT or as needed for customer deliveries.

2.4 CONSTRUCTION SCHEDULE AND WORKFORCE

NEXUS and Texas Eastern would seek approval to begin construction as soon as possible after receiving all necessary federal authorizations and have proposed an in-service date of November 2017 for the proposed facilities, except that the increased compression proposed by Texas Eastern would be placed in-service in October 2018. Construction of mainline pipeline and compressor stations was requested to begin in the first quarter of 2017, followed by M&R stations and launcher and receiver stations. Restoration efforts would commence following construction and continue until all workspaces are compliant with the *FERC Plan and Procedures*.

NEXUS and Texas Eastern would seek to begin construction of their Projects dependent upon:

- whether the Commission decides to authorize a Certificate;
- subsequent acquisition of additional survey access and easement agreements;
- completion of field surveys and submittal of permit applications;
- receipt of all necessary federal, state, and local authorizations;

- other Projects-specific requirements such as waterbody, migratory bird, and rare bat construction window restrictions (see sections 4.3.3, 4.6, and 4.7);
- satisfaction of all pre-construction conditions of any Certificate issued for the Projects; and
- the FERC’s separate post-Certificate authorization that construction may begin.

Section 4.10.3 details the estimated construction workforce for each phase of the NGT and TEAL Projects. The total construction workforce of over 3,360 workers would occur during construction in 2017 for both projects and in both states affected by the NGT and TEAL Projects. In 2018, a total construction workforce of 320 to 470 workers would be required for the TEAL Project. The total construction workforce would vary on any given day depending on the phase of construction. As the pipeline spread moves along, construction at any single point would last approximately 8 to 16 weeks; however, the duration of construction may be longer at aboveground facility sites and at hydrostatic test tie-in locations. Construction crews would typically work 10 hours per day, 6 days per week. Work would be conducted during daylight hours, except where the pipe would be installed using the HDD and bore methods, which require around-the-clock operations and typically last a few days to a few weeks.

2.5 ENVIRONMENTAL INSPECTION, COMPLIANCE MONITORING, AND POST-APPROVAL VARIANCES

2.5.1 Coordination and Training

NEXUS and Texas Eastern would incorporate into their construction drawings and specifications the mitigation measures identified in their permit applications, as well as additional requirements of federal, state, and local agencies. NEXUS and Texas Eastern would also provide copies of applicable environmental permits and construction drawings and specifications to their construction contractors.

Each of the applicants would develop environmental training programs tailored to their respective proposed Project and the requirements for each. The programs would be designed to ensure that:

- qualified environmental training personnel provide thorough and focused training sessions regarding the environmental requirements applicable to the trainees’ activities;
- all individuals receive environmental training before they begin work on any construction workspaces;
- adequate training records are kept; and
- refresher training is provided as needed to maintain high awareness of environmental requirements.

The applicants would also conduct training for construction personnel regarding proper field implementation of NEXUS’ and Texas Eastern’s construction and restoration plans and other Projects-specific plans and mitigation measures.

2.5.2 Environmental Inspection

NEXUS and Texas Eastern have each proposed to employ EIs on their Projects to ensure that construction complies with the procedures and mitigation measures identified in their respective

applications, the FERC Certificates, other environmental permits and approvals, and environmental requirements in landowner easement agreements. A minimum of one EI would be assigned to each construction spread, which equates to four EIs on the NGT Project and two EIs on the TEAL Project. EIs would have peer status with all other activity inspectors. EIs would have the authority to stop activities that violate the environmental conditions of the FERC Certificate, other permits, or landowner requirements, and to order the appropriate corrective action. At a minimum, the EI would be responsible for:

- ensuring compliance with the measures set forth in NEXUS' and Texas Eastern's *E&SCPs* and all other environmental permits and approvals, as well as environmental requirements in landowner agreements;
- identifying, documenting, and overseeing corrective actions as necessary to bring an activity back into compliance;
- verifying that the limits of authorized construction work areas and locations of access roads are properly marked before clearing;
- verifying the locations of signs and highly visible flagging to mark the boundaries of sensitive resource areas, waterbodies, wetlands, or areas with special requirements along the construction work area;
- identifying erosion/sediment control and stabilization needs in all areas;
- locating dewatering structures and slope breakers to ensure that they would not direct water into sensitive areas, such as known cultural resource sites or sensitive species habitat;
- verifying that trench dewatering activities do not result in deposition of sand, silt, and/or sediment near the point of discharge in a wetland or waterbody. If such deposition is occurring, the EI would stop the dewatering activity and take corrective action to prevent a reoccurrence;
- advising the Chief Construction Inspector when conditions (such as wet or frozen weather) make it advisable to restrict construction activities to avoid excessive rutting;
- approving imported soils and verifying that the soil is certified free of noxious weeds and soil pests, unless otherwise specified by the landowner;
- determining the need for and ensuring that erosion controls are properly installed, as necessary, to prevent sediment flow into wetlands, waterbodies, and sensitive areas, and onto roads;
- inspecting and ensuring the maintenance of temporary erosion control measures at least daily in areas of active construction or equipment operation, on a weekly basis in areas with no construction or equipment operation; and within 24 hours of each 0.5 inch or greater of rainfall;
- ensuring restoration of contours and topsoil;
- ensuring the repair of all ineffective temporary erosion control measures as soon as possible but not longer than 24 hours after identification;

- ensuring that subsoil and topsoil are tested in agricultural and residential areas to measure compaction and determine the need for corrective action;
- keeping records of compliance with conditions of all environmental permits and approvals during active construction and restoration; and
- identifying areas that should be given special attention to ensure stabilization and restoration after the construction phase.

2.5.3 Post-Approval Variance Process

The pipeline alignment and work areas identified in this EIS should be sufficient for construction and operation (including maintenance) of the Projects and ancillary facilities. However, minor route realignments and other workspace refinements often continue past the Projects' planning phase and into the construction phase. As a result, the Projects' locations and areas of disturbance described in this EIS may require refinement after the Projects are approved (assuming they are approved). These changes frequently involve minor route realignments, shifting or adding new ATWS, or adding additional access roads. We have developed a procedure for assessing impacts on those areas that have not been evaluated in this EIS and for approving or denying their use.

In general, biological and cultural resource surveys were conducted using a survey corridor larger than that necessary to construct the pipeline. If NEXUS or Texas Eastern shifts any ATWS or requires unanticipated workspace subsequent to any regulatory approval, these areas would typically be within the previously surveyed area. Such requests would be reviewed using a post-approval variance process.

NEXUS and Texas Eastern would prepare its request for route realignments or ATWS locations, including a copy of the survey results, and forward it to the FERC (and other federal land-managing agencies as applicable) in the form of a "variance request" in compliance with environmental recommendation number 5 in section 5.2 of this EIS. Any variance activity by the applicants and subsequent FERC action would be available on the FERC's e-library webpage under the docket number for the respective Project (CP16-22 or CP16-23).

Typically, no further resource agency consultation would be required if the requested change is within previously surveyed areas as long as no sensitive species or features were present. The procedures used for assessing impacts on work areas outside the survey corridor and for approving their use are similar to those described previously, except that additional surveys, analyses, and resource agency consultations would be performed to ensure that impacts on biological, cultural, and other sensitive resources are avoided or minimized to the maximum extent practicable. After the applicants complete any additional surveys, landowner consultation, analyses, and/or resource agency consultations, the new work area(s) and supporting documentation (including a statement of landowner approval) would be submitted to FERC in the form of a formal variance request, which would be evaluated in the manner described previously for approval or denial.

2.5.4 Compliance Monitoring

NEXUS filed information with the Commission on June 12, 2015 indicating it would like to implement a third-party compliance monitoring program on the NGT Project. The overall objective of a third-party compliance monitoring program is threefold: to assess environmental compliance during construction in order to achieve a higher level of environmental compliance throughout a project; to assist FERC staff in screening and processing variance requests during construction; and to create and maintain a database of daily reports documenting compliance and instances of noncompliance.

In addition to the EIs, FERC third-party monitors typically would conduct periodic field inspections during construction and restoration. The monitors would report on the effectiveness of the environmental inspection program and help ensure compliance with the terms and conditions of the FERC Certificate. Third-party compliance monitors would report to FERC; would have authority to approve simple variance requests (see section 2.5.3); and would have the authority to stop any activity that violates an environmental condition of the FERC Certificate. FERC environmental staff would also visit the site periodically during construction and restoration. The FERC monitor would be present on the ground throughout construction. Other federal, state, and local agencies also may monitor the Projects to the extent determined necessary by the agency.

Texas Eastern is not proposing to implement a third-party compliance monitoring program; therefore, Texas Eastern would not gain the benefits of expedited processing of variance requests during construction.

Other regulatory agencies also may include terms and conditions or stipulations as part of their permits or approvals. While there would be jurisdictional differences between the FERC's and other agencies' conditions, the environmental inspection program for the Projects would address all environmental or construction-related conditions or other permit requirements placed on the Projects by all regulatory agencies.

2.5.5 Post-construction Monitoring

NEXUS and Texas Eastern would conduct follow-up inspections and monitor disturbed areas after the first and second growing seasons at a minimum, including until revegetation thresholds are met and temporary erosion control devices are removed. NEXUS and Texas Eastern would submit quarterly monitoring reports for at least 2 years following construction. Restoration is deemed complete when the density and cover of non-nuisance vegetation are similar in density and cover to adjacent, undisturbed areas.

We would monitor the rights-of-way following construction for issues such as vegetation cover, invasive species, soil settling, soil compaction, excessively rocky soils, and drainage problems. We would also continue oversight of the NGT and TEAL Projects area after construction by reviewing NEXUS' and Texas Eastern's monitoring reports and conducting compliance inspections. We would require NEXUS and Texas Eastern to continue revegetation efforts until we determine that restoration is successful.

We recognize that during and after construction, issues or complaints may develop that were not addressed during the environmental proceedings at the Commission, and it is important that landowners have an avenue to contact NEXUS and Texas Eastern representatives. Should the NGT and TEAL Projects be approved, we are interested in ensuring that landowner issues and complaints received during and after construction are resolved in a timely and efficient manner. Resolution of landowner issues and complaints are discussed further in section 4.9.

2.6 OPERATION AND MAINTENANCE

The NGT and TEAL Projects' pipelines and aboveground facilities would be operated and maintained in accordance with DOT regulations in 49 CFR 192, the Commission's guidance in 18 CFR 380.15, and NEXUS and Texas Eastern construction and restoration plans.

2.6.1 Pipeline Surveys and Inspections

As required by 49 CFR 192.615, NEXUS and Texas Eastern would establish an operation and maintenance plan as well as an emergency plan for each Project that includes procedures to minimize the

hazards in a natural gas pipeline emergency. As a part of pipeline operations and maintenance, NEXUS and Texas Eastern would conduct regular patrols of the pipeline rights-of-way. The patrol program would be conducted in accordance with DOT requirements and include aerial and ground patrols of the pipeline facilities to survey surface conditions on and adjacent to the pipeline right-of-way for evidence of leaks, unauthorized excavation activities, erosion and wash-out areas, areas of sparse vegetation, damage to permanent erosion control devices, exposed pipe, missing markers and signs, new residential developments, and other conditions that might affect the safety or operation of the pipeline. The cathodic protection system would also be inspected to ensure that it is functioning properly. In addition, pigs are sent through the pipeline to check for corrosion and irregularities in the pipe in accordance with DOT requirements. All MLVs along the NGT Project would be installed with equipment such that they may be remotely operated from a control center. All MLVs along the NGT Project would be equipped with line break control that would automatically close the MLV in the event of a major leak or break. NEXUS and Texas Eastern would be required to keep detailed records of all inspections and supplements to the corrosion protection system as necessary to meet the requirements of 49 CFR 192.

NEXUS and Texas Eastern would also maintain a liaison with the appropriate fire, police, and public officials as part of each of their emergency operating procedures. Communications with these parties would include the potential hazards associated with NEXUS' and Texas Eastern's facilities located in their service area and prevention measures undertaken, the types of emergencies that may occur on or near the new pipeline facilities, the purpose of pipeline markers and the information contained on them, pipeline location information, recognition of and response to pipeline emergencies, and procedures to contact NEXUS and Texas Eastern for more information.

In addition, NEXUS and Texas Eastern would install a supervisory control and data acquisition system on each pipeline system that would continuously monitor gas pressure, temperature, and volume at specific locations along the pipeline. These systems would be continuously monitored from each NEXUS' and Texas Eastern's gas control center. The systems would provide continuous information to the control center operators and has threshold and alarm values set to warn operators if critical parameters are exceeded.

2.6.2 Right-of-way Maintenance

In addition to the survey, inspection, and repair activities described previously, operation of the pipelines would include right-of-way maintenance. The rights-of-way would be allowed to revegetate after restoration; however, larger shrubs and brush may be periodically removed near the pipeline. The frequency of the vegetation maintenance would depend upon the vegetation growth rate. NEXUS and Texas Eastern have indicated that they would not need to maintain vegetation (i.e., mow) within the 50-foot-wide permanent right-of-way in most land uses types. However, in accordance with NEXUS' and Texas Eastern's construction and restoration plans, routine vegetation maintenance clearing of the permanent right-of-way is allowed but would not be done more frequently than every 3 years. To facilitate periodic corrosion and leak surveys, a corridor not exceeding 10 feet in width centered on the pipeline may be maintained in an herbaceous state. In no case would routine vegetation maintenance clearing occur between April 15 and August 1 of any year. Vegetation management is discussed further in section 4.5.2.

Pipeline facilities would be clearly marked at line-of-sight intervals and at crossings of roads, railroads, and other key points. The markers would clearly indicate the presence of the pipeline and provide a telephone number and address where a company representative may be reached in the event of an emergency or prior to any excavation in the area of the pipeline by a third party. NEXUS and Texas Eastern would participate in the national and state One Call systems in the states in which they operate.

3.0 NGT AND TEAL PROJECTS ALTERNATIVES

In accordance with NEPA, FERC policy, and CWA 404(b)(1) guidelines, we identified and evaluated alternatives to the proposed Projects to determine whether the alternatives would be reasonable and environmentally preferable to the proposed action while still meeting project objectives. These alternatives included the No Action Alternative, system alternatives, major route alternatives, minor route variations, and aboveground facility site alternatives. The analysis of alternatives is based on information provided by NEXUS and Texas Eastern, as well as input from cooperating agencies, public scoping, site visits, and our own assessments. We compared each of the alternatives to the Projects using the following three criteria:

- Does the alternative have the ability to meet the Projects' objectives?
- Is the alternative technically and economically feasible and practical?
- Does the alternative offer a substantial environmental advantage over the proposed Projects?

The stated objectives of the Projects, described in greater detail in section 1.1, are to provide for the transportation of 1.5 million Dth/d of Appalachian Basin shale gas to consuming markets in northern Ohio and southeastern Michigan, and to the Dawn Hub in Ontario, Canada. Therefore, a preferable alternative must be able to meet this objective. A preferable alternative also would need to provide the services within a reasonably similar timeframe. It is important to recognize that not all conceivable alternatives have the ability to meet the objective, and an alternative that does not meet the Projects' objectives cannot be considered a reasonable alternative and is not considered in our evaluation.

Many alternatives are technically and economically feasible. Technically practical alternatives, with exceptions, would generally require the use of common construction methods. An alternative that would require the use of a new, unique, or experimental construction method may not be technically practical because the required technology is not available or is unproven. Economically practical alternatives would result in an action that generally maintains the price competitive nature of the proposed action. Generally, we do not consider the cost of an alternative as a critical factor unless the sum total cost to construct and operate the alternative would render the project economically impractical.

Determining if an alternative provides a significant environmental advantage requires a comparison of the impacts on each resource as well as an analysis of impacts on resources that are not common to the alternatives being considered. The determination must then balance the overall impacts and all other relevant considerations. In comparing the impact between resources (factors), we also considered the degree of impact anticipated on each resource. Ultimately, an alternative that results in equal or only minor advantages in terms of environmental impact would not compel us to shift the impacts from the current set of landowners affected by the proposed Projects to a new set of landowners.

To ensure a consistent environmental comparison and to normalize the comparison factors, we generally use desktop sources of information when evaluating alternatives against the proposed route (e.g., publicly available data, Geographic Information Systems [GIS] data, aerial imagery) and assume the same right-of-way widths and general workspace requirements. As described previously, our environmental analysis and this evaluation consider quantitative data (e.g., acreage, mileage, or numbers of residences) and use common comparative factors such as total length, amount of co-location, and land requirements. The total length of an alternative as well as the length of greenfield construction provide a baseline for which to evaluate, at a high level, the anticipated impacts from construction and operation. A longer a route or a route with more greenfield construction suggests a greater amount and intensity of impacts. We also

often evaluate the total mileage of steep slopes and sidehill construction because such areas generally require substantially more workspace and suggest greater impacts.

Our evaluation also considers impacts on both natural and human environments. Impacts on the natural environment include wetlands, waterbodies, aquifers, forested lands, karst geology, and other common environmental resources. Impacts on the human environment include proximity to residences and crossings of designated forests or parks. In recognition of the competing interests and the different nature of impacts resulting from an alternative that sometimes exists (i.e., impacts on the natural environment versus impacts on the human environment), we also considered other factors that are relevant to a particular alternative or discount or eliminate factors that are not relevant or may have less weight or significance.

We received thousands of comments during scoping expressing concern about the Projects, many of which requested that we evaluate alternatives to the Projects, the proposed pipeline routes, and the aboveground facility locations. In response to many of these comments, we required NEXUS and Texas Eastern to provide additional environmental information, requested they assess the feasibility of alternatives as proposed by the commenters, conducted site visits and field investigations, met with affected landowners and local representatives and officials, consulted with federal and state regulatory agencies, and sought additional public input. These efforts, along with NEXUS' and Texas Eastern's continued assessments of their respective projects, resulted in numerous changes to the proposed actions. During the course of the pre-filing processes and the issuance of the draft EIS, over 239 route alternatives and variations were adopted (see sections 3.3 and 3.4).

Some of the comments we received during scoping suggested that FERC should establish an energy corridor through Ohio and Michigan where the NGT Project as well as other pipelines could be safely and efficiently routed. It is important to understand that the Commission does not direct development of the gas industry's infrastructure, neither on a broad regional basis through the establishment of energy corridors, nor on a more local scale in the design of specific projects. Instead, the Commission responds when an application is filed with FERC and in each application the parameters of the project are determined by the applicant. Typically, a project presented to FERC represents one way to get certain gas supplies to certain markets, and, in some cases, may be the only option. This does not mean that we cannot recommend a modification to a project or different routing option and, as required by NEPA, the Commission evaluates a full range of practical and feasible alternatives to applicant proposals. However, part of our review is to make sure any recommended modifications or alternatives would meet the applicant's objectives. Ultimately, the Commission (not FERC staff) determines whether a project's objectives are in the public interest.

We also received comments stating that the pipeline and compressor stations should be routed away from population centers and relocated to more rural, less populated areas due to the potential for a pipeline accident. Each of the alternatives evaluated in this section includes a comparison of resources affected by the proposed action and the alternative. Within these tables, we have included the number of residential-type structures (including detached dwellings, garages, sheds, and other buildings often associated with a residence) within 150 feet of the pipeline centerline. However, this information is included to characterize the potential construction-related impacts on residential land use. As discussed in section 4.13, the transportation of natural gas by pipeline involves some incremental risk to the public due to the potential for an accident; the DOT is the federal agency responsible for administering the national regulatory program to ensure the safe transportation of natural gas. DOT safety standards are intended to ensure adequate protection for the public and account for population density in the vicinity of the pipeline and aboveground facilities. The safety standards specify more rigorous safety requirements for populated areas and areas where a gas pipeline accident could do considerable harm to people and their property (e.g., near multiple residences, schools, churches, retirement homes, airports). The pipelines and aboveground facilities

associated with the NGT and TEAL Projects must be designed, constructed, operated, and maintained in accordance with these safety standards.

Factors that must be considered in pipeline routing are specified in 18 CFR 380.15; however, proximity to people is not specified in these regulations. Because public safety is addressed by compliance with DOT safety standards, it is not a primary consideration for siting alternatives. The pipeline facilities would be built according to the class location and high-consequence area (HCA) safety as defined in 49 CFR 192 (see section 4.13.1). Proximity to people is not a factor with respect to public safety because the pipeline must meet DOT safety standards.

With regard to co-location in particular, we frequently evaluate alternatives that minimize the creation of new rights-of-way (i.e., greenfield¹ routes) by routing pipelines within or adjacent to existing rights-of-way. Installation of new pipeline along an existing, cleared right-of-way (such as another pipeline, electric transmission line, road, or railroad) may be environmentally preferable to construction along a new right-of-way, and construction effects and cumulative impacts can normally be reduced by use of a previously cleared right-of-way. Likewise, long-term or permanent environmental impacts may be reduced by avoiding the creation of new right-of-way through previously undisturbed areas.

Finally, we received comments during scoping suggesting that the receipt and delivery points identified by NEXUS are baseless, and that other receipt and delivery points could or should be considered. We recognize the difference between definitive receipt and delivery points based on binding precedent agreements and speculative receipt and delivery points based on the potential for future customers. As discussed in section 1.1.1, we are only evaluating alternatives that serve the six M&R station sites. However, the alternatives do not need to serve the 13 tee-tap sites. Ultimately, the Commission will decide if the tee-taps are essential to the Projects' objectives and whether alternatives that do not serve the tee-tap locations would not be viable without modification.

3.1 NO ACTION ALTERNATIVE

The Commission has two possible courses of action in processing applications under Section 7 of the NGA: 1) deny the requested authorizations (i.e., the No Action Alternative), or 2) grant the Certificate with or without conditions. If the Commission denies the NEXUS and Texas Eastern applications, the environmental impacts identified in this EIS would not occur nor would the Projects' objectives be met. Although a Commission decision to deny the proposed action would avoid the immediate environmental impacts addressed in this EIS, other natural gas companies could construct projects in substitute for the natural gas supplies offered by the NGT and TEAL Projects. Such alternative projects could require the construction of additional and/or new pipeline facilities in the same or other locations to transport the gas volumes proposed by the Projects. These projects would result in their own set of specific environmental impacts that could be less than, equal to, or greater than those described for the current proposal.

If the applicants' proposed facilities are not constructed, the Projects' shippers would presumably need to obtain an equivalent supply of natural gas from new or existing pipeline systems. In response, the applicants or another natural gas transmission company would likely develop a new project or projects to provide the volume of natural gas contracted through the Projects' binding precedent agreements with the shippers. As more fully evaluated in the following sections, construction of new pipelines or other natural gas infrastructure would result in environmental impacts equal to or greater than those of the Projects, and

¹ A greenfield pipeline crosses land previously untouched by linear infrastructure (e.g., pipelines, electric power lines, roads, railroads) rather than using existing rights-of-way.

therefore would not be preferable to the proposed Projects. For these reasons, we are not recommending the no-action alternative.

The Commission received comments suggesting that other types of energy, such as electricity generated from renewable sources, could eliminate the need for the Projects and that the use of these energy sources as well as gains realized from increased energy efficiency and conservation should be considered as alternatives to the Projects. The generation of electricity from renewable energy sources is a reasonable alternative for a review of generating facilities powered by fossil fuels. The siting, construction, and operation of generating facilities are regulated by the states. Authorizations related to how markets would meet demands for electricity are not part of the applications before the Commission and their consideration is outside the scope of this EIS. Therefore, because the purpose of the Projects is to transport natural gas, and the generation of electricity from renewable energy resources or the gains realized from increased energy efficiency and conservation are not transportation alternatives, they are not considered or evaluated further in this analysis.

3.2 SYSTEM ALTERNATIVES

System alternatives are alternatives to a proposed action that would make use of existing, modified, or other proposed natural gas transmission systems to meet the stated objectives of the proposed Projects. A system alternative would make it unnecessary to construct all or part of the proposed Projects, although some modifications or additions to another pipeline system may be required, or another entirely new system may need to be constructed. Such modifications or additions would result in environmental impacts that could be less than, similar to, or greater than the impacts associated with construction of the proposed Projects. The purpose of identifying and evaluating system alternatives is to determine whether the environmental impacts associated with the construction and operation of the proposed Projects would be avoided or reduced by using existing, modified, or other proposed pipeline systems.

A viable system alternative to the Projects would have to provide the pipeline capacity necessary to transport an additional 1.5 million Dth/d of natural gas at the contracted volumes from the production areas of the Appalachian Basin to the delivery points required by the precedent agreements signed by the Projects' shippers.

We identified and evaluated several other interstate natural gas pipeline system alternatives, as described in the following sections and corresponding figures.

Although we are evaluating system alternatives, we recognize that NEXUS and Texas Eastern are already making use of their existing systems as a means of meeting the project objectives. In addition to constructing new facilities, the Projects involve contracting existing and expanded capacity on pipeline systems in Pennsylvania, West Virginia, Ohio, and Michigan.

3.2.1 Existing Pipeline Systems

Six existing pipeline systems presently operate in the vicinity of the Projects that could potentially transport natural gas from the Appalachian Basin to markets in northern Ohio and southeastern Michigan, and to the Dawn Hub in Ontario, Canada (see figure 3.2.1-1). These six systems include:

- ANR Pipeline Co. (ANR), which consists of about 9,400 miles of pipeline between Texas and Michigan;
- Columbia Gas Transmission (Columbia), which consists of about 12,700 miles of pipeline between Kentucky and New York;

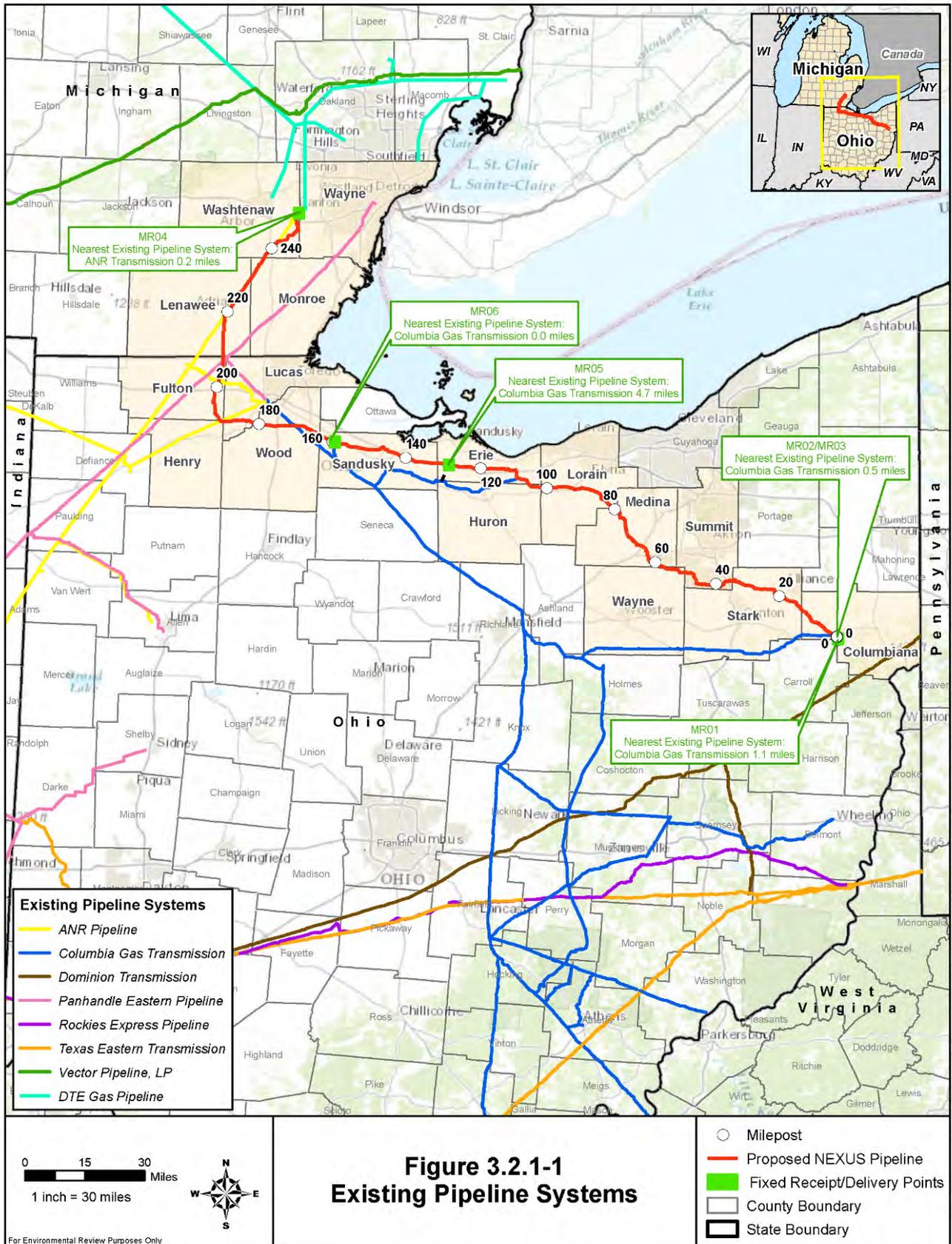
- Dominion, which consists of about 7,800 mile of pipeline between Ohio and New York;
- Panhandle Eastern Pipe Line (Panhandle Eastern), which consists of about 6,000 miles of pipeline between the Texas and Michigan;
- Rockies Express Pipeline (REX), which consists of about 1,700 miles of pipeline between Colorado and Ohio; and
- Texas Eastern, which consists of about 9,100 miles of pipeline between Texas and New Jersey.

Conceivably, these six systems could be used in various combinations to transport natural gas to and from the markets served by the Projects; however, the main constraint limiting the viability of these systems is that none of these existing pipelines have capacity available for transporting the required volumes of natural gas needed by the Projects and subsequently would also require expansion of facilities. Furthermore, these existing systems do not service all the proposed receipt and delivery points; therefore, additional pipeline lateral facilities from the mainline pipelines to the receipt and delivery points would be needed. For these reasons, use of these systems is not technically feasible without substantial modifications and the construction of new natural gas transmission infrastructure, including new mainline, pipeline loop, lateral pipeline, and compression. Under the best scenario, we estimate that about 300 miles of new pipeline or pipeline loop would be required to achieve the Projects' objectives, which is substantially more than the proposed Projects. Further, these systems may not be economically viable due to higher capital cost, rate stacking, and fuel retention. These systems, therefore, are not reasonable alternatives to the Projects and we eliminated them from further consideration.

3.2.2 Proposed Pipeline Systems

One planned and two different proposed pipeline systems are presently located in the vicinity of the Projects that could be used to transport natural gas from the Appalachian Basin to markets in northern Ohio and southeastern Michigan, and to the Dawn Hub in Ontario, Canada. These three systems include:

- Rover Pipeline Project (FERC Docket No. CP15-93-000);
- Leach XPress Project (FERC Docket No. CP15-514-000); and
- ANR East Pipeline Project (ANR East) (not yet entered pre-filing with FERC)



**Figure 3.2.1-1
Existing Pipeline Systems**

Rover Pipeline, LLC (Rover) is proposing to construct a new natural gas system that would consist of about 511 miles of new 24-, 30-, 36-, and 42-inch-diameter pipeline, 10 new compressor stations, and other related facilities in West Virginia, Pennsylvania, Ohio, and Michigan (see figure 3.2.2-1). Rover proposed to place its new system in service on or before June 2017; however, we note that this date is not likely feasible as FERC's review is still pending. Rover has executed precedent agreements with shippers representing 3.1 million Dth/d of the 3.25 million Dth/d total capacity of the new system.

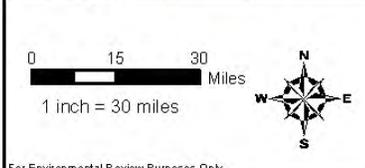
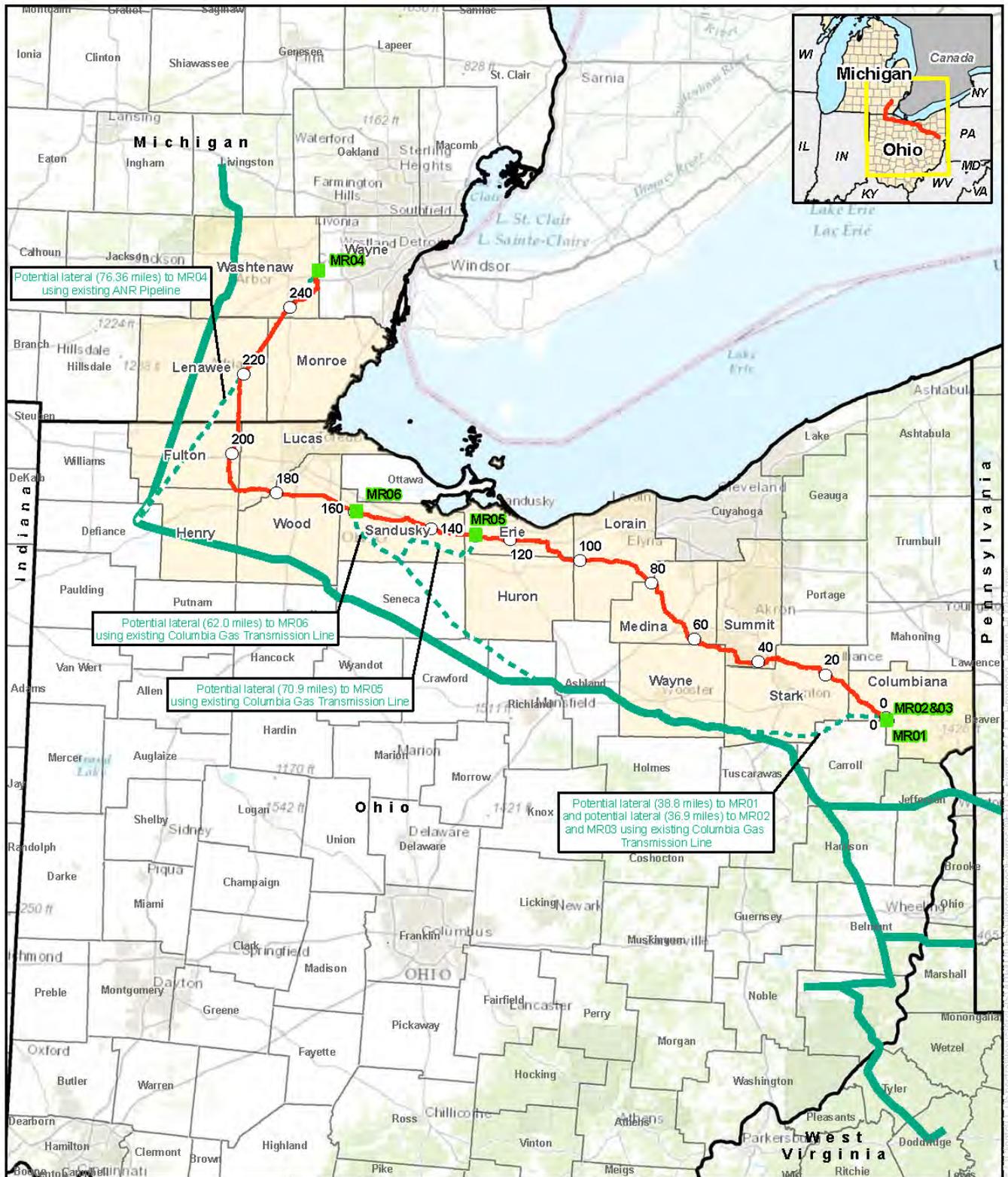
Columbia is proposing its Leach Xpress Project to construct new natural gas transportation facilities that would consist of approximately 160 miles of 30- and 36-inch-diameter pipeline, three new compressor stations, one existing compressor station upgrade, and other related facilities in West Virginia and Ohio (see figure 3.2.2-2). Columbia is proposing to place its new facilities in service on or before November 2017, pending any delays. Columbia has executed precedent agreements with shippers representing 1.4 million Dth/d of the 1.5 million Dth/d total capacity of the new pipeline system.

TransCanada is planning to construct ANR East to transport natural gas from Utica and Marcellus shale producers to the Gulf Coast and other Midwestern markets and would consist of 320 miles of large diameter pipeline (see figure 3.2.2-3). TransCanada initially planned an in-service date for the project in late 2017. However, we note that this date is not likely feasible as the project is still being developed and has not yet entered FERC's pre-filling process.

Conceivably, these proposed or planned pipelines could be used to transport natural gas to and from the markets served by the Projects. However, the main constraints limiting the viability of these pipelines are the same as those limiting the viability of existing system pipelines: they already are almost fully subscribed and do not serve the required definitive receipt and delivery points. For these reasons, use of the other proposed or planned pipelines is not technically feasible without significant modifications to their design and the construction of new additional infrastructure and pipeline to serve NEXUS' and Texas Eastern's customers. We also note that the ANR East Project would not be in service within a timeframe reasonably similar to the Projects. The proposed and planned pipelines, therefore, are not a reasonable alternative to the Projects. Because we received several comments during scoping suggesting that the NGT Project could be realigned to follow the Rover pipeline route, we have included a more detailed discussion of this alternative in section 3.3.1.

3.3 MAJOR ROUTE ALTERNATIVES

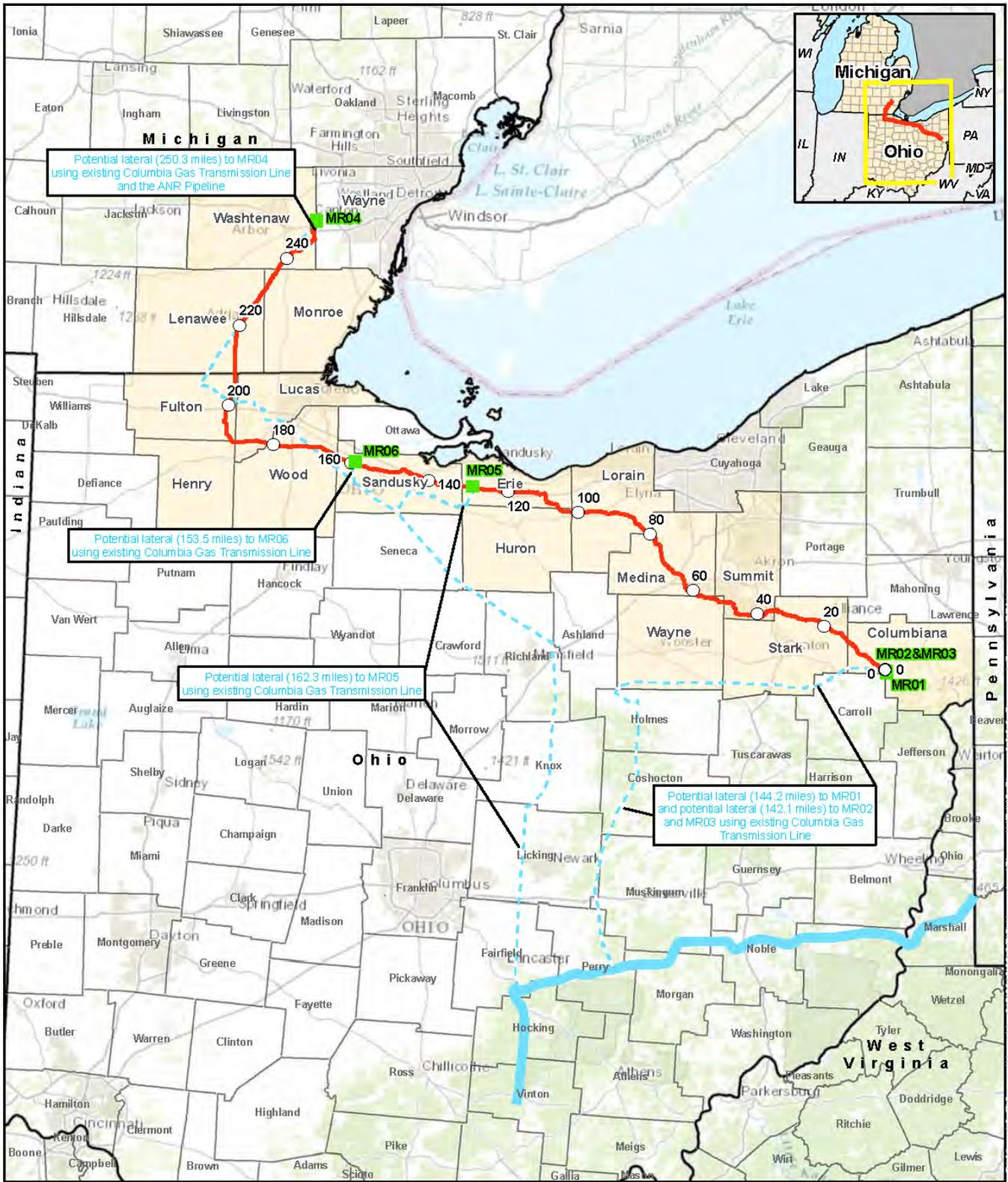
We considered other routes for the Projects to determine if the route alternatives would avoid or reduce impacts on environmentally sensitive resources. Route alternatives are typically only recommended if the alternative confers a substantial environmental advantage over the proposed route. Otherwise, such an alternative merely represents a shift in impacts from one area or resource to another. We note that all major route alternatives evaluated in this EIS are along the NGT mainline. We found no reason of our own nor any compelling reason based on stakeholder comments to evaluate major route alternatives for 0.9 mile of TGP interconnecting pipeline, the 4.4 miles of TEAL pipeline loop, or 0.3 mile of TEAL connecting pipeline.



**Figure 3.2.2-1
Proposed ROVER
Pipeline System
NGT and TEAL Projects**

- Milepost
- Proposed NEXUS Mainline
- - - Potential Lateral
- Proposed ROVER System
- Fixed Receipt/Delivery Points
- County Boundary
- ▭ State Boundary

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Potential lateral (250.3 miles) to MR04 using existing Columbia Gas Transmission Line and the ANR Pipeline

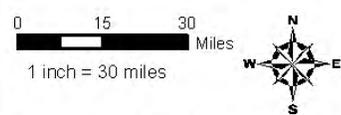
Potential lateral (153.5 miles) to MR06 using existing Columbia Gas Transmission Line

Potential lateral (162.3 miles) to MR05 using existing Columbia Gas Transmission Line

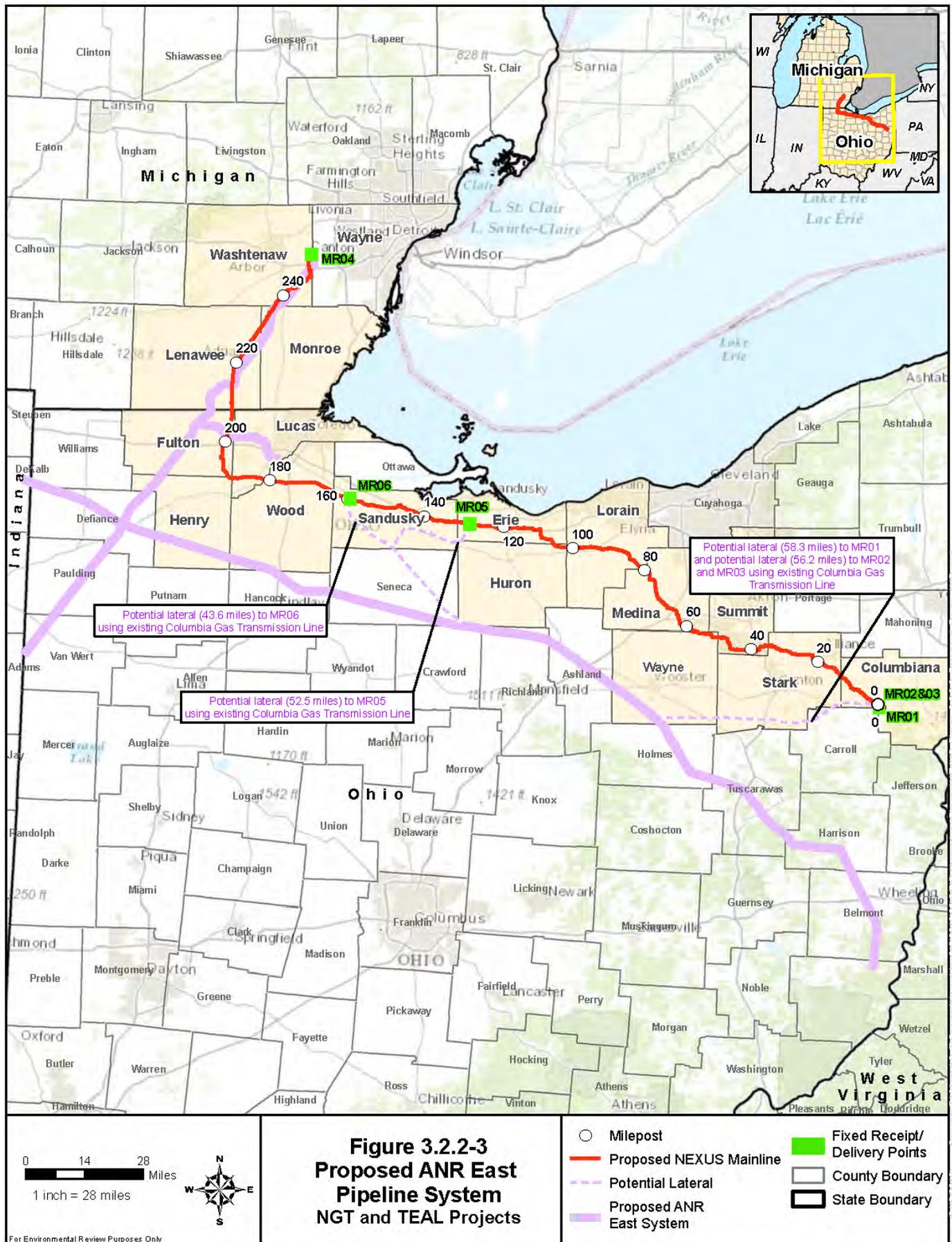
Potential lateral (144.2 miles) to MR01 and potential lateral (142.1 miles) to MR02 and MR03 using existing Columbia Gas Transmission Line

**Figure 3.2.2-2
Proposed Leech Xpress
Pipeline System
NGT and TEAL Projects**

- Milepost
- Proposed NEXUS Mainline
- - - Potential Lateral
- Proposed Leech Xpress System
- Fixed Receipt/Delivery Points
- County Boundary
- State Boundary



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3.3.1 Rover Route Alternative

The Rover Route Alternative was developed to address several stakeholder comments to co-locate the proposed pipeline with the proposed Rover pipeline route, which extends across Ohio and into Michigan south of the NGT Project. The two projects potentially could be routed in the same corridor being evaluated for Rover. The Rover Route Alternative would diverge from the NGT mainline at MP 0.0 in Columbiana County, Ohio and rejoin the NGT mainline at MP 255.0 in Washtenaw County, Michigan (see figure 3.3.1-1 and table 3.3.1-1). All four compressor stations would need to be re-sited to accommodate this alternative. Also, in order to meet the Projects' objective of delivering gas to MR04, MR05, and MR06, which would otherwise be bypassed by this alternative, approximately 137 miles of lateral pipelines extending from the alternative mainline to the M&R stations would be required. These lateral pipelines are included in our environmental analysis.

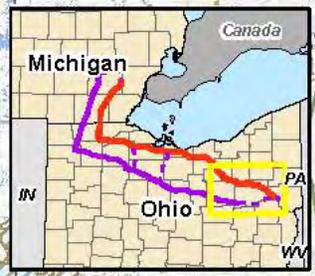
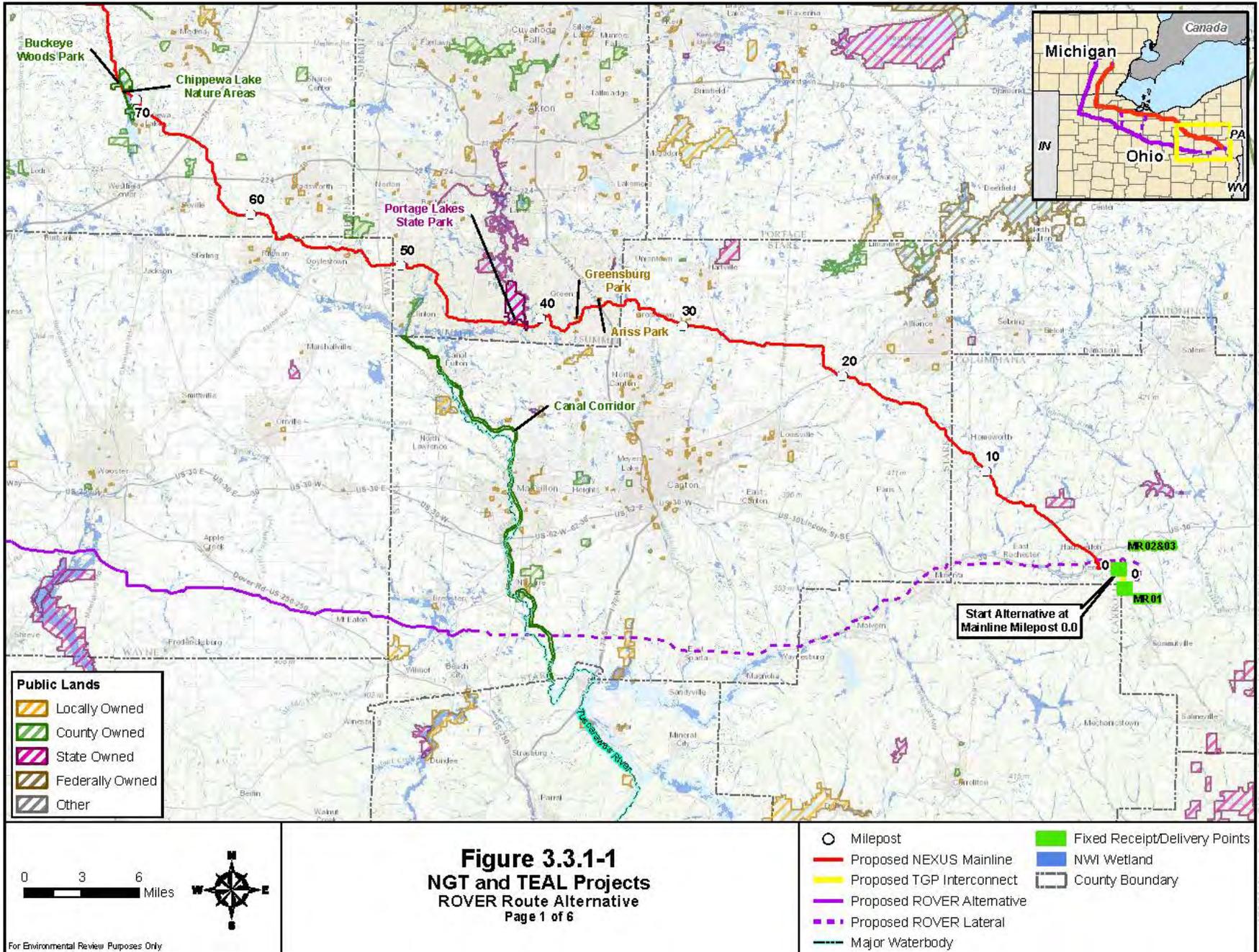
Factor	Alternative	Proposed Route
Length (miles)	385.0	255.7
Greenfield Construction (miles) ^a	274.0	142.0
Wetland Affected (acres) ^b	110.0	38.2
Perennial Waterbody Crossings (no.)	140	116
WHPA (no.) ^c	47	22
Agricultural Land (acres) ^d	4,469.7	3,071.2
Forested Land (acres) ^b	409.1	279.1
Wildlife Management Areas (no./miles)	0/0.0	1/0.1 ^e
State Parks and Forest (no./mile)	0/0.0	2/0.8 ^f
County/Metro Parks (no./mile)	2/0.2 ^g	7/0.8 ^h
Steep Slopes (miles) ⁱ	4.0	1.3
Sidehill Construction (miles) ^j	5.7	2.2
Residential-type Structures within 150 feet Pipe Centerline (no.) ^k	495	247

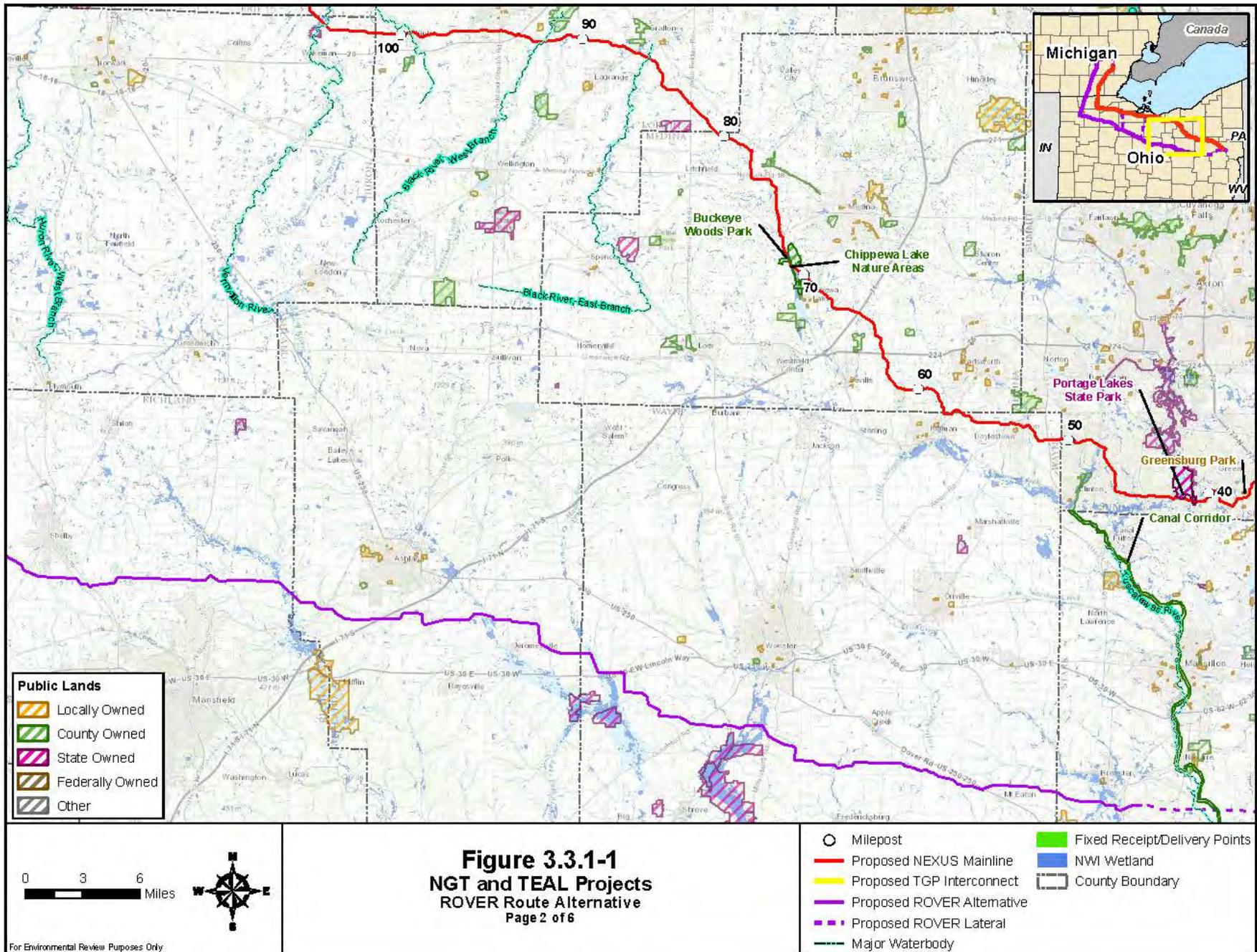
a	Based on the absence of adjacent or parallel rights-of-way within 300 feet of the pipe centerline. If the Rover Project is approved and constructed, the mileage of greenfield construction for the alternative route would drop substantially.
b	Based on a 75-foot-wide construction right-of-way in wetlands and forested land.
c	WHPA = wellhead protection area.
d	Based on a 125-foot-wide construction right-of-way in agricultural land.
e	Missionary Island Wildlife Area.
f	Portage Lakes State Park; Maumee State Forest.
g	Canal Corridor; Apple Ridge Park.
h	Ariss Park; Greensburg Park; Singer Lake Preserve; Chippewa Lake Nature Area; Buckeye Woods Park; Farnsworth Metropark; North Hydro Park.
i	Calculated by identifying slopes greater than 20 percent.
j	Calculated by identifying slopes greater than 20 percent, and determining if the pipeline direction differed from the direction of the ground aspect.
k	Includes dwellings, detached dwellings, garages, sheds, and other buildings often associated with a residence.

The Rover Route Alternative, including laterals, is 385.0 miles in length. The route alternative and proposed route would cross relatively similar amounts of steep slopes and have similar amounts of sidehill construction. The primary advantages of the route alternative is that it would not cross any wildlife management areas or state parks/forests, and 5 fewer county/metro parks. Conversely, the major disadvantages of the alternative are that it is 129.3 miles longer, has 132 miles more of greenfield construction, 71.8 acres more wetlands crossed, 24 more perennial waterbodies crossed, 25 more wellhead protection areas (WHPA) crossed, 1,398.5 acres more agricultural land, 130.0 acres more forested land, and is near 248 more residential-type structures. Based on our review of these routes and the need for 137 miles of lateral pipelines, we do not find the Rover Route Alternative

provides a significant environmental advantage when compared to the proposed route and do not recommend that this alternative be incorporated as part of the Projects.

During the draft EIS comment period we also receive comments suggesting that a single pipeline could serve both the NEXUS and Rover projects, and that the pipeline could follow the Rover route. As suggested, a single pipeline theoretically could be installed along the Rover route to serve both NEXUS and Rover customers. However, approximately 137 miles of lateral pipelines extending from the mainline to the M&R stations would be required in order to meet the Projects' objective of delivering gas to MR04, MR05, and MR06, which would otherwise be bypassed by this alternative. Further, building one main pipeline in this area to serve both NEXUS and Rover customers is not possible because Rover already is planning to construct two 42-inch-diameter pipelines through much of the shared area and a single 42-inch-diameter pipeline in the remaining shared area. Forty-two-inch diameter pipe is near the current technological and economical limits for steel natural gas pipeline. This, coupled with the fact that the Rover pipeline is nearly fully subscribed (Rover already has executed precedent agreements with shippers representing 3.1 million Dth/d of the 3.25 million Dth/d total capacity of the new system), indicates that another pipeline would be required to accommodate the volumes need for NEXUS. As such, the end result essentially would be the same as the Rover Route Alternative discussed above. The applicants for both the NEXUS and Rover pipelines each continue to maintain separate needs, customers, and delivery points for their respective projects. If the markets change, each applicant could modify or withdraw their applications should they decide to combine or withdraw their projects.

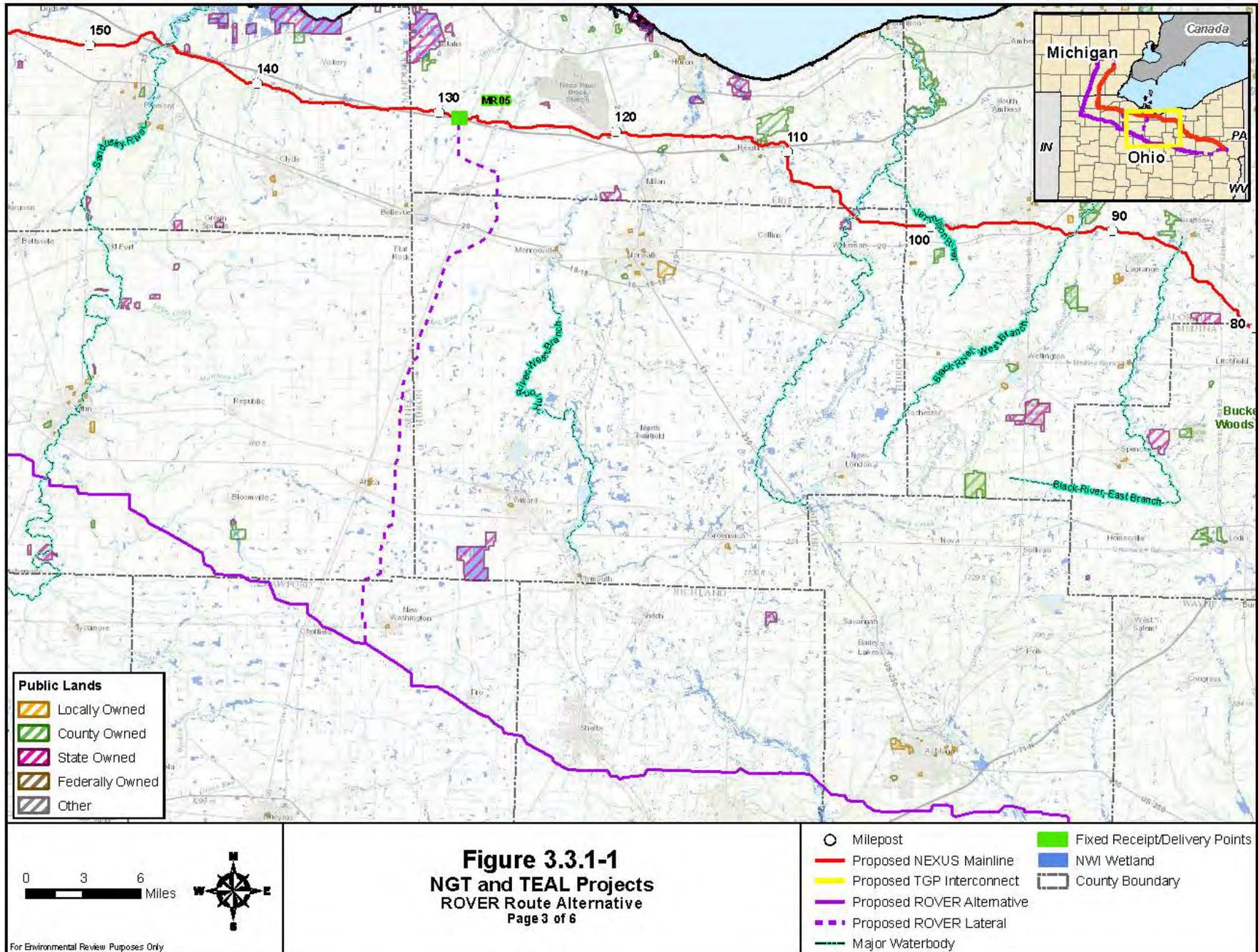




0 3 6 Miles

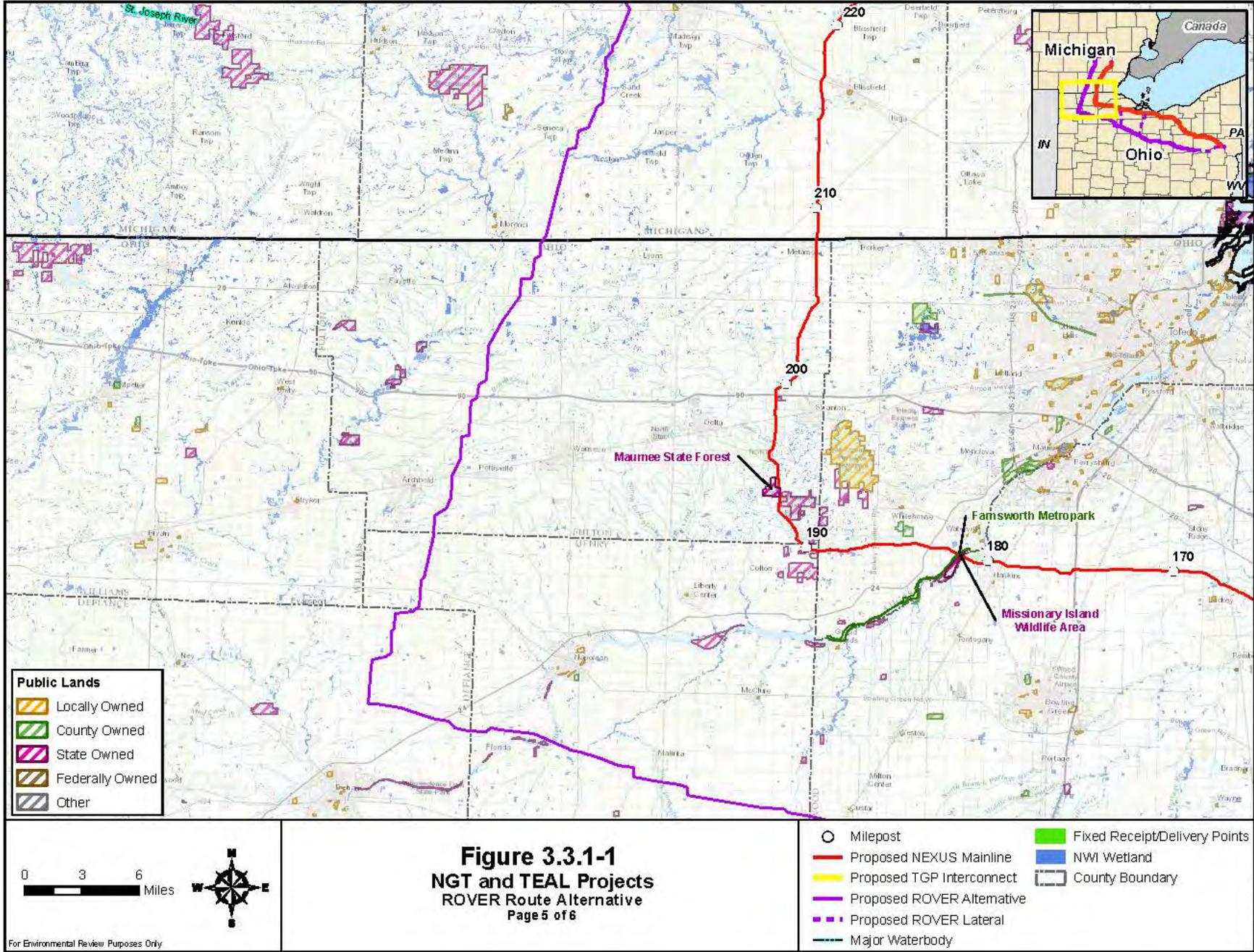


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Public Lands

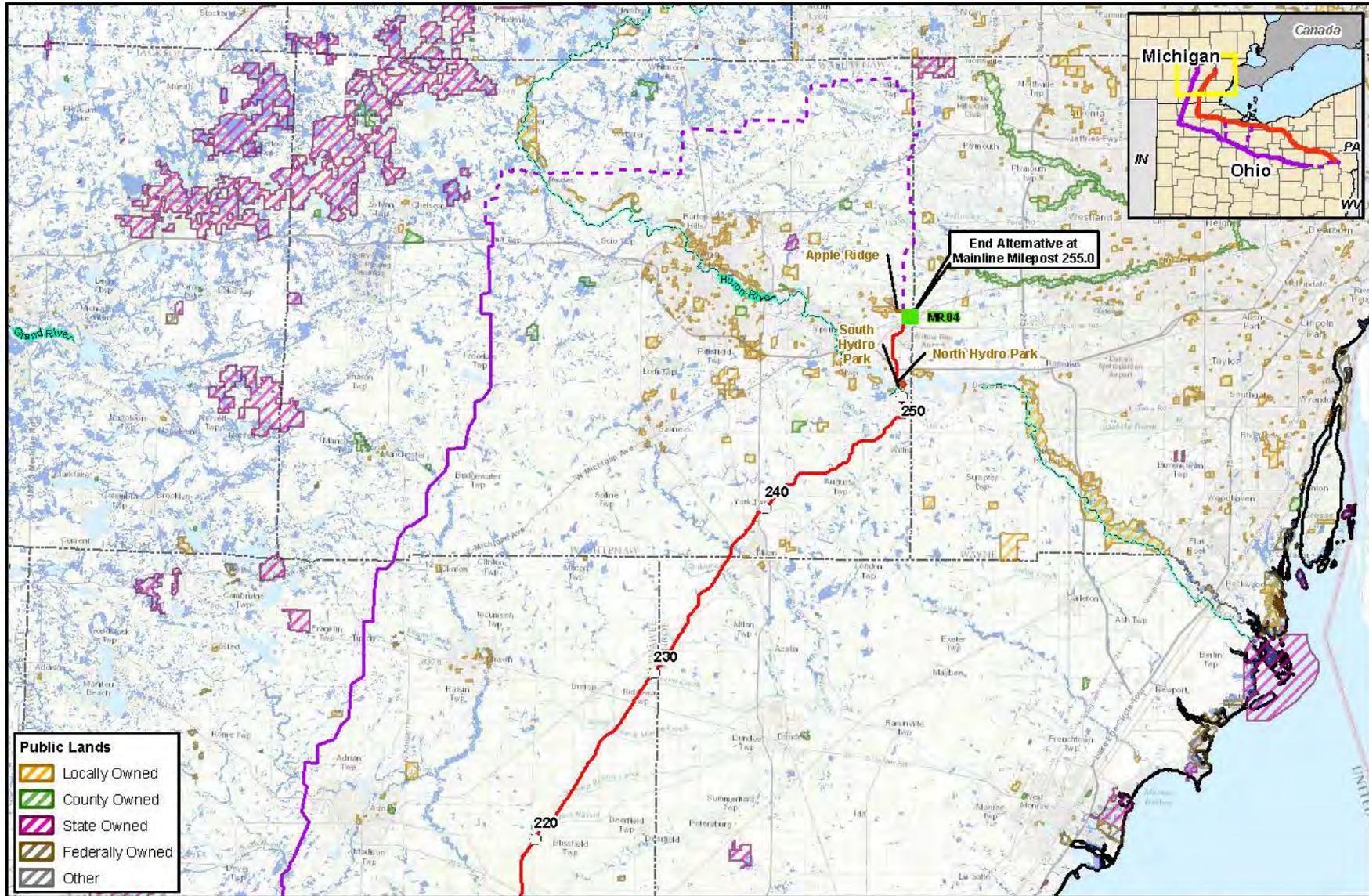
- Locally Owned
- County Owned
- State Owned
- Federally Owned
- Other

0 3 6 Miles

Figure 3.3.1-1
NGT and TEAL Projects
ROVER Route Alternative
 Page 5 of 6

- Milepost
- Proposed NEXUS Mainline
- Proposed TGP Interconnect
- Proposed ROVER Alternative
- Proposed ROVER Lateral
- Major Waterbody
- Fixed Receipt/Delivery Points
- NWI Wetland
- County Boundary

For Environmental Review Purposes Only



Public Lands

- Locally Owned
- County Owned
- State Owned
- Federally Owned
- Other

0 3 6 Miles

Figure 3.3.1-1
NGT and TEAL Projects
ROVER Route Alternative
 Page 6 of 6

- Proposed NEXUS Mainline
- Proposed TGP Interconnect
- Proposed ROVER Alternative
- Proposed ROVER Lateral
- Major Waterbody
- Fixed Receipt/Delivery Points
- NWI Wetland
- County Boundary
- Milepost

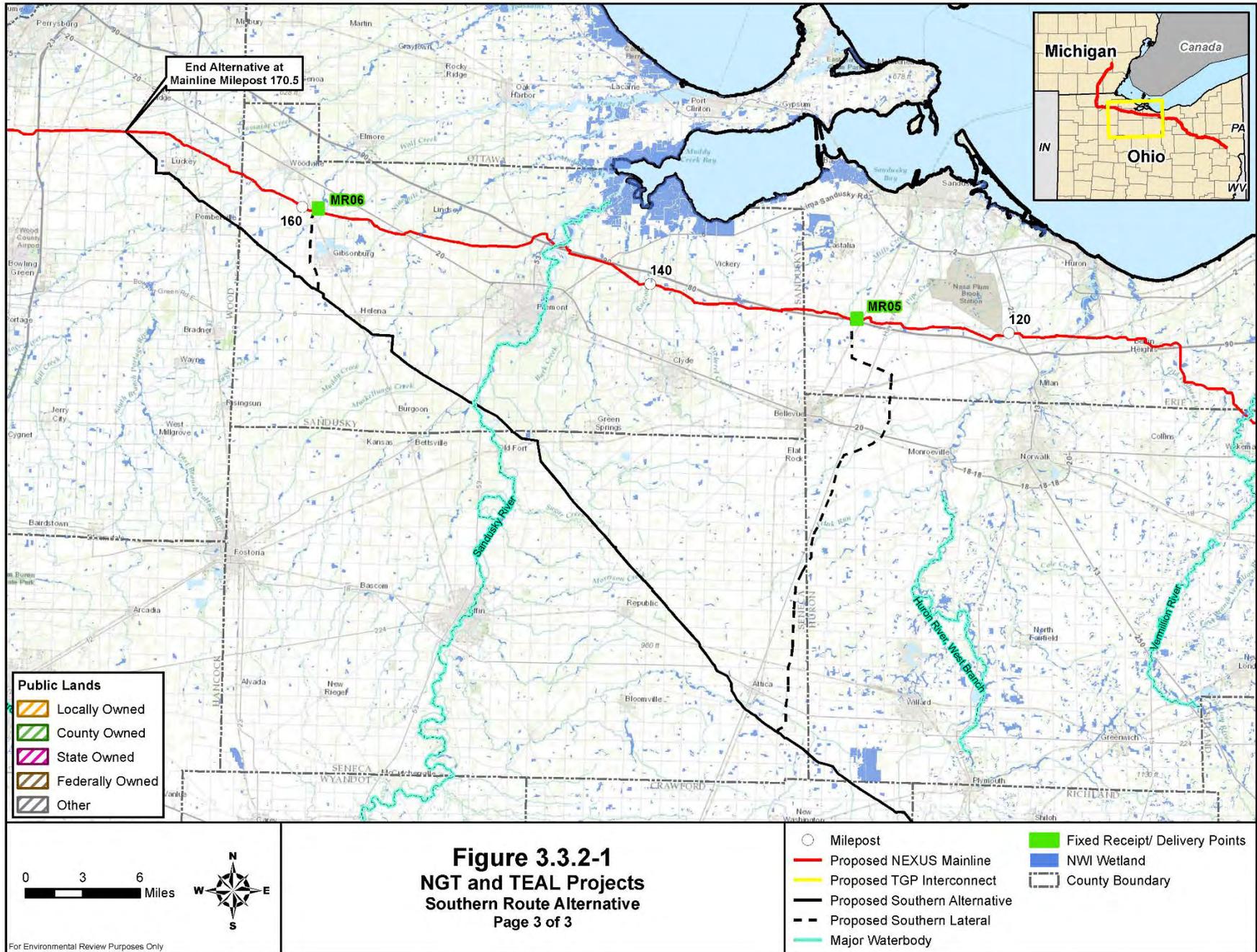
3.3.2 Southern Route Alternative

During scoping, we received a number of comments requesting that the NGT Project be routed through less densely populated areas south of the proposed route. Many of the commenters cited pipeline safety as the main reason for the alternative route. We analyzed the Southern Route Alternative (see figure 3.3.2-1 and table 3.3.2-1) to determine if it would provide a significant environmental advantage. The Southern Route Alternative diverges from the proposed NGT mainline at MP 1.4 in Columbiana County and connects back to the proposed NGT mainline at MP 170.5 in Wood County. Two compressor stations would need to be re-sited to accommodate this alternative. Also, in order to meet the objectives of delivering gas to MR05 and MR06, which would otherwise be bypassed by this alternative, approximately 29.7 miles of lateral pipelines extending from the alternative mainline to the M&R stations would be required. These lateral pipelines are included in our environmental analysis.

Factor	Alternative	Proposed Route
Length (miles)	198.0	169.8
Greenfield Construction (miles) ^a	79.6	98.9
Wetland Affected (acres) ^b	15.5	28.2
Perennial Waterbody Crossings (no.)	88	89
WHPA (no.)	22	19
Agricultural Land (acres) ^c	2,369.7	1,962.1
Forested Land (acres) ^b	242.7	241.8
State Parks and Forest (no./mile)	0/0.0	1/0.3 ^d
County/Metro Parks (no./mile)	1/0.2 ^e	5/0.6 ^f
Steep Slopes (miles) ^g	4.1	1.1
Sidehill Construction (miles) ^h	5.5	2.0
Residential-type Structures within 150 feet Pipe Centerline (no.) ⁱ	208	218

a	Based on the absence of adjacent or parallel rights-of-way within 300 feet of the pipe centerline.
b	Based on a 75-foot-wide construction right-of-way in wetlands and forested land.
c	Based on a 125-foot-wide construction right-of-way in agricultural land.
d	Portage Lakes State Park.
e	Canal Corridor.
f	Ariss Park; Greensburg Park; Singer Lake Preserve; Chippewa Lake Nature Area; Buckeye Woods Park.
g	Calculated by identifying slopes greater than 20 percent.
h	Calculated by identifying slopes greater than 20 percent, and determining if the pipeline direction differed from the direction of the ground aspect.
i	Includes dwellings, detached dwellings, garages, sheds, and other buildings often associated with a residence.

The Southern Route Alternative, including laterals, is 198.0 miles long. Both routes would affect similar amounts of perennial waterbodies, forested land, and residential-type structures within 150 feet of the pipeline centerline. The main advantages of the alternative are that it would have 19.3 miles less greenfield construction, cross 12.7 acres less wetlands, no state parks/forests, and 4 fewer county/metro parks. Conversely, the disadvantages of the alternative are that it is 28.2 miles longer, has 3 more WHPAs, 407.6 acres more agricultural land, 3 miles more of steep slopes, and 3.5 miles more of sidehill construction. The purpose of the alternative was to route through less densely populated areas; however, given the laterals necessary to reach the required delivery points, only 10 fewer residential-type structures would be affected by the alternative. Therefore, based on these factors, we do not find the Southern Route Alternative provides a significant environmental advantage when compared to the corresponding segment of the proposed route and do not recommend that this alternative be incorporated as part of the Projects.



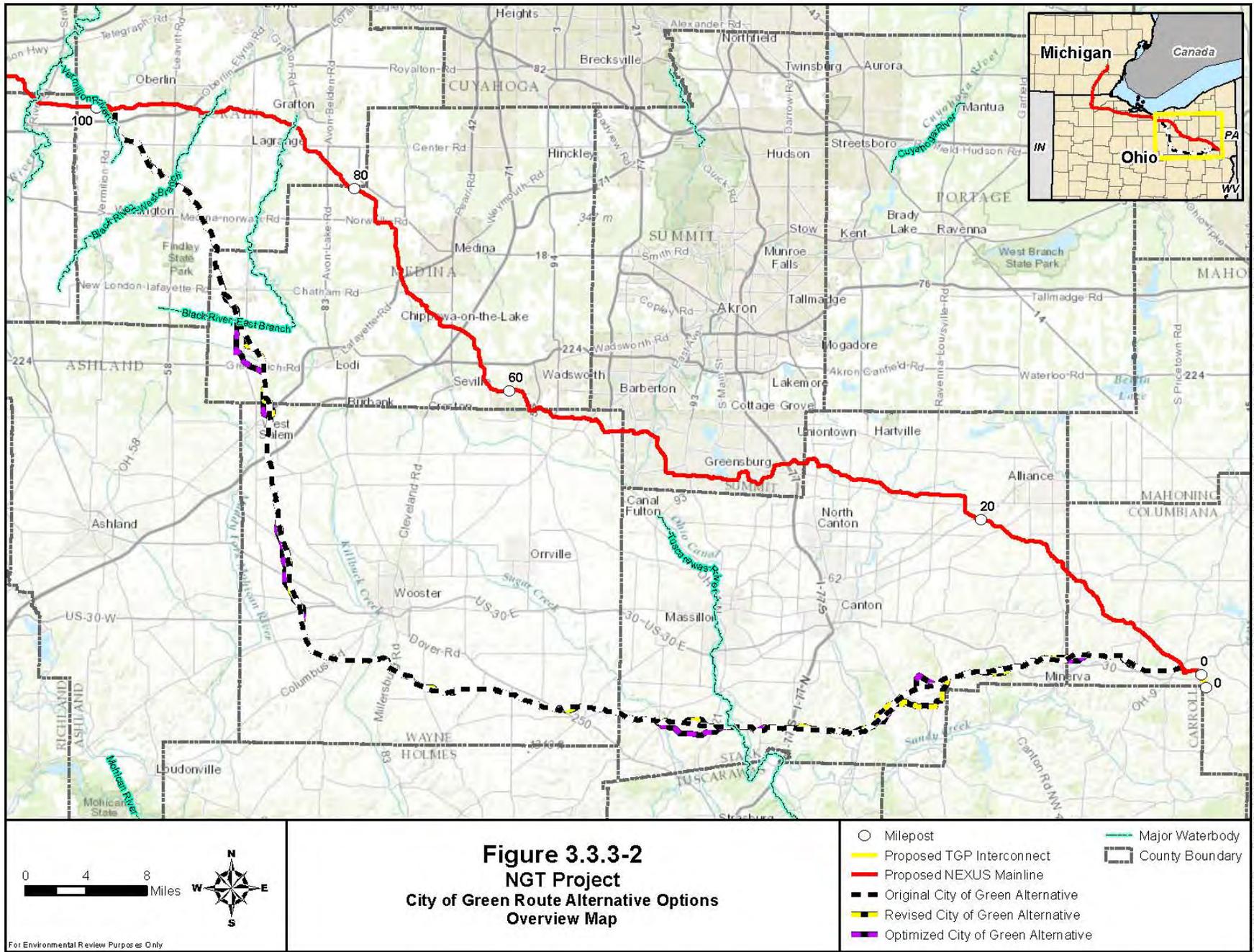
3.3.3 City of Green Route Alternative

The City of Green Route Alternative was proposed to minimize the impacts of the NGT Project on areas zoned for future development in the vicinity of the City of Green. Prior to the route alternative, NEXUS met with city officials and other stakeholders during the pre-filing planning process to address specific routing issues and siting concerns with the proposed route. NEXUS, however, was not able to address all issues or concerns. Thus, City of Green officials submitted the route alternative to FERC's docket during the pre-filing period in a letter dated March 23, 2015. After the route alternative was submitted, NEXUS continued to communicate with city officials and other stakeholders regarding issues and concerns. Notwithstanding, NEXUS has not been able to address all concerns, and City of Green officials and other stakeholders continue to maintain support for the route alternative.

The City of Green limits extend from about MP 34.2 to 42.1 along the proposed route. During pre-filing, NEXUS sent officials with the City of Green draft versions of Resource Report 1 (Project Description) and Resource Report 10 (Alternatives) and met with city officials on nine separate occasions over a 1-year period to discuss their specific issues and concerns. As a result of the meetings between NEXUS and stakeholders, about 84 percent of the proposed route within the city limits was adjusted via minor route variations since NEXUS entered the pre-filing process.

NEXUS realigned the proposed route between MPs 32.5 and 39.6, during pre-filing, in order to address landowner concerns. After the formal application was filed, NEXUS incorporated additional route variations at MPs 35.8 to 36.6, MPs 36.7 to 37.0, and MPs 39.7 and 42.6 to avoid conflicts with proposed business expansions, minimize impacts on the Nimisila Reservoir, avoid a Category III wetland, and maintain the proper offset from adjacent DEO Gas facilities (see figure 3.3.3-1). Despite significant adjustments to the proposed route, NEXUS was not able to avoid all areas of concern that were identified by the City of Green. The City of Green and its residents have identified continued conflict with the project including some areas identified for future residential, commercial, and industrial development, as well as Ariss Park, Greensburg Park, and Singer Lake Preserve (see section 4.9.3.1).

The City of Green Route Alternative, filed on March 23, 2015, diverges from the proposed NGT mainline at MP 1.8 in Columbiana County. The alternative heads in a westerly direction for approximately 62 miles, turns north for approximately 40.9 miles, and rejoins the proposed NGT mainline at MP 98.7 in Lorain County (see figure 3.3.3-2 and table 3.3.3-1). About 23.9 miles of the City of Green Route Alternative would follow the proposed Rover pipeline route. One compressor station would need to be re-sited to accommodate this alternative, which is discussed further in this section.



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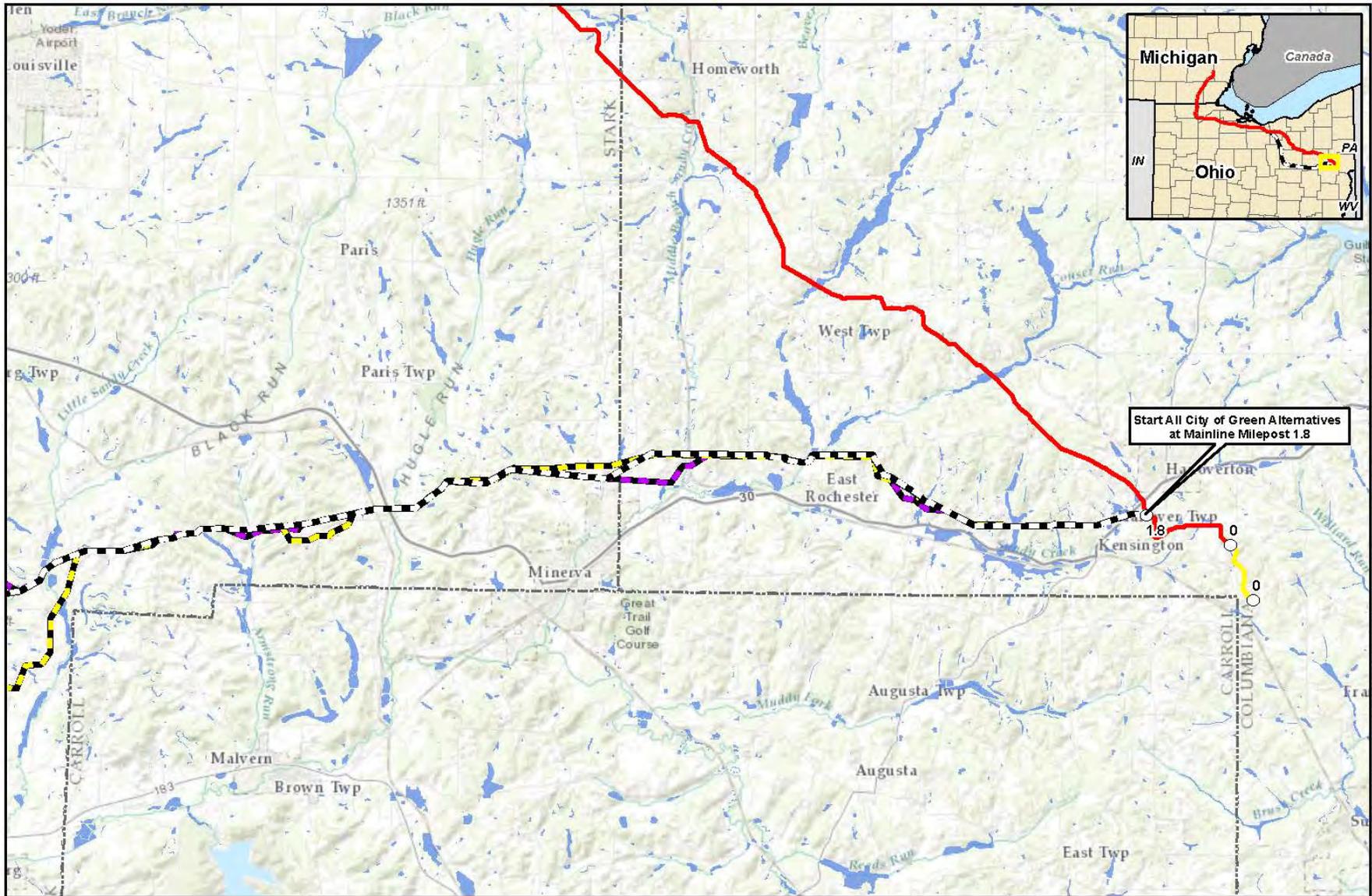


Figure 3.3.3-2
NGT Project
City of Green Route Alternative Options
 Page 1 of 7

- Milepost
- Proposed TGP Interconnect
- Proposed NEXUS Mainline
- - - Original City of Green Alternative
- - - Revised City of Green Alternative
- - - Optimized City of Green Alternative
- Major Waterbody
- NWI Wetland
- County Boundary

For Environmental Review Purposes Only

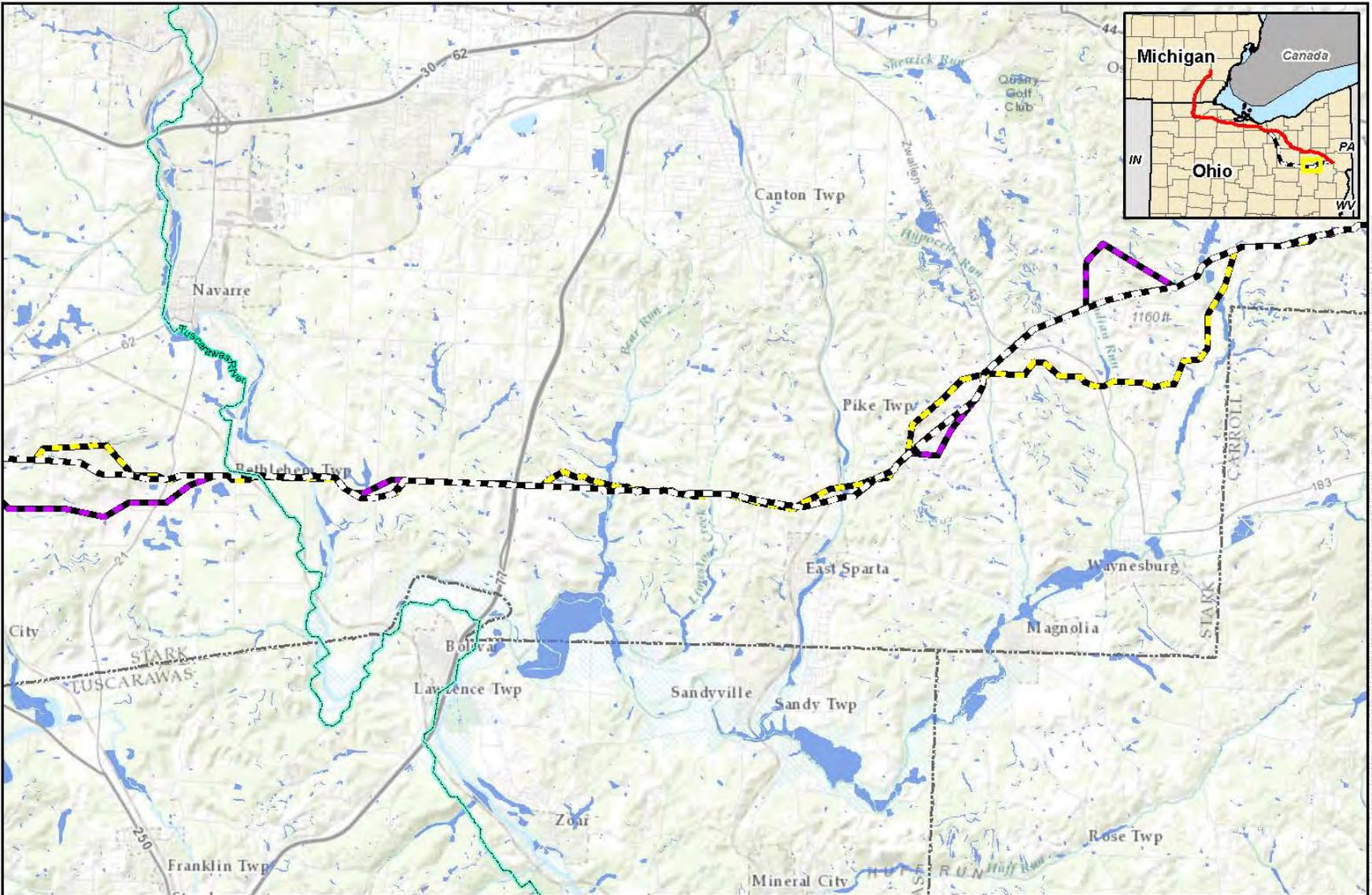
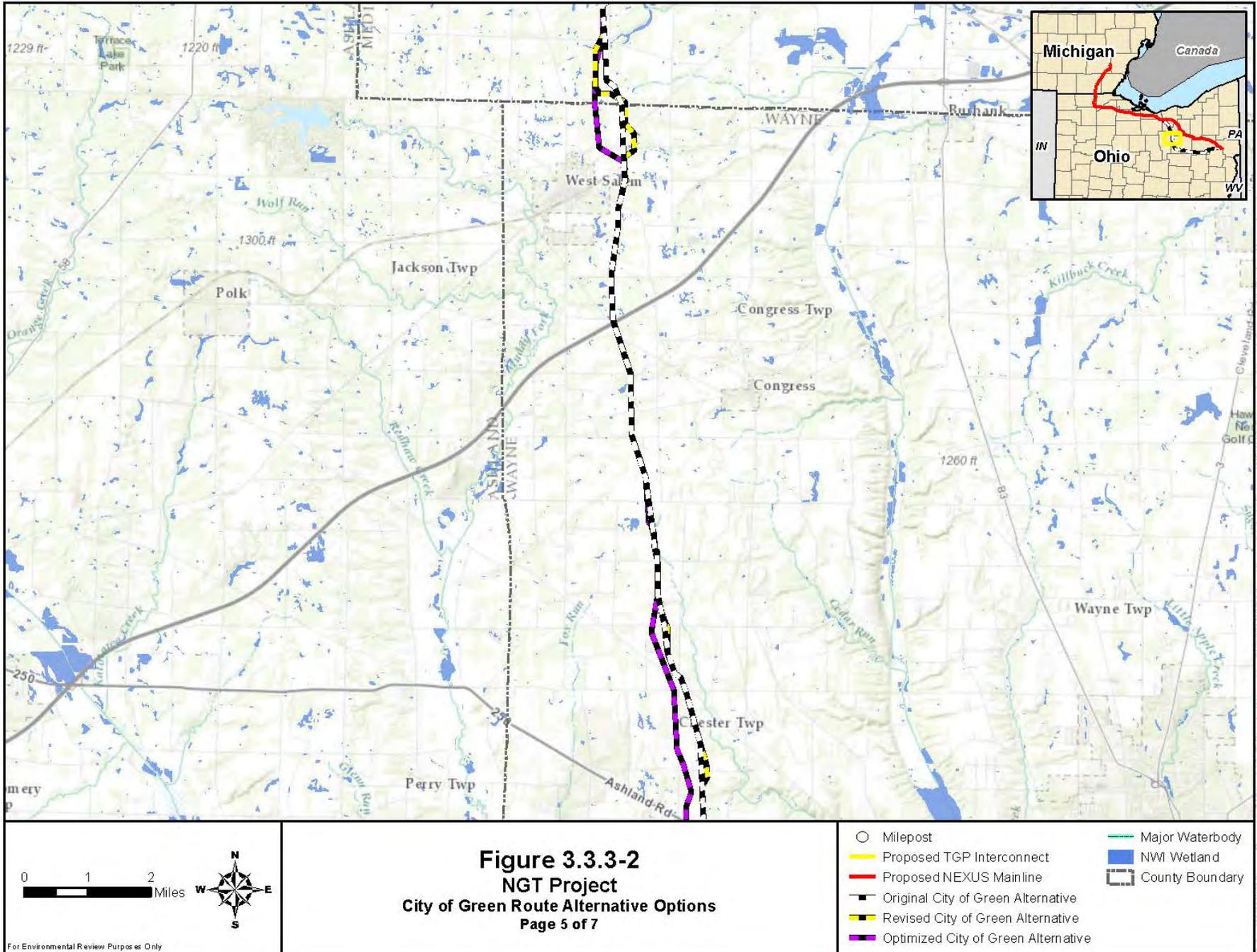


Figure 3.3.3-2
NGT Project
City of Green Route Alternative Options
 Page 2 of 7

- Milepost
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TABLE 3.3.3-1

Analysis of the City of Green Route Alternative		
Factor	Alternative	Proposed Route
Length (miles)	102.8	97.3
Greenfield Construction (miles) ^a	78.9	62.7
Wetland Affected (acres) ^b	10.0	21.8
Perennial Waterbody Crossings (no.)	55	49
WHPA (no.)	6	7
Agricultural Land (acres) ^c	1,039.4	1,027.3
Forested Land (acres) ^b	234.5	181.8
State Parks and Forest (no./mile)	0/0.0	1/0.3 ^d
County/Metro Parks (no./mile)	1/0.2 ^e	6/0.6 ^f
Steep Slopes (miles) ^g	5.6	1.0
Sidehill Construction (miles) ^h	7.4	1.6
Dwellings within 50 feet of the Pipe Centerline (no.)	4	1
Dwellings within 100 feet of the Pipe Centerline (no.)	12	12
Dwellings within 150 feet of the Pipe Centerline (no.)	31	66
Other Residential-type Structures within 150 feet (no.) ⁱ	57	91
a	Based on the absence of adjacent or parallel rights-of-way within 300 feet of the pipe centerline. Greenfield construction on the alternative route would be reduced by about 21.2 miles if the Rover Pipeline Project is constructed prior to the Projects.	
b	Based on a 75-foot-wide construction right-of-way in wetlands and forested land. Forest clearing on the alternative route would be reduced by an estimated 11.1 acres if the Rover Pipeline Project is constructed prior to the Projects.	
c	Based on a 125-foot-wide construction right-of-way in agricultural land.	
d	Portage Lakes State Park.	
e	Canal Corridor/Ohio-to-Erie Trail.	
f	Ariss Park; Greensburg Park; Singer Lake Preserve; Chippewa Lake Nature Area; Buckeye Woods Park; Ohio-to-Erie Trail.	
g	Calculated by identifying slopes greater than 20 percent.	
h	Calculated by identifying slopes greater than 20 percent, and determining if the pipeline direction differed from the direction of the ground aspect.	
i	Includes detached dwellings, garages, sheds, and other buildings often associated with a residence.	

The City of Green Alternative is 102.8 miles in length. The route alternative and proposed route are similar in length and would cross a similar number of perennial waterbodies. The primary advantages of the route alternative are that it would cross 11.8 acres fewer wetlands, 1 less WHPA, no state parks/forest lands, 5 fewer county/metro parks, and 35 fewer homes within 150 feet. Conversely, the main disadvantages of the alternative are that it would have 16.2 miles more greenfield construction, 52.7 acres more forested land, 4.6 more miles of steep slopes, and 5.8 more miles of sidehill construction.

The final EIS for the Rover Pipeline Project was issued in July 2016. If the Commission determines the Rover Pipeline Project is in the public convenience and necessity and authorizes construction of the project, about 23.9 miles of the City of Green Route Alternative would be adjacent or parallel to the Rover pipeline. A small portion of the Rover Pipeline Project already has existing infrastructure, but about 21.2 miles of greenfield land would be disturbed by Rover if it is authorized and constructed, and as such, greenfield construction on the City of Green Route Alternative would be reduced by about 21.2 miles and forested land clearing would be reduced by about 16.7 acres.

Pipeline safety in the proximity to residential, commercial, and industrial development is a primary concern raised by many stakeholders who commented in support of the City of Green Alternative. DOT safety standards are intended to ensure adequate protection regardless of proximity to development. The pipelines and aboveground facilities associated with the NGT and TEAL Projects must be designed, constructed, operated, and maintained in accordance with these safety standards. Therefore, we find that

either route is safe, regardless of population density (see section 4.13). However, an important consideration in routing a natural gas transmission pipeline instead is the impact on land use.

Impacts on developed areas include mainly temporary disruption and inconveniences on residents and businesses during construction (see section 4.9.3.1). Some aboveground structures (e.g., fences, sheds, playgrounds, trailers) and landscaping may be removed for construction; however, no residents or businesses would be temporarily or permanently displaced. We are particularly concerned where the construction work area is within 10 feet of residences due to the increased potential for construction to disrupt the residences and to ensure that property owners have adequate input to a construction activity occurring so close to their homes. In these areas, we have recommended in section 4.9.4.1 that, prior to construction, NEXUS should file with FERC evidence of landowner concurrence with the site-specific RCPs.

NEXUS would compensate landowners for an easement on their property. The easement acquisition process is designed to provide fair compensation to the landowner for the right to use the property for pipeline construction and operation (see section 4.9.3.1). Appraisal methods used to value land are typically based on objective characteristics of the property and any improvements. Landowners would continue to have use of their property following construction provided it does not interfere with the easement rights granted to NEXUS for construction and operation of the pipeline facilities. For example, no new trees or structures would be allowed within the permanent right-of-way, including houses, decks, playgrounds, tool sheds, garages, poles, guy wires, catch basins, swimming pools, trailers, leach fields, septic tanks, or other structures not easily removed. Semi-permanent structures that would be permitted to be used on the permanent right-of-way include items such as swing sets, sporting equipment, miniature swimming pools, doghouses, and gardens that are easily removed.

Rerouting the pipeline to less developed areas would shift impacts to other land uses, mainly forest/woodland, open land, and agricultural land. Impacts on forest/woodland would constitute the most pronounced effect (see section 4.9.1). Tree removal and ground disturbance would increase edge effects, and reduce the amount of available wildlife habitat. Trees would be cleared along the construction right-of-way and replaced by herbaceous plants, shrubs, saplings, and other successional species until trees can again flourish, which can take several decades or longer to occur. Forested areas within the permanent right-of-way would not be allowed to reestablish and would be permanently converted to open/edge habitat.

Impacts on open land would be less pronounced (see section 4.9.1). Open land would be affected during construction by removing vegetation and disturbing soils. Following construction, open land would be restored to pre-construction conditions. Since the permanent pipeline right-of-way would be maintained as open land, there would be no permanent change in land use. During operations, these areas would continue to function as open land.

Impacts on agricultural land also would be mostly minor and temporary to short-term (see section 4.9.1). Crops within the construction work areas would be taken out of production for one growing season while construction occurs and landowners would be compensated for the lost crops. If irrigation lines or drain tiles are damaged during construction, temporary repairs would be conducted immediately and permanent repairs would be completed following construction. Following construction, impacted agricultural land (except certain specialty crops, such as fruit and Christmas trees) would be restored to pre-construction conditions allowing continued use of farming activities.

One compressor station would need to be re-sited to accommodate the City of Green Route Alternative. According to NEXUS, the Wadsworth Compressor Station would need to be relocated to a site in the vicinity of Millbrook Road southwest of Wooster, Ohio. Initially, NEXUS indicated that the current land uses in this area include residential properties, mature forest, and agricultural lands. Our preliminary review of the area suggested there are a number of adequate sites in the general vicinity of Millbrook Road where impacts on

residential properties and mature forest could be minimized while meeting the engineering and hydraulic requirements of the system. Therefore, we requested that NEXUS identify a specific compressor station site on the City of Green Route alternative during the draft EIS comment period. We specified that NEXUS should attempt to avoid or minimize impacts on environmental resources while adequately meeting the engineering and hydraulic requirements of the proposed pipeline system. We also requested that NEXUS identify the range of flexibility it has in moving the compressor station on the route alternative. In response to our requests, NEXUS identified a preferred site for the compressor station in Salt Creek Township, Wayne County, Ohio (see figure 3.3.3-3 and table 3.3.3-2). NEXUS also indicated that it would have flexibility to place the compressor station on any adequate site between about MPs 49.2 and 53.2 on the City of Green Route Alternative.

Property and Resources Evaluated	Preferred Compressor Station Site on the City of Green Route Alternative	Proposed Wadsworth Compressor Station Site on the Proposed Route
Approximate Milepost	53.2	63.3
Property Size (acres)	130.1	63.8
Wetlands (acres)	0.1	0.0
Waterbodies (linear feet)	2,269	0.0
Agricultural Land (acres)	119.4	63.0
Forested Land (acres)	6.3	0.0
Open Land (acres)	2.4	0.3
Distance to Nearest NSA (feet)	55	1,800
NSAs within 0.5 mile (no.)	31	73
Potentially Available for Purchase	Unknown	Yes

NEXUS' preferred site for the compressor station on the City of Green Route Alternative is a 130.1-acre parcel at MP 53.2. The advantage of the site is that it has 42 fewer NSAs within 0.5 mile. The disadvantages are that it is closer to the nearest NSA, is a substantially larger site, and has wetlands, waterbodies, and forested land within the site boundaries. Although the site is larger, NEXUS stated that, due to its size, it would be able to design the compressor station to avoid or minimize impacts on wetlands, waterbodies, and forested land.

As mentioned above, one of the advantages of the route alternative is that it would cross 5 fewer county/metro parks than the proposed route. Parks avoided by the route alternative that are crossed by the proposed route are Ariss Park, Greensburg Park, Singer Lake Preserve, Chippewa Lake Nature Area, and Buckeye Woods Park.

- Ariss Park – The proposed route would cross about 1,375 feet of Ariss Park in an area that is presently cultivated agricultural land and woodland. The proposed route does not cross the park's maintained athletic fields, which are about 1,200 feet to the north and northwest.
- Greensburg Park – The proposed route would cross less than 50 feet of the southeastern corner of Greensburg Park in an area that is presently woodland. The nearest maintained athletic field is about 75 feet to the northwest.
- Singer Lake Preserve – The proposed route would cross about 1,140 feet Singer Lake Preserve. Land use at the crossing consists predominantly of agricultural land. The bog, for which the preserve was designated, is about 230 feet to the southwest and would not be crossed.

- Chippewa Lake Nature Areas & Buckeye Woods Park – The proposed route would cross both the Chippewa Lake Nature Areas and Buckeye Woods Park. In section 3.4.11, we are recommending that NEXUS incorporate a route variation into the NGT Project that would avoid both of these areas.

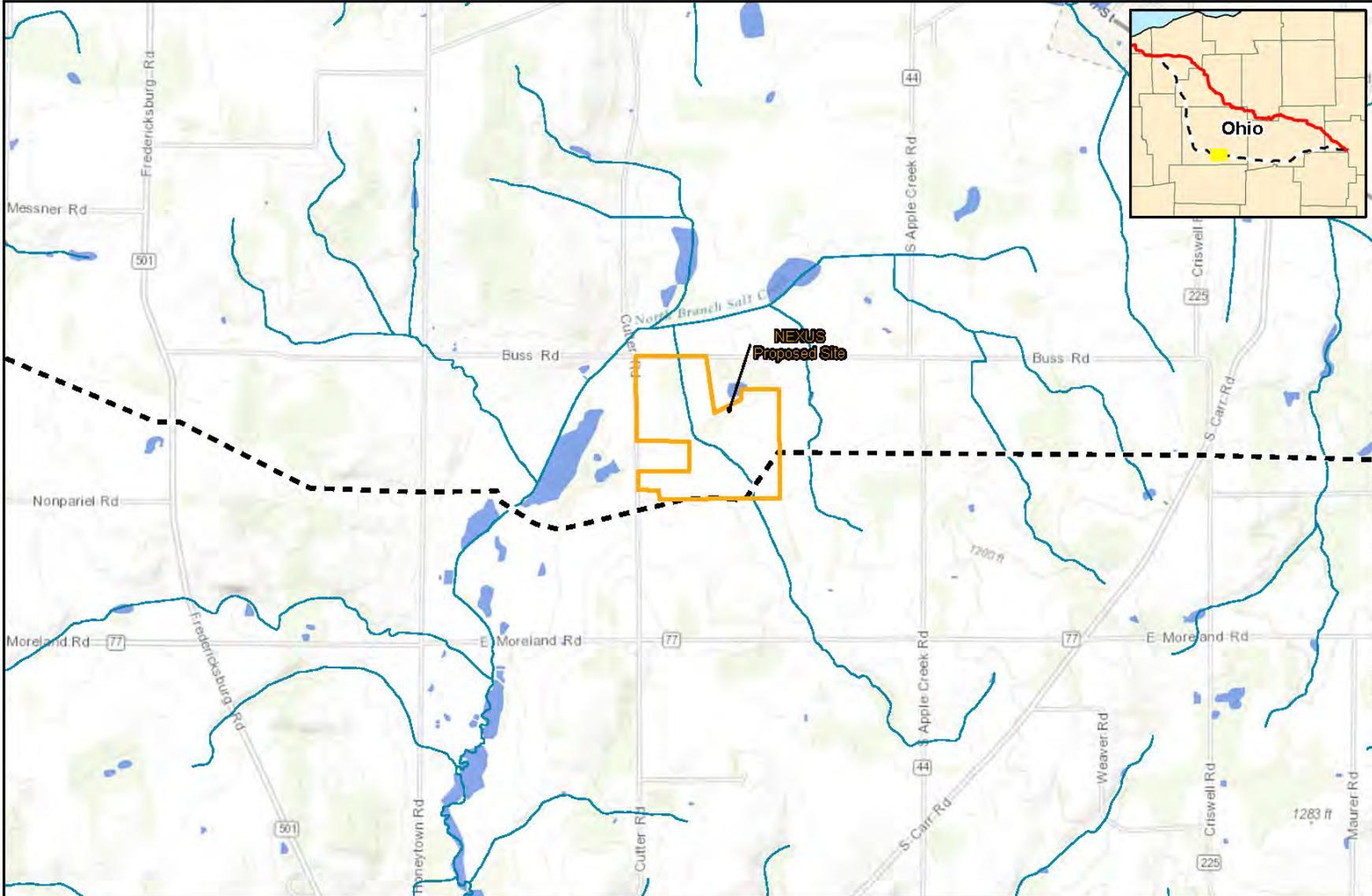
The City of Green commissioned an economic analysis of the impacts of the Projects and submitted it to FERC. On the whole, we found there to be methodological problems with the study. From a methodological standpoint, the authors of the study infer causation from unrelated, but correlated statistics. As an example, the authors mention population growth in Green and Ohio, followed by statistics about employment rates and median household incomes. This is problematic for two reasons. First, the statistics misrepresent within and between differences within geographic area. In other words, we don't know if Green's growth was about the same as other growing communities in Ohio, or if Green's growth is exceptional (the study implies it is exceptional, which may not be the case). Second, the statistics are presented in a manner that may lead the reader to assume that some causation exists between population growth and employment rates or median household income. This relationship may not exist.

Another methodological shortcoming is that the authors do not address possible issues of multicollinearity. As an example, the study refers to home sale prices in relation to high voltage overhead transmission lines. The study suggests that part of a "reduction in property value is likely view-related" because those closer to the powerlines have greater losses than those further away. Without knowledge about other factors in the areas from which these assumptions are drawn, we know nothing about the true impact of the location of the powerlines. Furthermore, suggesting that view-related impacts of aboveground powerlines is relatable to belowground pipelines is incongruous because the two types of facilities have very different types of visual impacts.

The report overall shows biases in the selection of, or disregard for, certain variables. This bias can be seen in the high voltage overhead transmission line example above. Another example is the "highly relevant studies" cited in the analysis. Most of the highly relevant studies used to estimate the economic effects of the Projects were based on property value changes after pipeline incidents had occurred (e.g., leaks and/or ruptures). Three of the five studies involved petroleum pipelines that resulted in surface or groundwater contamination and are not relevant to the type of incidents associated with natural gas pipelines. The fourth study involved a gasoline pipeline that ruptured into a stream and is not relevant to natural gas pipelines. The remaining study involved a natural gas pipeline and is the most relevant of all the studies. This study showed no price effect on property values before or after the accident, yet this study appears to have been otherwise discounted in the analysis. Although pipelines may have some inherent risks (see section 4.13), we do not find most of the studies used in the analysis relevant to assessing the effects of constructing and operating a new natural gas pipeline. Rather, most of the studies appear to be more relevant to estimating the economic effect of a liquids pipeline incident on property values.

The analysis also makes other flawed assumptions. For example, the analysis appears to assume that property or portions of property could not be developed after pipeline installation, insinuating that driveways or roads cannot be constructed over a pipeline and, therefore, certain portions of the property that otherwise would have been developed become "cut off" from development. This is not necessarily true because it is possible to install roads and driveways over pipelines. The pipeline easement generally restricts constructing permanent or immobile buildings or planting/growing trees within 25 feet of the pipeline, but otherwise does not completely restrict use of the property. Many of the commercial/industrial parcels evaluated in the economic analysis are large (multiple acres in size). In most instances, bisecting the property with a pipeline would not reduce the developable area by half, rather it would result in two smaller developable sides of the same parcel so long as access (such as a driveway over the pipeline) is provided to both sides. Further, the economic analysis is problematic because it appears to assume all developable property would be actualized to its maximum potential within 50 years, and that parts of the

City of Green development code would be amended in 10 years to allow an even greater density of development than is currently allowed. Such assumptions are speculative and biased. In making such assumptions, it is then difficult to understand why the analysis then fails to consider the additional energy or infrastructure that may be necessary to support this level of development. Considering that the study implies that economic activity (e.g., economic growth) is a proxy for economic health, it is too convenient that the study avoids elaborating on the potentially beneficial impact of infrastructure being developed.



- Proposed NEXUS Mainline
- - - City of Green Alternative
- NHD Waterbody
- NWI Wetland
- Proposed City of Green Compressor Station



Figure 3.3.3-3
NGT Project
Proposed City of Green Compressor Station

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Finally, the economic analysis seems to suggest that the proposed route would leave the City of Green to disproportionately suffer the effects of the Projects because the city is more affluent than other areas of the state. The report cites higher home values, higher employment rates, more buying power, and faster growth than other parts of the state. Conversely, relocating the route from more affluent areas to those that are less affluent presents an entirely different set of impacts, including the possibility of an unfair distribution of environmental burdens on less affluent communities (see section 4.10.10). On the whole, we did not find the economic analysis compelling.

In the draft EIS, we indicated that we received substantial input from landowners on the proposed route because they were on the Projects' mailing list early in the environmental review process. Landowners along the City of Green Route Alternative, however, were only recently added to the mailing list. In the draft EIS, we encouraged stakeholders to provide us additional comments on the proposed route and City of Green Route Alternative during the draft EIS comment period. Based on that request, we received a number of comments both in favor of and opposed to the City of Green Route Alternative.

Those in favor of the City of Green Route Alternative generally live on or near the proposed route and would like the route moved to another location because of their concerns with pipeline safety in the vicinity of homes, schools, and businesses; potential effects of the pipeline on property values and future development; and potential impacts on Ariss Park, Greenburg Park, Medina County Park District properties (i.e., Chippewa Rail Trail, Chippewa Lake Nature Area, Chippewa Inlet Trail, and Buckeye Woods Park/Schleman Nature Preserve), the Nimisila Reservoir, and Singer Lake Bog.

Those opposed to the City of Green Route Alternative generally live on or near the alternative route and prefer to keep the pipeline on the proposed route. The opponents share concerns regarding pipeline safety and the effects of the pipeline on property values and future development. Additionally, opponents raised general concerns with the effects of the pipeline on farmland, organic farms, drain tiles, agricultural easement agreements, fruit orchards, streams, wetlands, watersheds, aquifers, wildlife, cultural resources, and cumulative impacts. Site-specific concerns included:

- Mellinger Farm, a research farm managed by The Ohio State University's Ohio Agricultural Research and Development Center (crossed by the alternative route);
- Falcon Flats Nature Preserve (crossed by the alternative route);
- Rails-to-Trails paths (the Ohio-to-Erie Trail is crossed by the alternative route);
- a previously recorded Native American burial site (possibly crossed by the alternative route);
- Homerville KOA Campground (about 0.1 mile west of the alternative route);
- Killbuck Marsh State Wildlife Area (about 0.2 mile south of the alternative route);
- Fredericksburg Farm of The Ohio State University's Beef and Sheep Research Unit (about 0.4 mile northeast of the alternative route);
- previously recorded Native American burial mounds (about 0.5 mile north of the alternative route);
- previously recorded Native American pre-historic village site (about 0.5 mile south of the alternative route);

- Starks Nature Preserve (about 0.6 mile south of the alternative route);
- Wooster aquifer and water potable well field (about 1.0 mile north of the alternative route);
- Wooster Memorial Park/Spangler Park (about 1.4 miles east of the alternative route);
- Izaak Walton Memorial Forest conservation easements (about 1.6 mile east of the alternative route);
- The Wilderness Center (about 1.7 miles south of the alternative route);
- Pee Wee Hollow Boy Scout Camp and conservation easements (about 2.5 miles east of the alternative route); and
- Shreve Swamp conservation easements (about 4.5 miles south of the alternative route).

With regard to recent concerns about pipeline safety, we reiterate that DOT safety standards are intended to ensure adequate protection of the public regardless of where the pipeline is routed, therefore, there is no basis on which to recommend one route over another as it pertains to pipeline safety. As for comments on property values and future development, we refer the reader to section 4.10.8 of this EIS where we find no conclusive evidence indicating that natural gas pipeline easements would have a negative impact on property values. We also note that other economic impacts described in section 4.10 would be similar in nature for both the proposed route and City of Green Route Alternative, including impacts on employment, housing, public services, tourism, transportation, and tax revenues.

With regard to concerns about the proposed route's potential impacts on Ariss Park, Greenburg Park, Medina County Park District properties (i.e., Chippewa Rail Trail, Chippewa Lake Nature Area, Chippewa Inlet Trail, and Buckeye Woods Park/Schleman Nature Preserve), the Nimisila Reservoir, and Singer Lake Bog, potential impacts on each of these of resources are evaluated in section 4.3.2 or 4.9.7 of the EIS. The evaluation includes a discussion of the measures NEXUS would implement to minimize impacts on the resources (e.g., boring, HDD). The cumulative length of the route across these sites is about a mile. We do not find any of the impacts on any of these resources to be significant.

With regard to concerns about the City of Green Route Alternative impacts on farmland, organic farms, drain tiles, agricultural easement agreements, fruit orchards, streams, wetlands, watersheds, aquifers, wildlife, cultural resources, and cumulative impacts, each of these concerns also has been raised on the proposed route and has been evaluated in section 4.0 of the EIS. The types of impacts on the City of Green Route Alternative would be the same or similar to the impacts disclosed in section 4.0 for the proposed route, although the magnitude would vary for many resources as shown in table 3.3.3-1. Where farmland, drain tiles, organic farms, and agricultural easement agreements are crossed, crops within the construction work areas would be taken out of production for one growing season while construction occurs and impacted agricultural land (except certain specialty crops, such as fruit and Christmas trees) would be restored to pre-construction conditions allowing for continued use of farming activities after construction. NEXUS would implement the same mitigation plans in agricultural areas and on organic farms as on the proposed route and significant impacts would not be expected. Three tree farms or orchards would be crossed on the alternative route based on a review of aerial photography. Each of these tree farms or orchards could be avoided by making minor route adjustments. NEXUS would implement special construction measures to minimize impacts on streams, wetlands, watersheds, aquifers, and wildlife as described in sections 2.0 and 4.0 of this EIS. Cultural resources would be subject to the same preservation requirements as the proposed route. If NRHP-eligible resources are identified that cannot be avoided, the

applicants would prepare treatment plans. Implementation of a treatment plan would only occur after certification of the Projects and after FERC provides written notification to proceed.

With regard to site-specific resources of concern on the City of Green Route Alternative, most of the resources would not actually be crossed by the alternative route. However, Mellinger Farm, Falcon Flats Nature Preserve, and the Ohio-to-Erie Trail would be crossed, and, based on historic records, a Native American burial site may be crossed. Mellinger Farm was gifted to Ohio State University in 2002 for development of a long-term research, education, and demonstration program for integrated systems of forestry, crops, and livestock. According to farm operators, constructing across the farm would jeopardize existing and future research projects. Mellinger Farm could be avoided by making minor route adjustments. Falcon Flats Nature Preserve is owned and managed by The Wilderness Center, Inc. for the protection of the physical, biological, and chemical integrity of Sugar Creek. The preserve could be avoided by making a minor route adjustment. The location of the Native American burial site would need to be verified, and also likely could be avoided by making minor route adjustments if necessary. The Ohio-to-Erie Trail could not be avoided without a substantial reroute. However, the Ohio-to-Erie Trail is also crossed by the proposed route and NEXUS is planning to avoid direct impacts on the trail and the adjacent Tuscarawas River using the HDD method, which also could be used on the alternative route.

Finally, we received comments during the draft EIS comment period suggesting that the City of Green Route Alternative could impact the Amish population in the area. The Amish are a Christian religious group who settled in America in the 1700s and continue to live in a traditional way on farms (M-W, 2016). Most Amish are farmers, and the Amish economy is centered on an agricultural way of life (Countries and Their Cultures, 2016). The Amish are known for simple living, plain dress, and a resistance to modern technology. The Amish still use horse-drawn agricultural equipment for farming and horse and buggy for transportation. Tractors, cars, electricity, phones, radios, televisions, and computers are not used.

Ohio has a large Amish population with the second largest settlement of Amish in the United States residing in and around Holmes County, which is within about 2 miles of City of Green Route Alternative. This area is known to be home to more than 34,000 Amish (Elizabethtown College, 2016). The Amish adhere to a doctrine of non-resistance, which means they do not resist authority and generally do not participate in military service, politics, or legal actions (Amish America, 2016b). The Amish also adhere to doctrines of *Gelassenheit* (calmness), *Demut* (humility), and rejection of *Hochmut* (arrogance) (Amish America, 2016b; Wikipedia, 2016). These doctrines advocate a reluctance to be assertive or self-serving. For these reasons, the Amish are not likely to engage in environmental review processes, such as this EIS process.

The environmental impacts of the City of Green Route Alternative on Amish residents would be nearly identical to the impacts experienced by other farmers (see section 4.9). The main exception would be public safety in areas where Amish horse-and-buggy traffic would use the same roads as heavy construction equipment. These roads may be rural and narrow, and present additional risks to road users. Normal speeds for horse-drawn buggies are between 5 and 8 miles per hour, and horse-drawn vehicles may be even slower when pulling large farm equipment or when crossing intersections (ODOT, 2016). Conflicts with faster moving construction-related traffic could occur.

Of all the factors evaluated in the City of Green Alternative, perhaps the most compelling factors of the alternative route are that 35 fewer homes would be within 150 feet of the proposed pipeline and 11.8 miles fewer wetlands would be crossed by the pipeline. Conversely, the most compelling aspects of the proposed route are it has 16.2 miles fewer greenfield construction areas and crosses 52.7 acres fewer forested land. We also note that, based on our review, although the alternative route has fewer homes within 150 feet of the centerline, the proposed route actually has fewer homes within a closer proximity that would experience greater construction impacts; both the proposed and alternative routes have 12 homes within

100 feet, but the proposed route has only one home within 50 feet, whereas the alternative route has four. As described earlier in section 3.0, the alternative appears to shift impacts from one area, group of landowners, and set of resources to another area, group of landowners, and set of resources.

We received comments during the draft EIS comment period suggesting that a wider corridor (e.g., a 1,500-foot centerline buffer) should be used to compare number of residences affected by the Projects. The comments point to safety concerns and social impacts as rationale for using a wider corridor. With regard to safety, we reiterate that DOT safety standards are intended to ensure adequate protection of the public regardless of where the pipeline is routed, therefore, there is no basis to adjust the corridor for safety reasons. With regard to social impacts, our experience indicates that the greatest impacts occur on landowners that are crossed by or abut the construction work area. As such, using a 150-foot centerline buffer best identifies those landowners that would experience the greatest impacts. While other nearby residences may experience limited impacts from construction noise and traffic, those impacts would be temporary and limited to the duration of construction in the area as discussed in sections 4.12.2 and 4.10.7.

In the draft EIS, we recognized the need for a more detailed routing analysis of the City of Green route to avoid forested areas and other impacts. We requested that NEXUS make route adjustments and realignments to the City of Green Route Alternative in order to minimize impacts on residences, forests, and other environmental resources. During the draft EIS comment period, NEXUS filed a “Revised” City of Green Route Alternative incorporating 37 changes to the original route alternative.

The Revised City of Green Route Alternative diverges from the proposed NGT mainline at MP 1.8 in Columbiana County. The alternative heads in a westerly direction for approximately 64 miles, turns north for approximately 41.8 miles, and rejoins the proposed NGT mainline at MP 99.0 in Lorain County (see figure 3.3.3-2 and table 3.3.3-3 for a comparison of the alternative and proposed route). About 21.9 miles of the Revised City of Green Route Alternative would follow the proposed Rover pipeline route.

Factor	Revised City of Green Route Alternative	Proposed Route
Length (miles)	105.8	97.5
Greenfield Construction (miles) ^a	82.8	62.7
Wetland Affected (acres) ^b	14.7	21.8
Perennial Waterbody Crossings (no.)	55	49
WHPA (no.)	6	7
Agricultural Land (acres) ^c	1,138.6	1,031.9
Forested Land (acres) ^b	201.3	182.0
State Parks and Forest (no./mile)	0/0.0	1/0.3 ^d
County/Metro Parks (no./mile)	1/0.2 ^e	6/0.6 ^f
Steep Slopes (miles) ^g	7.8	1.7
Sidehill Construction (miles) ^h	5.6	1.1
Dwellings within 50 feet of the Pipe Centerline (no.)	1	1
Dwellings within 100 feet of the Pipe Centerline (no.)	8	12
Dwellings within 150 feet of the Pipe Centerline (no.)	22	66
Other Residential-type Structures within 150 feet (no.) ⁱ	42	91
^a	Based on the absence of adjacent or parallel rights-of-way within 300 feet of the pipe centerline. Greenfield construction on the alternative route would be reduced by about 19.1 miles if the Rover Pipeline Project is constructed prior to the Projects.	
^b	Based on a 75-foot-wide construction right-of-way in wetlands and forested land. Forest clearing on the alternative route would be reduced by an estimated 8.4 acres if the Rover Pipeline Project is constructed prior to the Projects.	

TABLE 3.3.3-3 (cont'd)

Analysis of the Revised City of Green Route Alternative

	Factor	Revised City of Green Route Alternative	Proposed Route
c	Based on a 125-foot-wide construction right-of-way in agricultural land.		
d	Portage Lakes State Park.		
e	Canal Corridor/Ohio-to-Erie Trail.		
f	Ariss Park; Greensburg Park; Singer Lake Preserve; Chippewa Lake Nature Area; Buckeye Woods Park; Ohio-to-Erie Trail.		
g	Calculated by identifying slopes greater than 20 percent.		
h	Calculated by identifying slopes greater than 20 percent, and determining if the pipeline direction differed from the direction of the ground aspect.		
i	Includes detached dwellings, garages, sheds, and other buildings often associated with a residence.		

The Revised City of Green Route Alternative is 105.8 miles in length, which is 8.3 miles longer than the corresponding segment of the proposed route. The primary advantages of the revised route alternative, as compared to the proposed route, are that it would cross 7.1 acres fewer wetlands, 1 fewer WHPA, no state parks/forest lands, 5 fewer county/metro parks, and 44 fewer homes within 150 feet. Conversely, the main disadvantages of the revised alternative are that it would have 20.1 miles more greenfield construction, 19.3 acres more forested land, 6.1 more miles of steep slopes, and 4.5 more miles of sidehill construction. As compared to the original route alternative, the Revised of City Green Route Alternative would reduce impacts on some resource, but increase impacts on other resources.

In addition to NEXUS’ efforts in refining the City of Green Route Alternative, City of Green officials also presented a series of route adjustments and realignments to the City of Green Route Alternative in order to minimize impacts on residences, forests, and other environmental resources. During the draft EIS comment period, City of Green officials filed 72 possible route realignment options to the City of Green Route Alternative, many of which overlapped one another. City officials did not identify a preference for any of the realignment options, but rather presented them all as potential alternatives. There are many ways to incorporate one or more of the realignments into the City of Green Route Alternative.² Thus, to effectively evaluate the myriad options, we compared each possible route realignment to the corresponding segment of the original alternative as well as any other overlapping realignments. We then selected what we determined to be the most environmentally advantageous alignment for that segment of the route. We compiled each of these environmentally advantageous segments into a single route alternative referred to as “Optimized” City of Green Route Alternative. Appendix F-1 includes figures depicting each of the 72 possible route realignments and appendix F-2 includes a matrix identifying the reason for selecting each segment for incorporation into the Optimized City of Green Route Alternative.

The Optimized City of Green Route Alternative diverges from the proposed NGT mainline at MP 1.8 in Columbiana County. The alternative heads in a westerly direction for approximately 63.4 miles, turns north for approximately 41.9 miles, and rejoins the proposed NGT mainline at MP 98.9 in Lorain County (see figure 3.3.3-2 and table 3.3.3-4 for a comparison of the alternative and proposed route). About 22.2 miles of the Optimized City of Green Route Alternative would follow the proposed Rover pipeline route.

² There are more than 879 trillion ways in which one or more of the 72 realignments could be incorporated into the City of Green Route Alternative.

TABLE 3.3.3-4

Analysis of the Optimized City of Green Route Alternative

Factor	Optimized City of Green Route Alternative	Proposed Route
Length (miles)	105.3	97.5
Greenfield Construction (miles) ^a	78.7	62.7
Wetland Affected (acres) ^b	10.9	21.8
Perennial Waterbody Crossings (no.)	55	49
WHPA (no.)	5	7
Agricultural Land (acres) ^c	1,149.9	1,032.0
Forested Land (acres) ^b	192.1	182.0
State Parks and Forest (no./mile)	0/0.0	1/0.3 ^d
County/Metro Parks (no./mile)	1/0.2 ^e	6/0.6 ^f
Steep Slopes (miles) ^g	6.5	1.7
Sidehill Construction (miles) ^h	4.7	1.1
Dwellings within 50 feet of the Pipe Centerline (no.)	0	1
Dwellings within 100 feet of the Pipe Centerline (no.)	5	12
Dwellings within 150 feet of the Pipe Centerline (no.)	17	66
Other Residential-type Structures within 150 feet (no.) ⁱ	43	91
a	Based on the absence of adjacent or parallel rights-of-way within 300 feet of the pipe centerline. Greenfield construction on the alternative route would be reduced by about 19.6 miles if the Rover Pipeline Project is constructed prior to the Projects.	
b	Based on a 75-foot-wide construction right-of-way in wetlands and forested land. Forest clearing on the alternative route would be reduced by an estimated 7.1 acres if the Rover Pipeline Project is constructed prior to the Projects.	
c	Based on a 125-foot-wide construction right-of-way in agricultural land.	
d	Portage Lakes State Park.	
e	Canal Corridor/Ohio-to-Erie Trail.	
f	Ariss Park; Greensburg Park; Singer Lake Preserve; Chippewa Lake Nature Area; Buckeye Woods Park; Ohio-to-Erie Trail.	
g	Calculated by identifying slopes greater than 20 percent.	
h	Calculated by identifying slopes greater than 20 percent, and determining if the pipeline direction differed from the direction of the ground aspect.	
i	Includes detached dwellings, garages, sheds, and other buildings often associated with a residence.	

The Optimized City of Green Route Alternative is 105.3 miles in length, which is 7.8 miles longer than the corresponding segment of the proposed route. The primary advantages of the optimized route alternative, as compared to the proposed route, are that it would cross 10.9 acres fewer wetlands, 2 fewer WHPAs, no state parks/forest lands, 5 fewer county/metro parks, and 49 fewer homes within 150 feet. Conversely, the main disadvantages of the optimized alternative are that it would have 16.0 miles more greenfield construction, 10.3 acres more forested land, 4.8 more miles of steep slopes, and 3.6 more miles of sidehill construction. As compared to the original route alternative, the Optimized City Green Route Alternative reduces impacts on several resources, but only modestly, and it does not reduce impacts to a point where any of the disadvantages are eliminated.

Notably, the Optimized City of Green Route Alternative affects the fewest dwellings of all the options. The Optimized City of Green Route Alternative has 17 dwellings within 150 feet of the pipe centerline, whereas the proposed route has 66 dwellings, a reduction of 49 dwellings. This difference appears substantial based on magnitude alone; however, intensity must also be considered. One way to measure intensity is to determine if the impact is concentrated in a small area, or if it is diluted over a large expanse. In this case, the 49 additional dwellings are dispersed over a 97.5 mile span, which equates to an average of about 1 additional dwelling every 2 miles. While 49 additional dwellings over a 1 or 2 mile span may be intense, 1 additional dwelling over a 2 mile span is not intense. Thus, we find that affecting 49 additional dwellings over 97.5 miles is not significant. It is worth noting that the dwellings are not spread evenly over the 97.5 mile span; however, neither are they clustered in just one or two areas. Based

on the actual distribution of dwellings, applying the average distribution across the range as a statistical measure of intensity is a reasonable and useful tool.

3.3.3.1 Conclusion

A comparison of each of the three different versions of the City of Green Route Alternative to the proposed route draws attention to the advantages and disadvantages of each route. Table 3.3.3-5 identifies, by resource, which of the four options has the least environmental impact.

Property and Resources Evaluated	Original City of Green Route Alternative	Revised City of Green Route Alternative	Optimized City of Green Route Alternative	Proposed Route
Length				✓
Greenfield Construction	✓ ^a			✓ ^a
Wetland Affected	✓			
Perennial Waterbody Crossings				✓
WHPA			✓	
Agricultural Land				✓
Forested Land				✓
State Parks and Forest	✓ ^b	✓ ^b	✓ ^b	
County/Metro Parks	✓ ^b	✓ ^b	✓ ^b	
Steep Slopes				✓
Sidehill Construction				✓
Dwellings within 50 feet of the Pipe Centerline			✓	
Dwellings within 100 feet of the Pipe Centerline			✓	
Dwellings within 150 feet of the Pipe Centerline			✓	
Other Residential-type Structures within 150 feet		✓		
a	The proposed route would have the least greenfield construction based on existing environmental conditions. The City of Green Route Alternative would have the least greenfield construction if the Rover Pipeline Project is constructed.			
b	Identifies a tie among route alternatives.			

The City of Green Route Alternative has generated more stakeholder attention and public comment than perhaps any other single issue relating to the NGT Project. This EIS, however, is not intended to evaluate which route is most popular among stakeholders. Rather, the purpose of this EIS is to identify and assess potential environmental impacts of the proposed Projects and reasonable alternatives. Toward that end, we find the proposed route and all three variations of the City of Green Route Alternative to be environmentally acceptable. Each has its advantages and each has its disadvantages. Although they are environmentally acceptable, we do not find that any of the three variations of the City of Green Route Alternative provide a significant environmental advantage when compared to the corresponding segment of the proposed route and do not recommend that any of the three alternatives be incorporated as part of the Projects.

As stated in section 1.1.1 of this EIS, we received comments from NEXUS disagreeing with our position that the additional 13 tee-tap sites are not essential to the project objective. NEXUS asserts that at least four laterals would be required on the City of Green Route Alternative to deliver natural gas to market area connections located along the proposed route. NEXUS states that the proposed route would ensure that northern Ohio markets would be served more economically and without the environmental impacts associated with lateral pipelines that would be necessary if the Projects were authorized along a route further to the south. Ultimately, the Commission will decide if the tee-taps are essential to the Projects' objectives

and whether alternatives that do not serve the tee-tap locations would not be viable without modification. Accordingly, this EIS evaluates alternatives that would not necessarily serve any or some the 13 tee-tap sites identified by NEXUS.

As an element of its review, the USACE must consider whether the proposed Projects represent the least environmentally damaging practicable alternative pursuant to the CWA Section 404(b)(1) guidelines. The term “practicable” means available and capable of being done after taking into consideration cost, existing technology, and logistics in light of the overall purposes of the Projects. With these factors in mind, we reiterate that the purpose of the NGT Project design is based on the contractual commitments for NEXUS to construct facilities to provide 1.5 million Dth/d of capacity to markets by November 1, 2017 to meet the firm transportation service requirements of the NGT Project shippers. Approximately 885,000 Dth/d of this capacity (59 percent) has been signed in precedent agreements³ by NEXUS, as summarized in table 1.1.1-1 of this EIS. NEXUS also states that, in addition to serving customers at six receipt and delivery points, it has designed its NGT Project to serve future demand in the vicinity of additional tee-taps. The alternatives may not be economically or logistically practicable if the laterals are factored into the Projects design.

Economically practical alternatives would result in an action that generally maintains the price competitive nature of the proposed action. Generally, we do not consider the cost of an alternative as a critical factor unless the sum total cost to construct and operate the alternative would render the project economically impractical. We do, however, acknowledge that general pipeline construction (not including HDD or other special construction methods) can be cost prohibitive. Therefore, an additional 8 miles of pipeline could be economically impractical. If consideration is given to the potential delay in construction timing, effects on contracts, or costs of additional surveys and easements along an alternative route, applicants may determine that an alternative renders the project no longer competitive, and therefore no longer economically viable.

3.3.4 Electric Transmission Line Route Alternative

The Electric Transmission Line Route Alternative was evaluated to address stakeholders’ comments requesting the NGT Project follow an existing electric transmission line right-of-way in Columbiana and Stark Counties, Ohio. Many stakeholders suggested that co-locating with the existing power line would be preferable to the proposed route. The Electric Transmission Line Alternative diverges from the proposed NGT mainline at MP 1.8 in Columbiana County. It heads west/southwest to an existing powerline right-of-way and follows the powerline right-of-way for approximately 22.0 miles where rejoins the proposed NGT mainline at MP 29.7 in Stark County (see figure 3.3.4-1 and table 3.3.4-1).

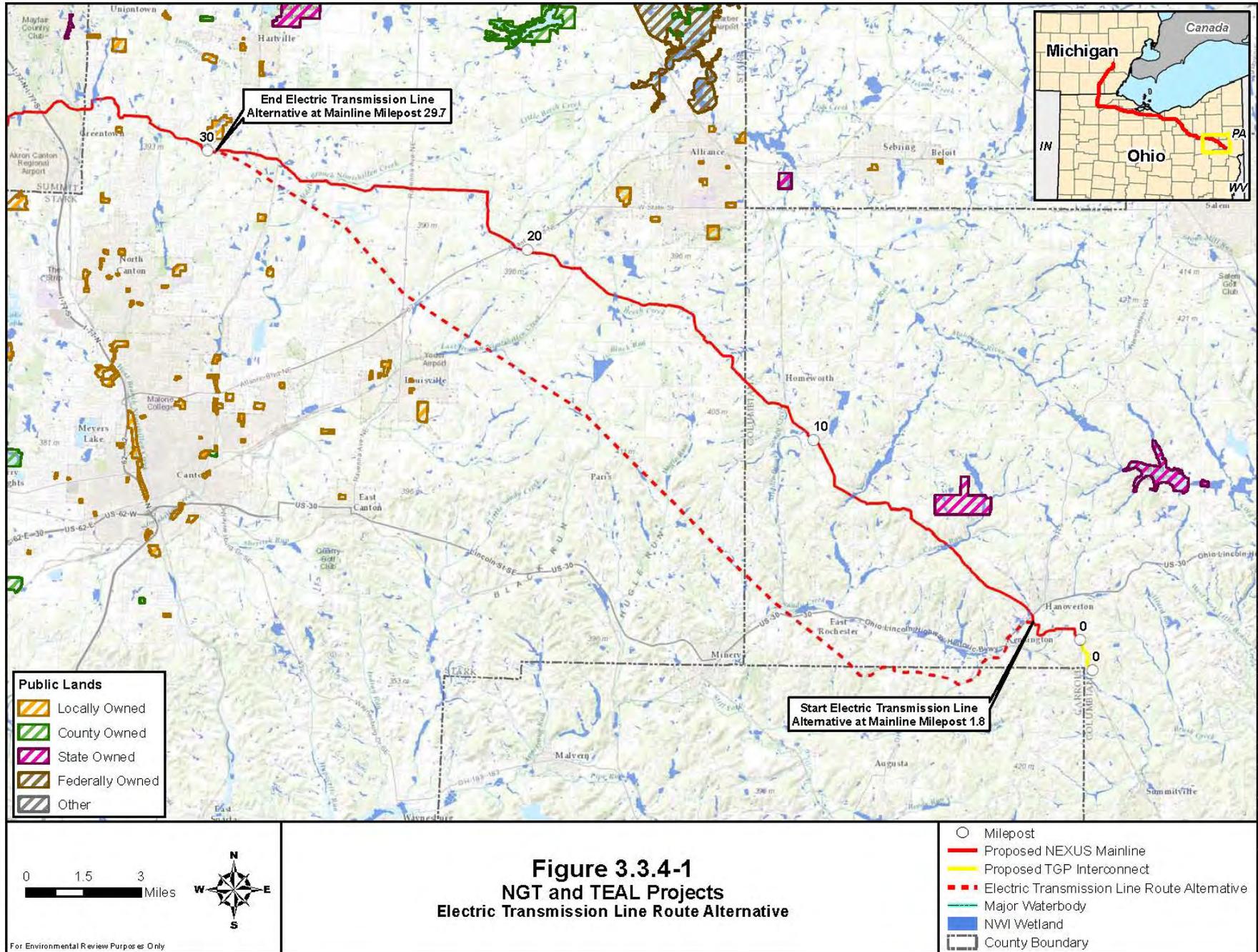
Factor	Alternative	Proposed Route
Length (miles)	27.6	27.9
Greenfield Construction (miles) ^a	0.2	18.8
Wetland Affected (acres) ^b	6.4	6.4
Perennial Waterbody Crossings (no.)	19	24
WHPA (no.)	3	0
Agricultural Land (acres) ^c	27.3	25.8
Forested Land (acres) ^b	42.7	38.2

³ A precedent agreement is a binding contract under which one or both parties has the ability to terminate the agreement if certain conditions, such as receipt of regulatory approvals, are not met.

TABLE 3.3.4-1 (cont'd)

Analysis of the Electric Transmission Line Route Alternative		
Factor	Alternative	Proposed Route
Steep Slopes (miles) ^e	0.9	0.3
Sidehill Construction (miles) ^e	1.2	0.7
Residential-type Structures within 150 feet Pipe Centerline (no.) ^f	115	23
a	Based on the absence of adjacent or parallel rights-of-way within 300 feet of the pipe centerline.	
b	Based on a 75-foot-wide construction right-of-way in wetlands and forested land.	
c	Based on a 125-foot-wide construction right-of-way in agricultural land.	
d	Calculated by identifying slopes greater than 20 percent.	
e	Calculated by identifying slopes greater than 20 percent, and determining if the pipeline direction differed from the direction of the ground aspect.	
f	Includes dwellings, detached dwellings, garages, sheds, and other buildings often associated with a residence.	

The Electric Transmission Line Route Alternative is 27.6 miles in length. The route alternative and proposed route are similar in length and amount of wetlands, agricultural land, and steep slopes affected. The main advantages of the route alternative are that it would have 18.6 miles less greenfield construction and crosses 5 fewer perennial waterbodies. Conversely, the disadvantages of the alternative are that it would cross 3 more WHPAs, 4.5 acres more forested land, and is near 92 more residential-type structures. As previously mentioned, many stakeholders suggested that co-locating with the existing power line would be preferable to proposed route. Although co-locating with an existing utility often can be a means of limiting impacts on sensitive resources, it does not appear to provide an environmental advantage in this case. Rather, it is merely shifting impacts from one area, group of landowners, and set of resources to another area, group of landowners, and set of resources. While limiting greenfield construction, this alternative also would greatly increase construction impacts on residential land. Based on our review, we find that the Electric Transmission Route Alternative would not provide a significant environmental advantage when compared to the corresponding segment of the proposed route and do not recommend that this alternative be incorporated as part of the Project.



3.3.5 Canton A Route Alternative

The Canton A Route Alternative was proposed by a stakeholder to minimize the impacts on the City of Green, Canton, and other populated areas. The stakeholder submitted a high-level overview map of the alternative. The Canton A Route Alternative diverges from the proposed NGT mainline at MP 2.2 in Columbiana County, runs south of the City of Canton, and rejoins the proposed NGT mainline at MP 51.3 in Wayne County (see figure 3.3.5-1 and table 3.3.5-1).

Factor	Alternative	Proposed Route
Length (miles)	57.5	49.2
Greenfield Construction (miles) ^a	33.3	29.9
Wetland Affected (acres) ^b	17.3	12.7
Perennial Waterbody Crossings (no.)	40	31
WHPA (no.)	3	3
Agricultural Land (acres) ^c	493.9	474.2
Forested Land (acres) ^b	150.9	109.1
State Parks and Forest (no./mile)	0/0.0	1/0.3 ^e
County/Metro Parks (no./mile)	2/0.3 ^e	3/0.5 ^f
Steep Slopes (miles) ^g	16.6	6.7
Sidehill Construction (miles) ^h	5.2	1.2
Residential-type Structures within 150 feet Pipe Centerline (no.) ⁱ	191	116

a Based on the absence of adjacent or parallel rights-of-way within 300 feet of the pipe centerline.
b Based on a 75-foot-wide construction right-of-way in wetlands and forested land.
c Based on a 125-foot-wide construction right-of-way in agricultural land.
d Portage Lakes State Park.
e Canal Corridor, Warwick Park.
f Ariss Park, Singer Lake Preserve, Greensburg Park.
g Calculated by identifying slopes greater than 20 percent.
h Calculated by identifying slopes greater than 20 percent, and determining if the pipeline direction differed from the direction of the ground aspect.
i Includes dwellings, detached dwellings, garages, sheds, and other buildings often associated with a residence.

The Canton A Route Alternative is 57.5 miles in length. The route alternative and proposed route would both cross the same number of WHPAs. The primary advantages of the route alternative are that would cross no state parks/forests and 1 fewer county/metro park than the proposed route. Conversely, the main disadvantages of the alternative are that it is 8.3 miles longer, has 3.4 miles more greenfield construction, crosses 4.5 acres more wetlands, crosses 9 more perennial waterbodies, 19.7 acres more agricultural land, 41.8 acres more forested land, 9.9 miles more steep slope, 4.0 miles more sidehill construction, and is near 75 more residential-type structures. Although the route avoids the City of Green and Canton, it increases impacts on residential land and would affect more environmental resources overall than the proposed route. Based on our review, the Canton A Route Alternative would not provide a significant environmental advantage when compared to the corresponding segment of the proposed route and do not recommend that this alternative be incorporated as part of the Project.

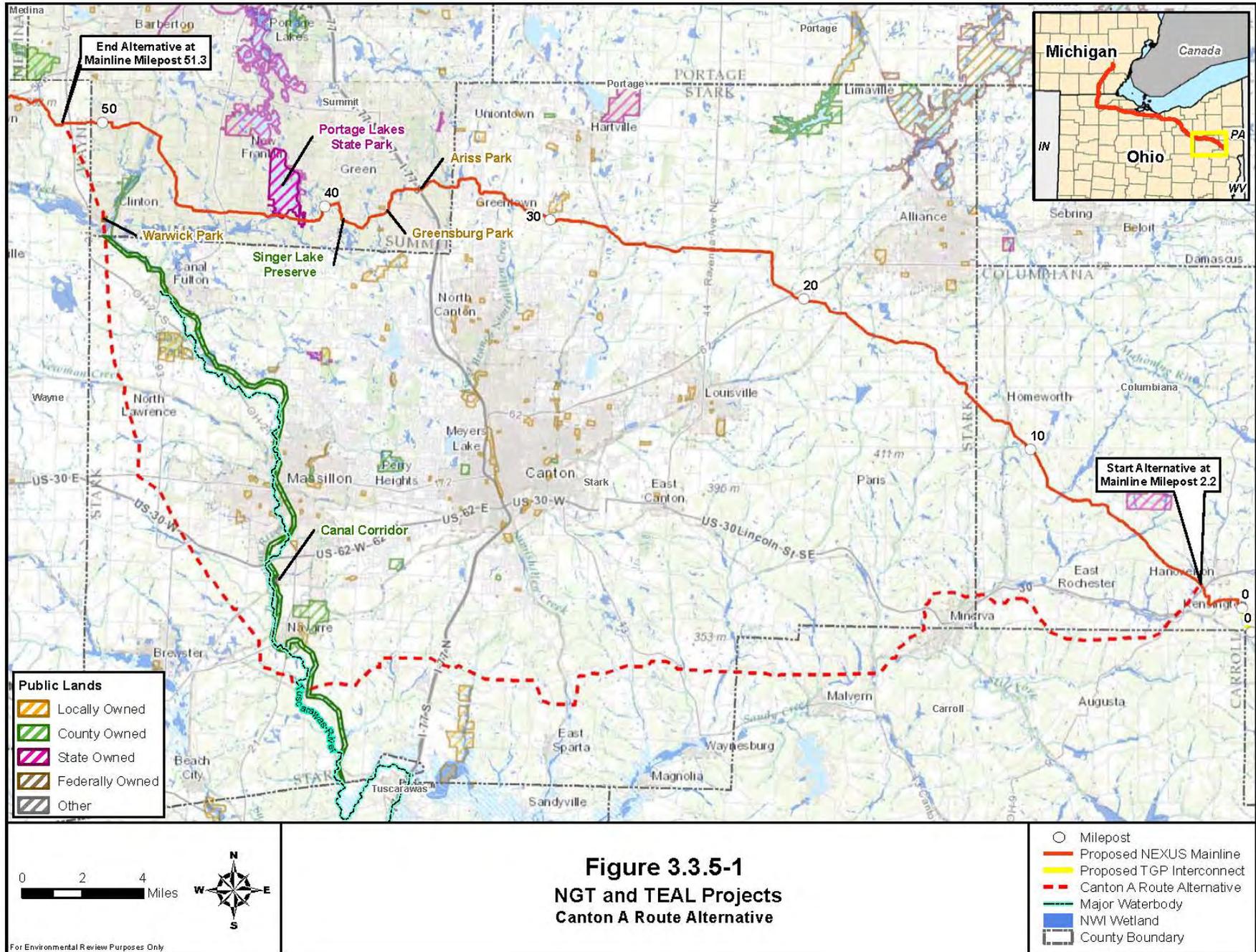


Figure 3.3.5-1
NGT and TEAL Projects
Canton A Route Alternative

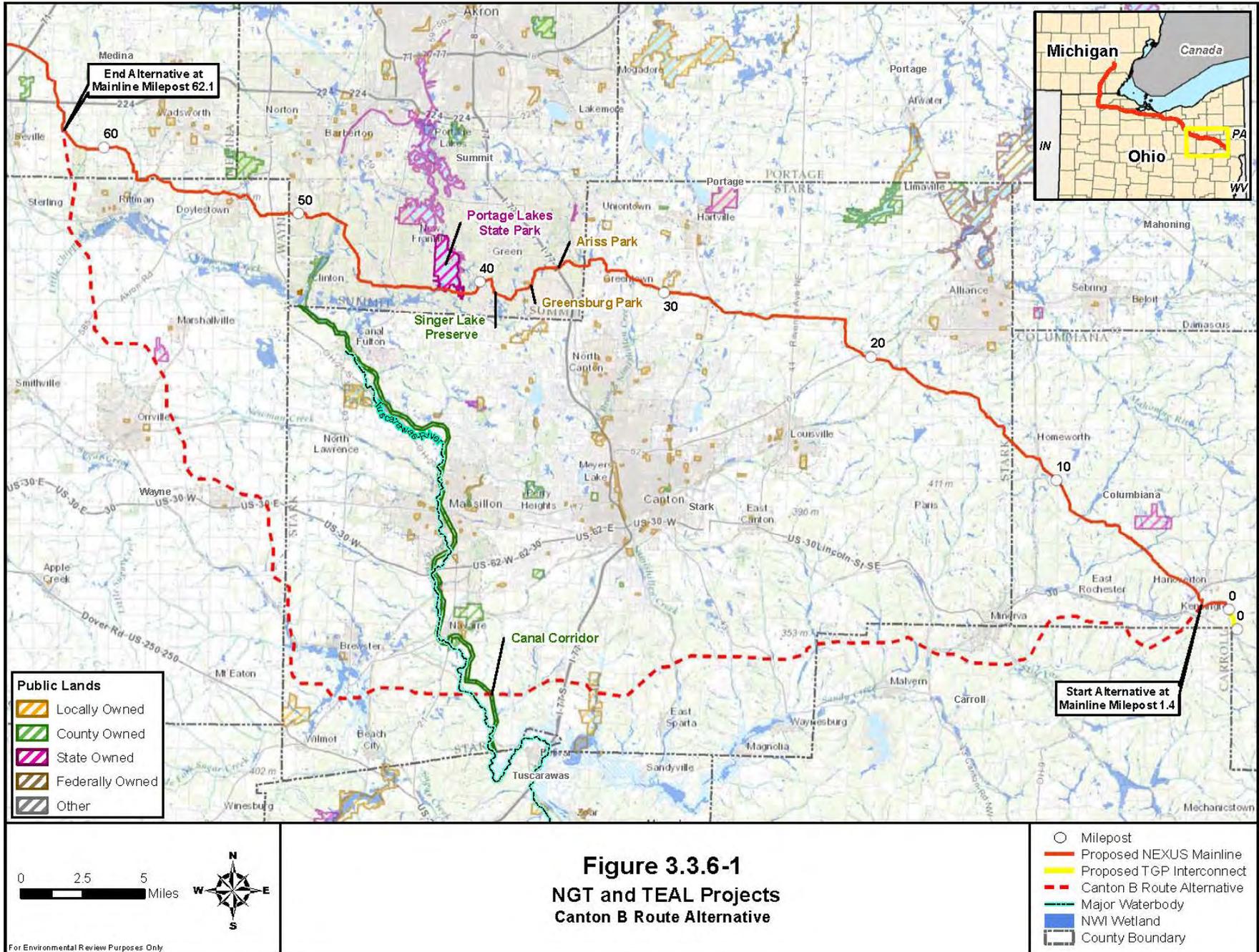
3.3.6 Canton B Route Alternative

The Canton B Route Alternative was developed by FERC staff to address the concerns of stakeholders over impacts on the City of Green, Canton, and other populated areas. The goal of the alternative was to identify a route that avoided populated areas, while minimizing other environmental impacts. The Canton B Route Alternative diverges from the proposed NGT mainline at MP 1.4 in Columbiana County and runs south and west of Canton and rejoins the proposed NGT mainline at MP 62.1 in Medina County (see figure 3.3.6-1 and table 3.3.6-1).

Factor	Alternative	Proposed Route
Length (miles)	68.4	60.8
Greenfield Construction (miles) ^a	47.1	37.7
Wetland Affected (acres) ^b	11.8	14.5
Perennial Waterbody Crossings (no.)	37	35
WHPA (no.)	0	5
Agricultural Land (acres) ^c	734.8	590.9
Forested Land (acres) ^b	135.5	130.9
State Parks and Forest (no./mile)	0/0.0	1/0.3 ^d
County/Metro Parks (no./mile)	1/0.1 ^e	3/0.5 ^f
Steep Slopes (miles) ^g	5.5	1.3
Sidehill Construction (miles) ^h	4.2	0.7
Residential-type Structures within 150 feet Pipe Centerline (no.) ⁱ	72	154

a Based on the absence of adjacent or parallel rights-of-way within 300 feet of the pipe centerline.
b Based on a 75-foot-wide construction right-of-way in wetlands and forested land.
c Based on a 125-foot-wide construction right-of-way in agricultural land.
d Portage Lakes State Park.
e Canal Corridor.
f Ariss Park; Greensburg Park; Singer Lake Preserve.
g Calculated by identifying slopes greater than 20 percent.
h Calculated by identifying slopes greater than 20 percent, and determining if the pipeline direction differed from the direction of the ground aspect.
i Includes dwellings, detached dwellings, garages, sheds, and other buildings often associated with a residence.

The Canton B Route Alternative is 68.4 miles in length. The primary advantages of the route alternative are that it would cross 5 fewer WHPAs, cross 2.7 acres less wetlands, no state parks/forests, 2 fewer county/metro parks, and would be near 82 fewer residential-type structures. Conversely, the main disadvantages of the alternative are that it would be 7.6 miles longer, cross 143.9 acres more agricultural land, 4.5 acres more forested land, 4.2 miles more steep slope, 3.5 miles more sidehill construction, and would have 9.4 more miles of greenfield construction. Our goal was to identify an alternative route that avoided resources associated with populated areas, while minimizing environmental impacts on other areas. In this case, temporary construction impacts on residences, wells, wetlands, and designated parks would be reduced; however, construction impacts on farms and waterbodies, and long-term impacts on forested land and rugged terrain would be increased. This represents a shift of impacts from one area, group of landowners, and set of resources to another area, group of landowners, and set of resources. The alternative also transitions temporary construction impacts to increased long-term impacts, would be longer, and would require more greenfield construction. For these reasons, we do not find the Canton B Route Alternative to have an environmental advantage when compared to the corresponding segment of the proposed route and do not recommend that this alternative be incorporated as part of the Project.



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3.3.7 Canton C Route Alternative

The Canton C Route Alternative was proposed by the same stakeholder that proposed the Canton A Route Alternative and for the same reasons. The purpose of the Canton C Route Alternative is to minimize impacts on the City of Green, Canton, and other populated areas. The Canton C Route Alternative diverges from the proposed NGT mainline at MP 2.2 in Columbiana County, runs south of the City of Canton, and rejoins the proposed NGT mainline at MP 87.6 in Lorain County (see figure 3.3.7-1 and table 3.3.7-1). One compressor station would need to be re-sited to accommodate this alternative.

Factor	Alternative	Proposed Route
Length (miles)	92.3	85.6
Greenfield Construction (miles) ^a	59.9	56.5
Wetland Affected (acres) ^b	19.1	20.0
Perennial Waterbody Crossings (no.)	48	39
WHPA (no.)	3	7
Agricultural Land (acres) ^c	851.5	883.3
Forested Land (acres) ^b	225.5	169.1
Wildlife Management Areas (no./miles)	1/0.6 ^d	0/0.0
State Parks and Forest (no./mile)	0/0.0	1/0.3 ^e
County/Metro Parks (no./mile)	1/0.2 ^f	5/0.6 ^g
Steep Slopes (miles) ^h	5.2	1.5
Sidehill Construction (miles) ⁱ	3.9	0.8
Residential-type Structures within 150 feet Pipe Centerline (no.) ^j	296	197

a	Based on the absence of adjacent or parallel rights-of-way within 300 feet of the pipe centerline.
b	Based on a 75-foot-wide construction right-of-way in wetlands and forested land.
c	Based on a 125-foot-wide construction right-of-way in agricultural land.
d	Camp Beldon Wildlife Management Area.
e	Portage Lakes State Park.
f	Canal Corridor.
g	Ariss Park; Greensburg Park; Singer Lake Preserve; Chippewa Lake Nature Area; Buckeye Woods Park.
h	Calculated by identifying slopes greater than 20 percent.
i	Calculated by identifying slopes greater than 20 percent, and determining if the pipeline direction differed from the direction of the ground aspect.
j	Includes dwellings, detached dwellings, garages, sheds, and other buildings often associated with a residence.

The Canton C Route Alternative is 92.3 miles in length, which is 6.7 miles longer than the proposed route. The route alternative and proposed route would require a similar amount of greenfield construction and would have similar impacts on wetlands. The primary advantages of the route alternative are that it would cross four fewer WHPAs, no state parks/forests, and four fewer county/metro parks. Conversely, the main disadvantages of the alternative are that would cross, 9 more perennial waterbodies, 56.4 acres more forested land, 1 more wildlife management area, 3.7 miles more steep slopes, 3.1 miles more sidehill construction, and is near 99 more residential-type structures. Although the route avoids the City of Green and Canton, it crosses other populated areas and affects other important environmental resources as compared to the proposed route. Based on our review of these routes, we do not find the Canton C Route Alternative provides a significant environmental advantage when compared to the corresponding segment of the proposed route and do not recommend that this alternative be incorporated as part of the Projects.

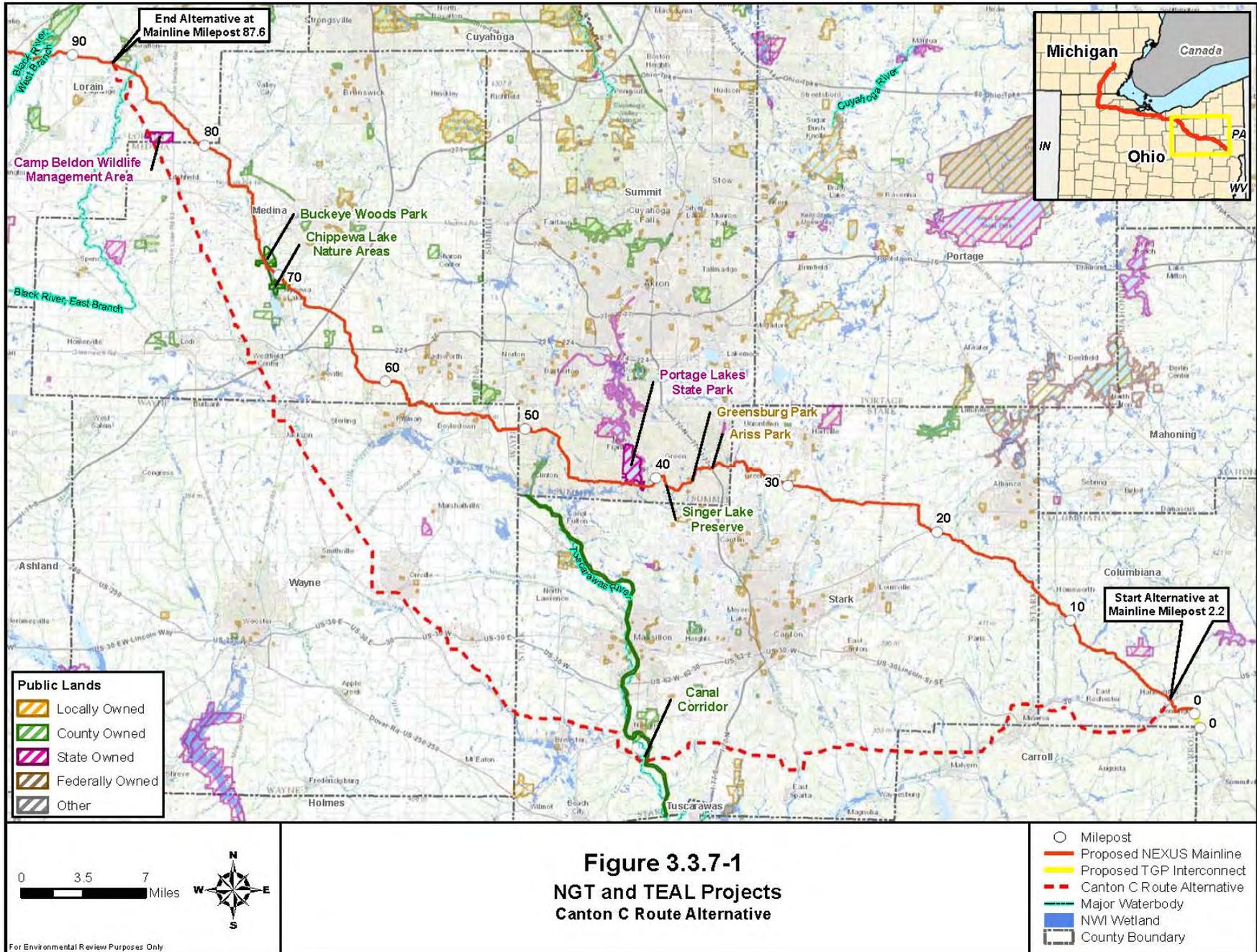


Figure 3.3.7-1
NGT and TEAL Projects
Canton C Route Alternative

3.3.8 Doylestown Route Alternative

The Doylestown Route Alternative was developed after a stakeholder requested the proposed route be moved to a less populated area made up of predominately farm fields. The stakeholder submitted an overview map of the alternative. The route alternative diverges from the NGT mainline MP 41.8 in Summit County and continues south of the proposed route until it rejoins the NGT mainline at MP 65.6 in Medina County (see figure 3.3.8-1 and table 3.3.8-1). One compressor station would need to be re-sited to accommodate this alternative.

Factor	Alternative	Proposed Route
Length (miles)	24.0	23.8
Greenfield Construction (miles) ^a	20.6	14.1
Wetland Affected (acres) ^b	39.1	2.7
Perennial Waterbody Crossings (no.)	17	8
WHPA (no.)	3	2
Agricultural Land (acres) ^c	219.7	231.8
Forested Land (acres) ^b	67.3	51.8
County/Metro Parks (no./mile)	2/0.1 ^d	0/0.0
Steep Slopes (miles) ^e	0.4	0.2
Sidehill Construction (miles) ^f	0.5	0.3
Residential-type Structures within 150 feet Pipe Centerline (no.) ^g	61	80

a	Based on the absence of adjacent or parallel rights-of-way within 300 feet of the pipe centerline.
b	Based on a 75-foot-wide construction right-of-way in wetlands and forested land.
c	Based on a 125-foot-wide construction right-of-way in agricultural land.
d	Franklin-Clinton Area; Ohio and Erie Canal.
e	Calculated by identifying slopes greater than 20 percent.
f	Calculated by identifying slopes greater than 20 percent, and determining if the pipeline direction differed from the direction of the ground aspect.
g	Includes dwellings, detached dwellings, garages, sheds, and other buildings often associated with a residence.

The Doylestown Route Alternative is 24.0 miles in length. The route alternative and proposed route are similar in length and amount of slopes crossed. The main advantages of the alternative are that it would cross 12.1 acres less agricultural land and would be near 19 fewer residential-type structures. Conversely, the primary disadvantages of the alternative are that it would cross 36.4 acres more wetlands, 9 more perennial waterbodies, 1 more WHPA, 15.5 acres more forested land, and 2 more county/metro parks. The alternative route would also require 6.5 miles more greenfield construction. Although this route is in a less populated area made up of predominately farm fields, it has several disadvantages that outweigh the advantages. Based on our review of these routes, we do not find the Doylestown Route Alternative provides a significant environmental advantage when compared to the corresponding segment of the proposed route and do not recommend that this alternative be incorporated as part of the Projects.

3.3.9 Turnpike Route Alternative

During scoping, we received several comments from stakeholders requesting that the NGT Project be routed along Interstate 80/90 in Erie, Sandusky, and Ottawa Counties, Ohio. The Turnpike Route Alternative was developed by NEXUS to address these comments. The Turnpike Alternative diverges from the NGT mainline at MP 88.5 in Lorain County and extends north and west along Interstate 80/90 until it rejoins the NGT mainline at MP 167.0 in Wood County (see figure 3.3.9-1 and table 3.3.9-1). One compressor station would need to be re-sited to accommodate this alternative.

Factor	Alternative	Proposed Route
Length (miles)	79.8	79.0
Greenfield Construction (miles) ^a	25.0	40.9
Wetland Affected (acres) ^b	16.4	6.4
Perennial Waterbody Crossings (no.)	44	44
WHPA (no.)	11	12
Agricultural Land (acres) ^c	737.9	1,019.7
Forested Land (acres) ^b	60.0	65.5
Waterfowl/Wildlife Production Areas (no./miles)	1/0.3 ^d	0/0.0
County/Metro Parks (no./mile)	2/1.2 ^e	0/0.0
Steep Slopes (miles) ^f	0.4	0.3
Sidehill Construction (miles) ^g	1.0	0.5
Residential-type Structures within 150 feet Pipe Centerline (no.) ^h	52	51

a	Based on the absence of adjacent or parallel rights-of-way within 300 feet of the pipe centerline.
b	Based on a 75-foot-wide construction right-of-way in wetlands and forested land.
c	Based on a 125-foot-wide construction right-of-way in agricultural land.
d	Wildlife Production Area 30.
e	Carlisle Reservation Park; Schendel Gardens and Arboretum.
f	Calculated by identifying slopes greater than 20 percent.
g	Calculated by identifying slopes greater than 20 percent, and determining if the pipeline direction differed from the direction of the ground aspect.
h	Includes dwellings, detached dwellings, garages, sheds, and other buildings often associated with a residence.

The Turnpike Route Alternative is 79.8 miles in length. The route alternative and proposed route are similar in length, number of waterbodies crossed, and amount of steep slopes. The main advantages of the route alternative are that it would have 15.9 less miles of greenfield construction, cross one fewer WHPA, 281.8 acres less agricultural land, and 5.5 acres less forested land. Conversely, the primary disadvantages of the alternative are that it would cross 10.0 acres more wetlands, one more waterfowl/wildlife production area, and two more county/metro parks. Although following an existing road often can be a means of limiting impacts on sensitive resources, it does not appear to provide an environmental advantage in this case. Rather it is merely shifting impacts from one area, group of landowners, and set of resources to another area, group of landowners, and set of resources. Based on our review of these routes, we do not find the Turnpike Route Alternative provides a significant environmental advantage when compared to the corresponding segment of the proposed route and do not recommend that this alternative be incorporated as part of the Projects.

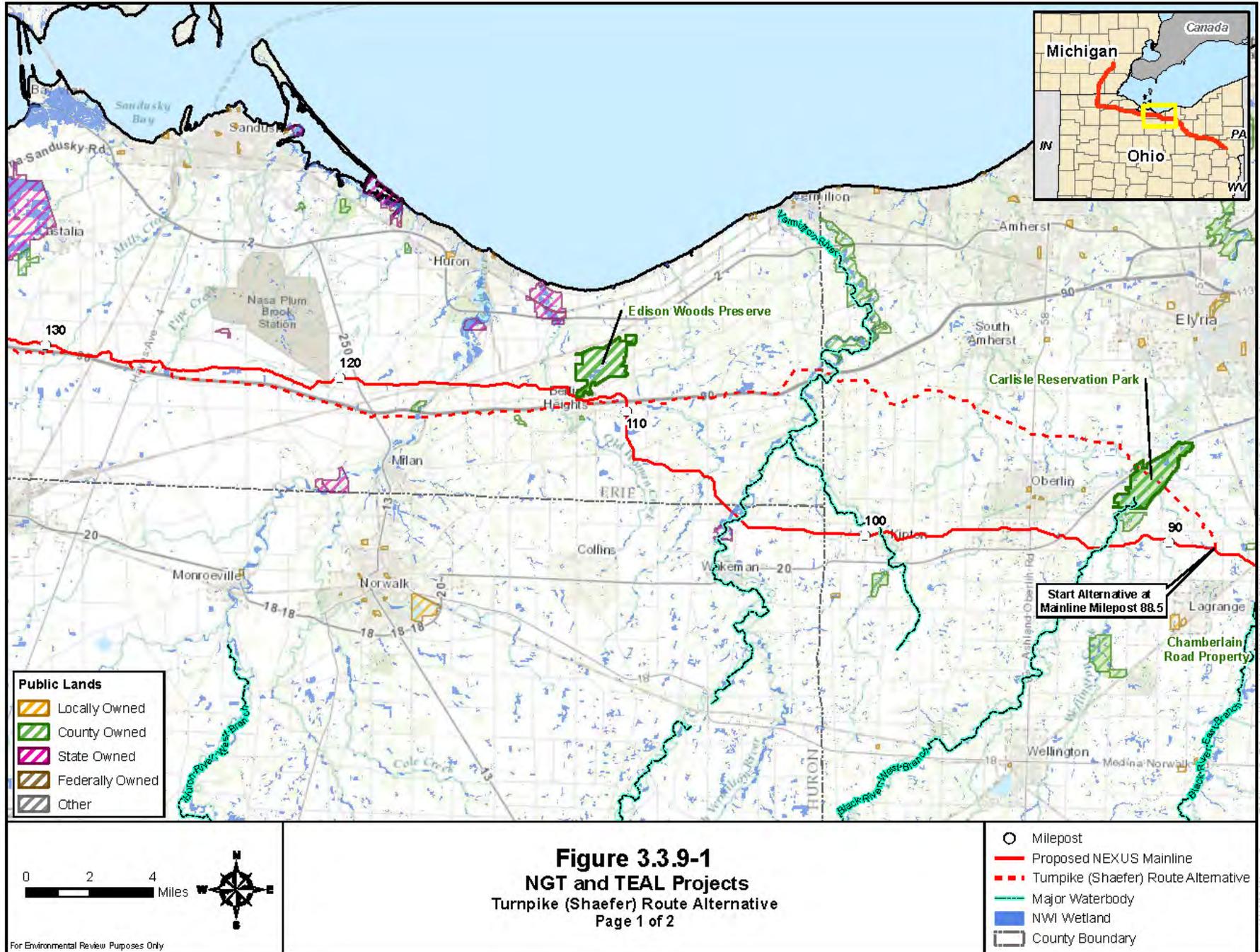


Figure 3.3.9-1
NGT and TEAL Projects
 Turnpike (Shaefer) Route Alternative
 Page 1 of 2

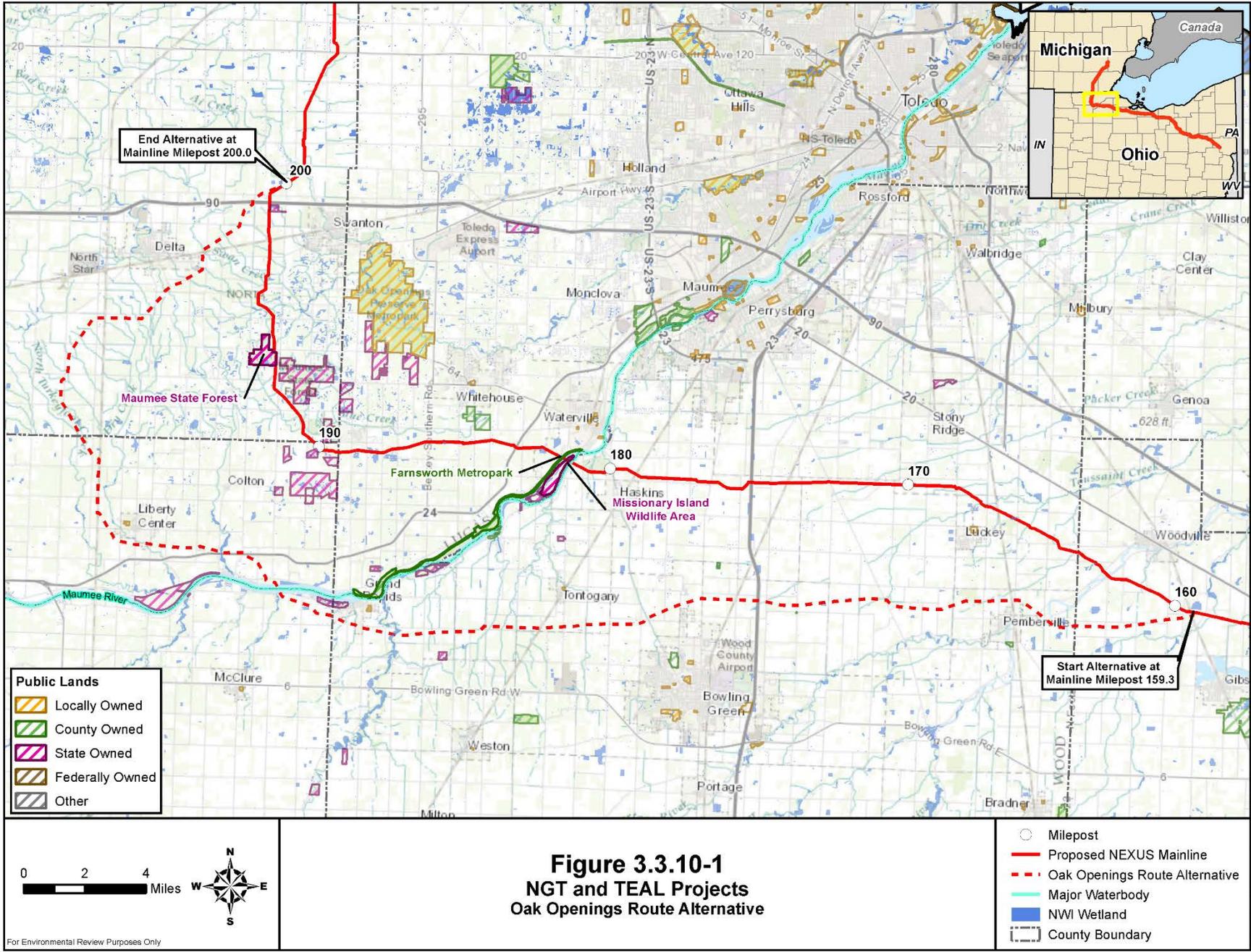
3.3.10 Oak Openings Route Alternative

During scoping, we received several comments from concerned stakeholders about the proposed route’s impacts on the Oak Openings Region. The Oak Openings Route Alternative was proposed by NEXUS to address concerns with crossing the Oak Openings Region. The Oak Openings Region is an area of prairie and oak savanna surrounded by wetland forests in northwestern Ohio. The Oak Openings Region was originally made up of several unique ecological communities that contain numerous rare, endemic species. Presently, about 99 percent of the ecosystem has been altered and fragmented by development, primarily through tree clearing and wetland draining. Section 4.5.1.1 contains additional information about the Oak Openings Region. During pre-filing, NEXUS adjusted its route in several locations (see appendix F) to reduce wetland and forest land impacts within the Oak Openings Region. The route alternative diverges from the NGT mainline at MP 159.3 in Sandusky County and runs south and west before rejoining the NGT mainline at MP 200.0 in Fulton County (see figure 3.3.10-1 and table 3.3.10-1). One compressor station would need to be re-sited to accommodate this alternative.

Factor	Alternative	Proposed Route
Length (miles)	54.0	40.6
Greenfield Construction (miles) ^a	48.8	19.7
Wetland Affected (acres) ^b	4.5	4.5
Perennial Waterbody Crossings (no.)	24	25
WHPA (no.)	7	5
Agricultural Land (acres) ^c	771.2	537.9
Forested Land (acres) ^b	3.6	27.3
Wildlife Management Areas (no./miles)	0/0.0	1/0.1 ^d
State Parks and Forest (no./mile)	0/0.0	1/0.4 ^e
County/Metro Parks (no./mile)	0/0.0	1/0.1 ^f
Residential-type Structures within 150 feet Pipe Centerline (no.) ^g	6	14

^a Based on not having an adjacent or parallel rights-of-way within 300 feet of the pipe centerline.
^b Based on a 75-foot-wide construction right-of-way in wetlands and forested land.
^c Based on a 125-foot-wide construction right-of-way in agricultural land.
^d Missionary Island Wildlife Area.
^e Maumee State Forest.
^f Farnsworth Metropark.
^g Includes dwellings, detached dwellings, garages, sheds, and other buildings often associated with a residence.

The Oak Openings Route Alternative is 54.0 miles in length. The route alternative and proposed route are similar in amount of wetlands crossed. The advantages of the route alternative are that it has 23.6 acres less forested land, no wildlife management areas, no state parks/forest, no county/metro parks, and is near 8 fewer residential-type structures. Conversely, the disadvantages of the alternative are that it would be 13.4 miles longer, have 29.1 miles more greenfield construction, and cross 2 more WHPAs.



Source: CH2M Hill, 2010. Date: 10/20/2010

Although this route alternative largely would be located outside the historic Oak Openings Region, the proposed route also would affect very little remnant Oak Openings communities. Almost all of the region already has been converted to agricultural and urban land uses. While portions of the region continue to support ecological diversity and rare species, these areas are generally limited to conservation lands such as preserves and state forests. Botanical surveys of the NGT mainline route conducted in 2015 identified two areas where the NGT Project would cross remnant Oak Openings communities. The first is located near MP 189, where characteristic species such as pin oak, red maple, spicebush, and fowl mannagrass were identified; however, non-characteristic species such as silver maple and cottonwood were also present along with invasive species such as common buckthorn and multiflora rose. The second location is near MP 193, where the NGT Project crosses about 2,400 feet along the edge of a woodlot on the eastern edge of the Maumee State Forest. Component species such as pin oak, red maple, winterberry, spicebush, and common lake sedge were found. Neither of these areas contained all of the indicative species that would be present in high-quality remnant communities. Based on these factors, we do not find the Oak Openings Route Alternative provides a significant environmental advantage when compared to the corresponding segment of the proposed route and do not recommend that this alternative be incorporated as part of the Projects.

3.3.11 Waterville Route Alternative

The Waterville Route Alternative was developed at the request of stakeholders that wanted the proposed route and the corresponding Waterville Compressor Station moved farther away from the populated area of the town of Waterville. The route alternative diverges from the NGT mainline at MP 178 in Lucas County and goes south and west until it rejoins the NGT mainline at MP 200.0 in Fulton County (see figure 3.3.11-1 and table 3.3.11-1).

Factor	Alternative	Proposed Route
Length (miles)	41.2	22.0
Greenfield Construction (miles) ^a	20.6	18.0
Wetland Affected (acres) ^b	7.3	2.7
Perennial Waterbody Crossings (no.)	14	15
WHPA (no.)	1	0
Agricultural Land (acres) ^c	365.2	295.5
Forested Land (acres) ^b	6.4	11.8
Wildlife Management Areas (no./miles)	0/0.0	1/0.1 ^d
State Parks and Forest (no./mile)	1/0.1 ^e	1/0.4 ^f
County/Metro Parks (no./mile)	0/0.0	1/0.1 ^g
Steep Slopes (miles) ^h	0.1	0.0
Residential-type Structures within 150 feet Pipe Centerline (no.) ⁱ	274	5

a	Based on the absence of adjacent or parallel rights-of-way within 300 feet of the pipe centerline.
b	Based on a 75-foot-wide construction right-of-way in wetlands and forested land.
c	Based on a 125-foot-wide construction right-of-way in agricultural land.
d	Missionary Island Wildlife Area.
e	North Turkeyfoot State Park.
f	Maumee State Forest.
g	Farnsworth Metropark.
h	Calculated by identifying slopes greater than 20 percent.
i	Includes dwellings, detached dwellings, garages, sheds, and other buildings often associated with a residence.

The Waterville Route Alternative is 41.2 miles in length. The route alternative and proposed route would be similar in number of perennial waterbodies and amount of steep slopes crossed. The advantages of the route alternative are that it would not cross any wildlife management areas or county/metro parks, and would impact 5.5 acres less forested land. Conversely, the disadvantages of the alternative are that it would be 19.2 miles longer, have 2.6 miles more greenfield construction, cross 4.5 acres more wetlands, 1 more WHPA, 69.7 acres more agricultural land, and is near 269 more residential-type structures. Although the route and compressor station site would be farther away from the populated area of the town of Waterville, it affects more residences and environmental resources in other than areas than the proposed route. This represent merely a shift of impacts from one area, group of landowners, and set of resources to another area, group of landowners, and set of resources. Based on our review of these routes, we do not find the Waterville Route provides a significant environmental advantage when compared to the corresponding segment of the proposed route and do not recommend that this alternative be incorporated as part of the Projects.

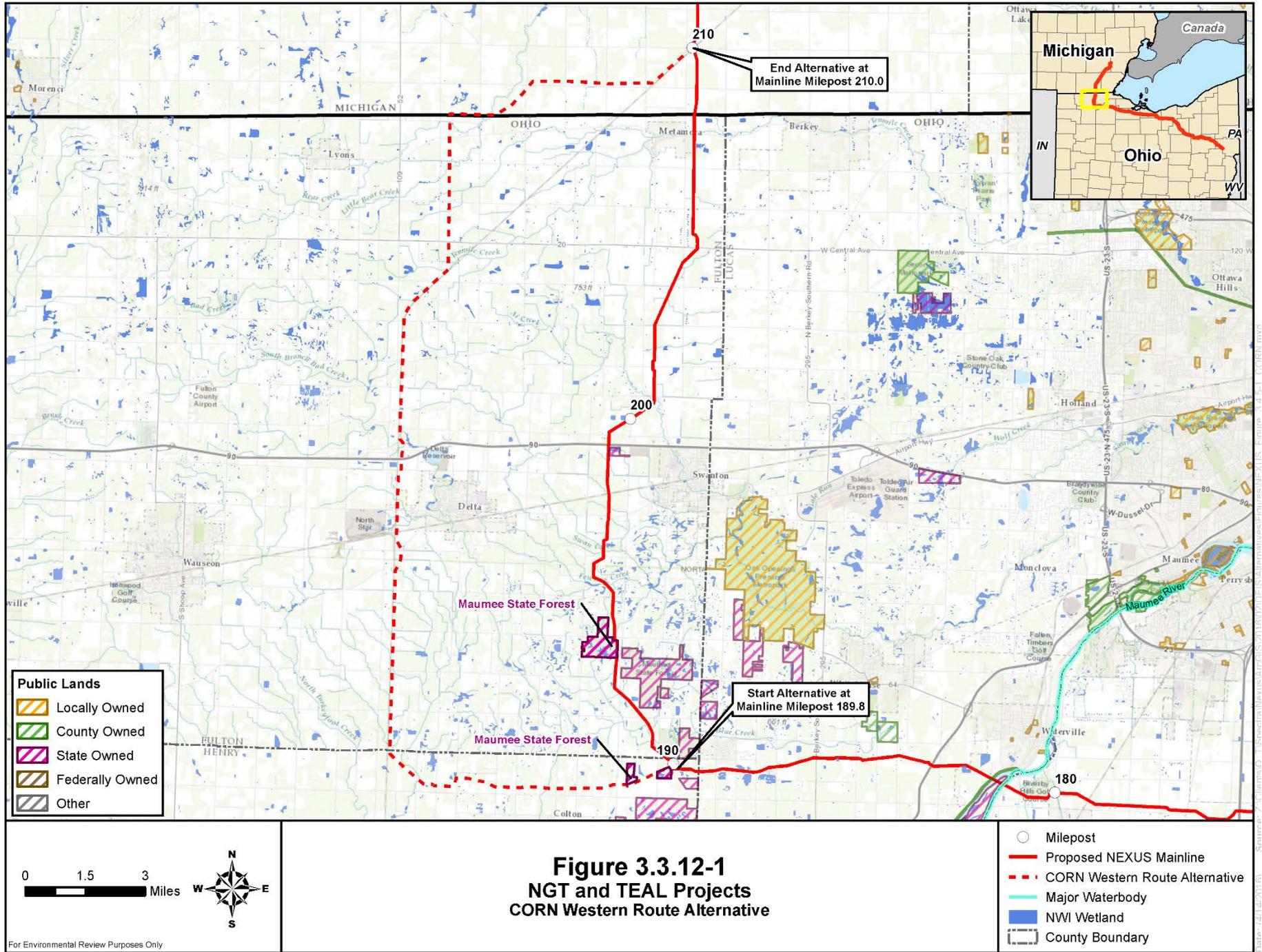
3.3.12 CORN Western Route Alternative

The Coalition to Reroute NEXUS (CORN) developed the CORN Western Route Alternative to avoid the historical Oak Openings Region (also see section 3.3.10). The route alternative diverges from the NGT mainline at MP 189.8 in Henry County, Ohio and runs west and north until it returns to the proposed NGT mainline at MP 210.0 in Lenawee County, Michigan (see figure 3.3.12-1 and table 3.3.12-1).

Factor	Alternative	Proposed Route
Length (miles)	31.1	20.2
Greenfield Construction (miles) ^a	13.6	11.1
Wetland Affected (acres) ^b	1.8	0.9
Perennial Waterbody Crossings (no.)	10	7
WHPA (no.)	1	0
Agricultural Land (acres) ^c	437.9	284.8
Forested Land (acres) ^b	10.9	5.5
State Parks and Forest (no./mile)	1/0.3 ^d	1/0.4 ^d
Potential for Subsidence (miles)	9.7	11.9
Residential-type Structures within 150 feet Pipe Centerline (no.) ^e	12	3

a Based on the absence of adjacent or parallel rights-of-way within 300 feet of the pipe centerline.
b Based on a 75-foot-wide construction right-of-way in wetlands and forested land.
c Based on a 125-foot-wide construction right-of-way in agricultural land.
d Maumee State Forest.
e Includes dwellings, detached dwellings, garages, sheds, and other buildings often associated with a residence.

The CORN Western Alternative is 31.1 miles in length. There do not appear to be any substantial advantages to the route alternative. The disadvantages of the alternative are that it would be 10.9 miles longer, have 2.5 miles more greenfield construction, cross 3 more perennial waterbodies, 1 more WHPA, 153.0 acres more agricultural land, 5.5 acres more forested land, and is near 9 more residential-type structures. Based on our review of these routes and for reasons similar to those discussed in section 3.3.10, we do not find the CORN Western Route Alternative provides a significant environmental advantage when compared to the corresponding segment of the proposed route and do not recommend that this alternative be incorporated as part of the Projects.



3.3.13 Hybrid Oak Openings-Western Route Alternative

We received a comment during the draft EIS comment period requesting that we consider combining the western portion of the Oak-Openings Route Alternative with the eastern portion of the CORN Western Route Alternative. The commenter suggest the proposed route would avoid impacts on historical Oak Openings and minimize impacts on residential areas. Toward this end, we developed the Hybrid Oak Openings-Western Route Alternative. The hybrid route alternative diverges from the NGT mainline at MP 159.3 in Sandusky County and runs south and west before rejoining the NGT mainline at MP 210 in Lenawee County, Michigan (see figure 3.3.13-1 and table 3.3.13-1). One compressor station would need to be re-sited to accommodate this alternative.

Factor	Alternative	Proposed Route
Length (miles)	69.9	50.8
Greenfield Construction (miles) ^a	52.1	22.4
Wetland Affected (acres) ^b	4.8	4.9
Perennial Waterbody Crossings (no.)	28	31
WHPA (no.)	7	5
Agricultural Land (acres) ^c	987.2	684.2
Forested Land (acres) ^b	14.0	26.4
Wildlife Management Areas (no./miles)	0/0.0	1/0.1 ^d
State Parks and Forest (no./mile)	0/0.0	1/0.4 ^e
County/Metro Parks (no./mile)	0/0.0	1/0.1 ^f
Residential-type Structures within 150 feet Pipe Centerline (no.) ^g	12	14

a	Based on not having an adjacent or parallel rights-of-way within 300 feet of the pipe centerline.
b	Based on a 75-foot-wide construction right-of-way in wetlands and forested land.
c	Based on a 125-foot-wide construction right-of-way in agricultural land.
d	Missionary Island Wildlife Area.
e	Maumee State Forest.
f	Farnsworth Metropark.
g	Includes dwellings, detached dwellings, garages, sheds, and other buildings often associated with a residence.

The Hybrid Oak Openings-Western Route Alternative is 69.9 miles in length. The advantages of the route alternative are that it has 12.4 acres less forested land, crosses 3 fewer perennial waterbodies, no wildlife management areas, no state parks/forest, no county/metro parks, and is near 2 fewer residential-type structures. Conversely, the disadvantages of the alternative are that it would be 19.1miles longer, have 29.7 miles more greenfield construction, and cross 2 more WHPAs. Based on our review of these routes and for reasons similar to those discussed in section 3.3.10, we do not find the Hybrid Oak Openings-Western Route Alternative provides a significant environmental advantage when compared to the corresponding segment of the proposed route and do not recommend that this alternative be incorporated as part of the Projects.

3.4 MINOR ROUTE VARIATIONS

Although they can extend for several miles, minor route variations are different from major route alternatives in that they are usually shorter and are often designed to avoid a site-specific environmental resource or engineering constraint. They also typically remain within the same general area as the proposed route. As with major route alternatives, all minor route variations evaluated in this EIS are along the NGT mainline. We found no reason of our own nor any compelling reason based on stakeholder comments to evaluate minor route variations for the 0.9 mile of TGP interconnecting pipeline, the 4.4 miles of TEAL pipeline loop, or 0.3 mile of TEAL connecting pipeline.

During project planning, NEXUS incorporated many route alternatives and variations into its original route. In total, NEXUS adopted a total of 239 route changes totaling about 231 miles (91 percent of the Projects' route) for various reasons, including landowner requests, avoidance of sensitive resources, or engineering considerations. Appendix F-3 lists the variations already incorporated into the route.

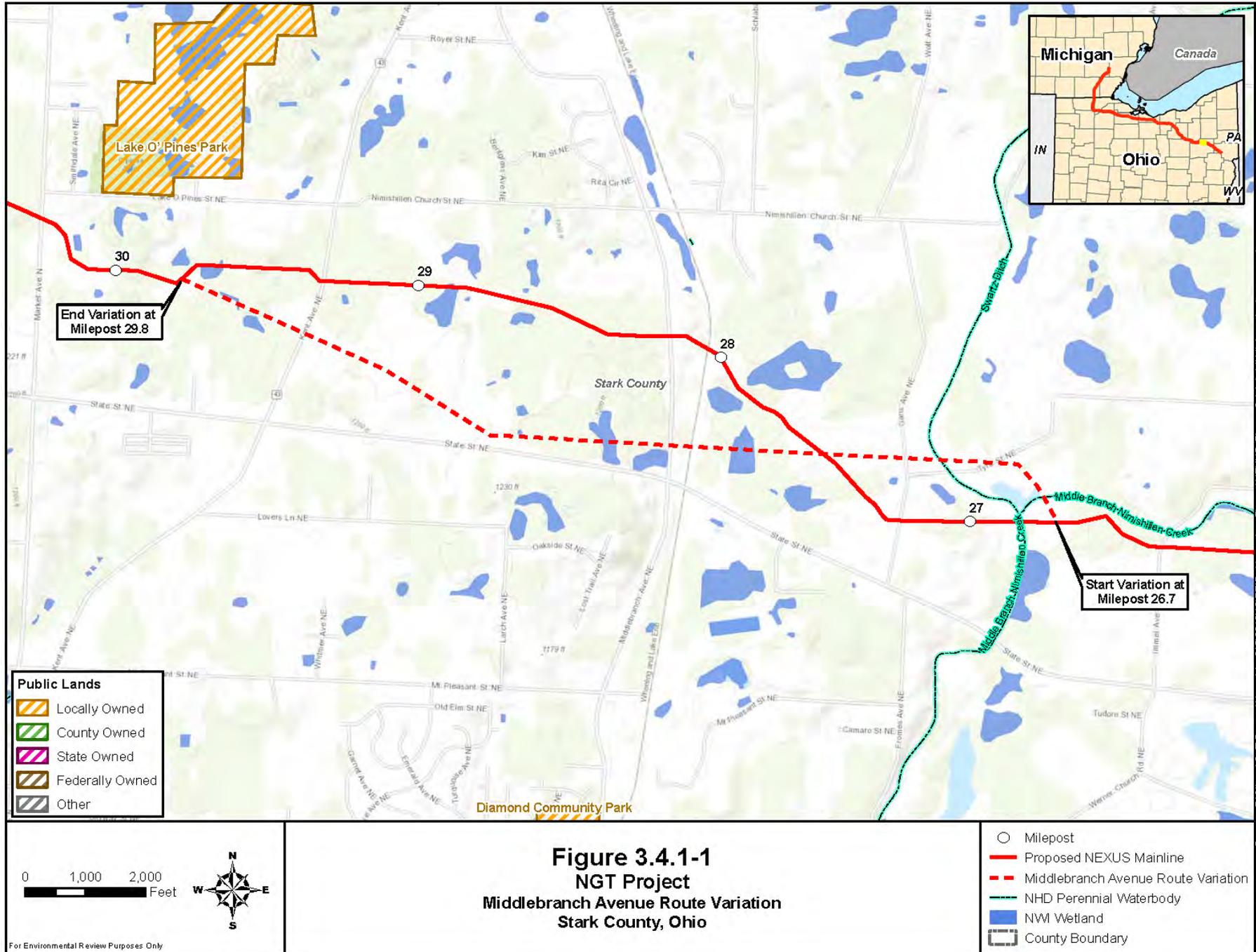
3.4.1 Middlebranch Avenue Route Variations

The Middlebranch Avenue Route Variation was considered at the request of a landowner to minimize impacts on wetlands, a waterbody, and forested areas by routing the pipeline partially along an existing electrical powerline south and west of the proposed route. This variation diverges from the NGT mainline at MP 26.7 and rejoins the NGT mainline at MP 29.8 (see figure 3.4.1-1 and table 3.4.1-1).

Factor	Route Variation	Proposed Route
Length (miles)	3.0	3.1
Greenfield Construction (miles) ^a	1.2	2.8
Wetland Affected (acres) ^b	0.9	0.9
Perennial Waterbody Crossings (no.)	2	1
Agricultural Land (acres) ^c	33.3	34.8
Forested Land (acres) ^b	3.6	4.5
Steep Slopes (miles) ^d	<0.1	0.0
Residential-type Structures within 150 feet Pipe Centerline (no.) ^e	19	3

a Based on the absence of adjacent or parallel rights-of-way within 300 feet of the pipe centerline.
b Based on a 75-foot-wide construction right-of-way in wetlands and forested land.
c Based on a 125-foot-wide construction right-of-way in agricultural land.
d Calculated by identifying slopes greater than 20 percent.
e Includes dwellings, detached dwellings, garages, sheds, and other buildings often associated with a residence.

The Middlebranch Avenue Route Variation is 3.0 miles in length. The route variation and proposed route are similar in length and would affect the similar amount of wetlands, agricultural land, and steep slopes. The advantage of the route variation is that it would require 1.6 miles less greenfield construction. Conversely, the disadvantage of the variation is that it would cross one additional waterbody and be near 16 more residential-type structures. The purpose of the alternative was to minimize impacts on wetlands, a waterbody, and forested areas. Only impacts on forested areas would be slightly reduced (less than 1 acre), whereas impacts on wetlands appear to be about the same and one additional waterbody would be crossed. Based on our review of these factors, we do not find the Middlebranch Avenue Route Variation provides a significant environmental advantage when compared to the corresponding segment of the proposed route and do not recommend that this variation be incorporated as part of the Projects.



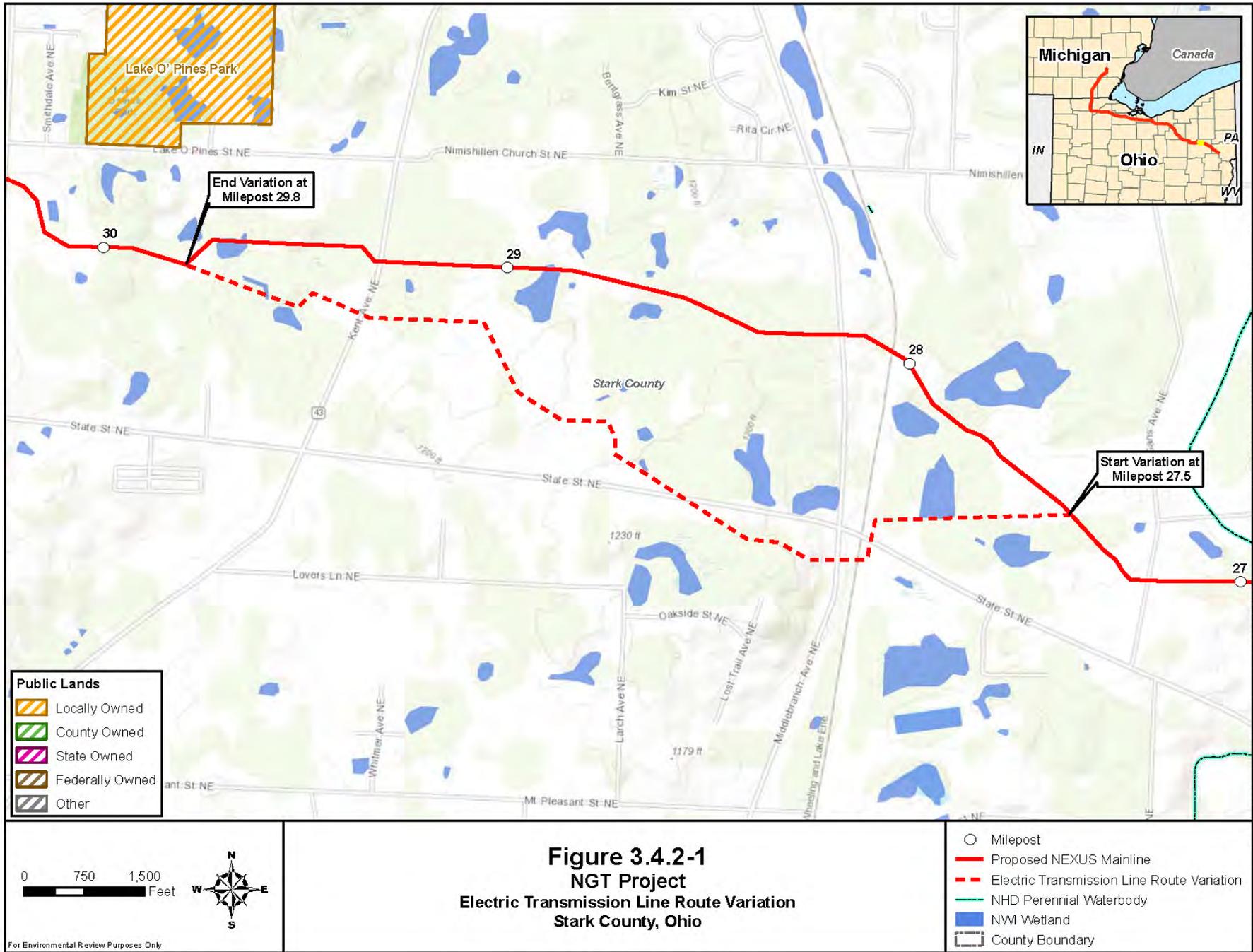
3.4.2 Electric Transmission Line Route Variation

The Electric Transmission Line Route Variation is in the same vicinity as the Middlebranch Avenue Route Variation. The route variation was suggested by a landowner as a means of co-locating the pipeline along the electric transmission line corridor off of and west of their property. The variation diverges from the NGT mainline at MP 27.5 and rejoins the NGT mainline at MP 29.8 (see figure 3.4.2-1 and table 3.4.2-1).

Factor	Route Variation	Proposed Route
Length (miles)	2.5	2.3
Greenfield Construction (miles) ^a	0.8	2.1
Wetland Affected (acres) ^b	0.5	0.9
Agricultural Land (acres) ^c	27.3	25.8
Forested Land (acres) ^b	3.6	4.5
Steep Slopes (miles) ^d	<0.1	0.0
Residential-type Structures within 150 feet Pipe Centerline (no.) ^e	6	3

^a Based on the absence of adjacent or parallel rights-of-way within 300 feet of the pipe centerline.
^b Based on a 75-foot-wide construction right-of-way in wetlands and forested land.
^c Based on a 125-foot-wide construction right-of-way in agricultural land.
^d Calculated by identifying slopes greater than 20 percent.
^e Includes dwellings, detached dwellings, garages, sheds, and other buildings often associated with a residence.

The Electric Transmission Line Route Variation is 2.5 miles long. The main advantage of the route variation is that it would have 1.3 less miles of greenfield construction. It also would affect slightly less wetland and forested land. The main disadvantage of the variation is that it would be near 3 more residential-type structures. It also would be slightly longer and affect more agricultural land and steep slopes. Although co-locating with an existing utility often can be a means of limiting impacting on sensitive resources, it does not appear to provide a substantial environmental advantage in this case. The variation merely transfers impacts from one area, group of landowners, and set of resource to another. Based on our review of this routes, we do not find that the Electric Transmission Line Route Variation provides a significant environmental advantage when compared to the corresponding segment of the proposed route and do not recommend that this variation be incorporated as part of the Projects.



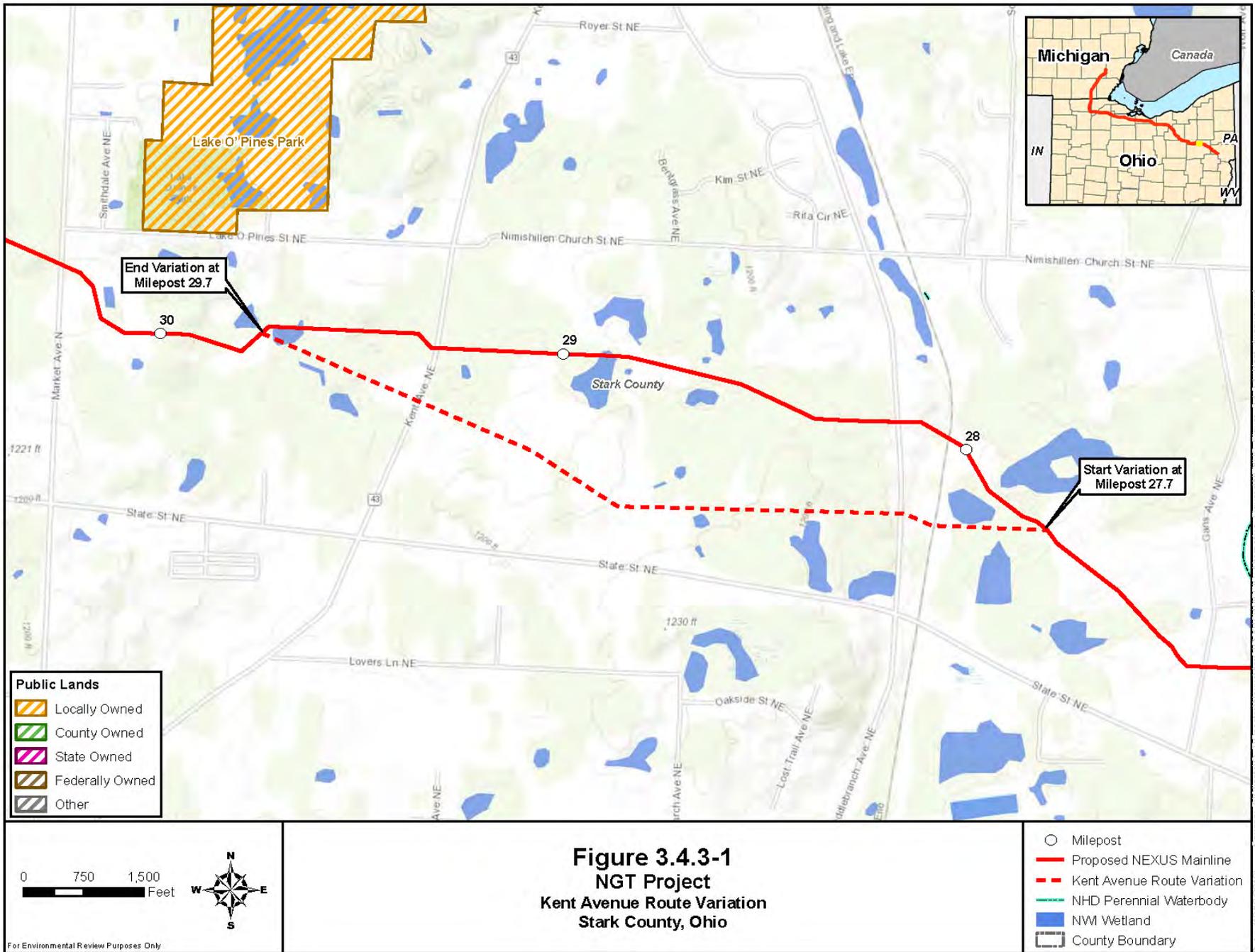
3.4.3 Kent Avenue Route Variation

The Kent Avenue Route Variation is in the same vicinity as the Middlebranch Avenue Route Variation and Electric Transmission Line Route Variation. The variation was proposed by a stakeholder who suggested that routing the pipeline along a nearby electrical powerline would minimize impacts on wetlands and forested land. The variation diverges from the NGT mainline at MP 27.7 and rejoins the NGT mainline at MP 29.7 (see figure 3.4.3-1 and 3.4.3-1).

Factor	Route Variation	Proposed Route
Length (miles)	2.0	2.0
Greenfield Construction (miles) ^a	1.0	1.8
Wetland Affected (acres) ^b	0.5	0.9
Agricultural Land (acres) ^c	21.2	21.2
Forested Land (acres) ^b	4.5	4.5
Residential-type Structures within 150 feet Pipe Centerline (no.) ^d	7	3

^a Based on the absence of adjacent or parallel rights-of-way within 300 feet of the pipe centerline.
^b Based on a 75-foot-wide construction right-of-way in wetlands and forested land.
^c Based on a 125-foot-wide construction right-of-way in agricultural land.
^d Includes dwellings, detached dwellings, garages, sheds, and other buildings often associated with a residence.

Both the proposed route and the Kent Avenue Route Variation would be of equal length and their impacts on waterbodies, forested land, and public roads would be identical or similar. The advantages of the route variation is that it would have 0.8 less miles of greenfield construction and would cross slightly less wetland. Conversely, the disadvantage of the variation is that it is near 4 more residential-type structures. Based on our review of these routes, it appears that the route variation would merely shift impacts away from wetlands to residential land use. Therefore, we do not find that the Kent Avenue Route Variation provides a significant environmental advantage when compared to the corresponding segment of the proposed route and do not recommend that this variation be incorporated as part of the Projects.



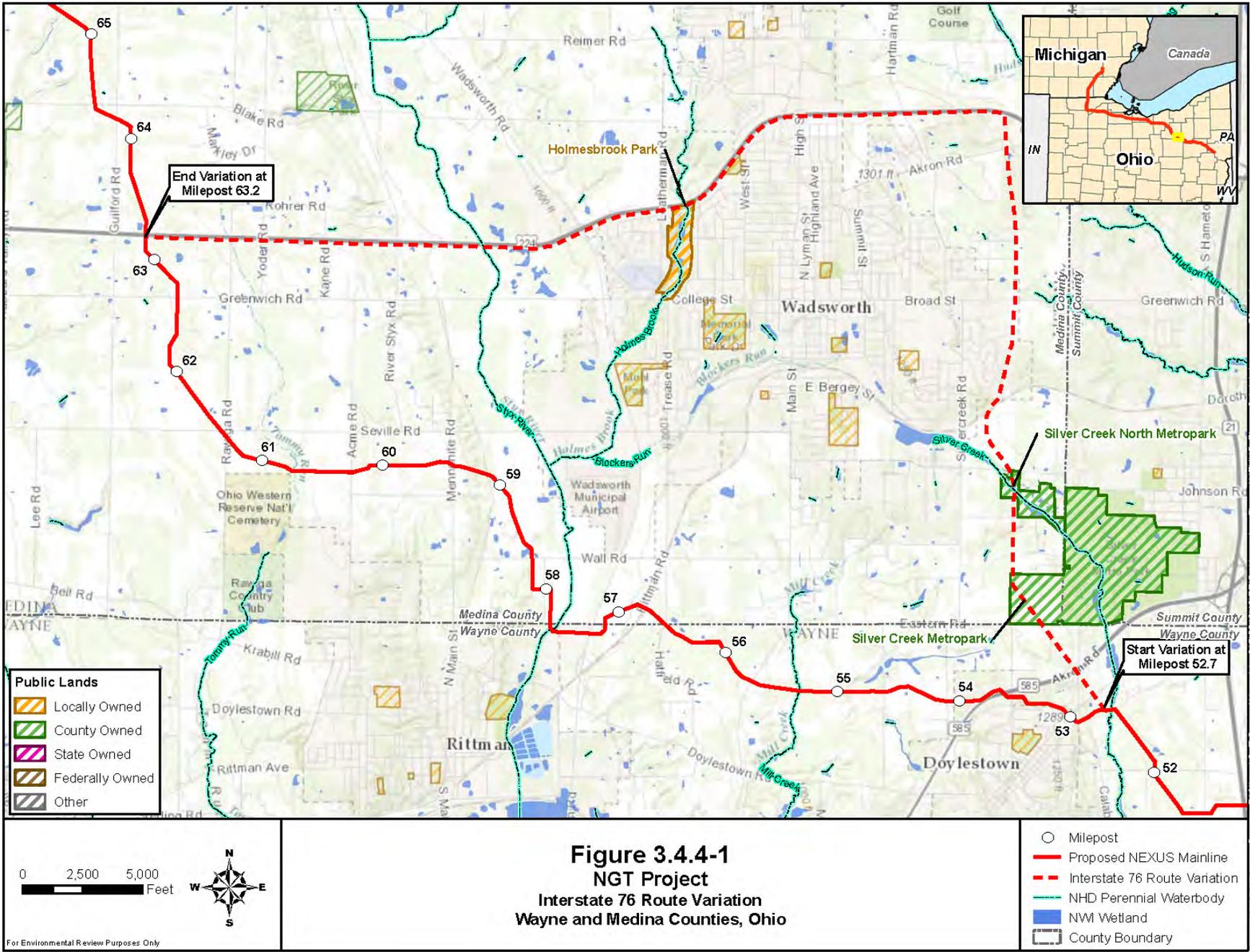
3.4.4 Interstate 76 Route Variation

The Interstate 76 Route Variation was requested by a landowner based on a concern that placement of the proposed route on their property would preclude them from constructing a private natural gas well on their property. The variation diverges from the NGT mainline at MP 52.7 and heads north along the eastern edge of the city of Wadsworth until it reaches U.S. Interstate 76, where it travels west along the interstate and eventually rejoins the NGT mainline at MP 63.2 (see figure 3.4.4-1 and table 3.4.4-1).

Factor	Route Variation	Proposed Route
Length (miles)	12.2	10.5
Greenfield Construction (miles) ^a	0.4	8.4
Wetland Affected (acres) ^b	0.8	0.8
Perennial Waterbody Crossings (no.)	3	2
WHPA (no.)	3	0
Agricultural Land (acres) ^c	50.0	116.7
Forested Land (acres) ^b	8.2	14.5
County/Metro Parks (no./mile)	3/0.8 ^d	0/0.0
Steep Slopes (miles) ^e	1.0	0.1
Sidehill Construction (miles) ^f	1.0	0.1
Residential-type Structures within 150 feet Pipe Centerline (no.) ^g	82	34

a	Based on the absence of adjacent or parallel rights-of-way within 300 feet of the pipe centerline.
b	Based on a 75-foot-wide construction right-of-way in wetlands and forested land.
c	Based on a 125-foot-wide construction right-of-way in agricultural land.
d	Silver Creek Metropark; Silver Creek North Metropark; Holmsbrook Park.
e	Calculated by identifying slopes greater than 20 percent.
f	Calculated by identifying slopes greater than 20 percent, and determining if the pipeline direction differed from the direction of the ground aspect.
g	Includes dwellings, detached dwellings, garages, sheds, and other buildings often associated with a residence.

The Interstate 76 Route Variation is approximately 12.2 miles long. The route variation and proposed route would have similar impacts on wetlands. The advantages of the route variation are that it would cross 66.7 acres less agricultural land, 6.4 acres less forested land, and would require 8.0 miles less greenfield construction. Conversely, the disadvantages of the variation are that it would cross 1 more perennial waterbody, 3 more WHPA, 3 more county/metro parks, 0.9 mile more steep slopes, 0.9 mile more sidehill construction, and is near 48 more residential-type buildings. The purpose of the route variation is to avoid a potential conflict with a future natural gas well on a landowner's property. Although landowners would continue to have use of their property following construction, the use cannot interfere with the easement rights granted to NEXUS for construction and operation of the pipeline facilities. As such, landowners would be prohibited from installing natural gas wells within the 50-foot-wide permanent right-of-way. However, natural gas is a deeply buried resource that likely also could be accessed by wells adjacent to the permanent right-of-way. If the route variation were adopted, it would merely shift easement restrictions from one group of landowners to another. Based on our review of both routes, we do not find the Interstate 76 Route Variation provides a significant environmental advantage when compared to the corresponding segment of the proposed route and do not recommend that this variation be incorporated as part of the Projects.



Source: Z:\Chen\GIS\Projects\NGT\MapDocs\Fig3_4_4-1\MapState_01.mxd

3.4.5 Route 21 Route Variation

The Route 21 Route Variation was proposed by a landowner who suggested that the proposed route follow Route 21 and Interstate 76 in the vicinity of Doylestown, Ohio to avoid passing through residential areas. The route variation diverges from the NGT mainline at MP 51.1 and rejoins the NGT mainline at MP 63.2 (see figure 3.4.5-1 and table 3.4.5-1).

Factor	Route Variation	Proposed Route
Length (miles)	14.0	12.1
Greenfield Construction (miles) ^a	0.0	8.4
Wetland Affected (acres) ^b	0.4	0.8
Perennial Waterbody Crossings (no.)	5	3
Agricultural Land (acres) ^c	1.0	129.4
Forested Land (acres) ^b	1.0	16.4
County/Metro Parks (no./mile)	1/0.2 ^d	0/0.0
Steep Slopes (miles) ^e	1.9	0.2
Sidehill Construction (miles) ^f	1.9	0.1
Residential-type Structures within 150 feet Pipe Centerline (no.) ^g	140	35

^a Based on the absence of adjacent or parallel rights-of-way within 300 feet of the pipe centerline.
^b Based on a 75-foot-wide construction right-of-way in wetlands and forested land.
^c Based on a 125-foot-wide construction right-of-way in agricultural land.
^d Holmsbrook Park.
^e Calculated by identifying slopes greater than 20 percent.
^f Calculated by identifying slopes greater than 20 percent, and determining if the pipeline direction differed from the direction of the ground aspect.
^g Includes dwellings, detached dwellings, garages, sheds, and other buildings often associated with a residence.

The Route 21 Route Variation is approximately 14.0 miles long, which is 1.9 miles longer than the propose route. The advantages of the route variation are that that is would have 8.4 fewer miles of greenfield construction, crosses 0.4 less acre of wetlands, 128.4 acres less agricultural land, and 15.4 acres less forested land. Conversely, the disadvantages of the variation are that it would cross 2 more perennial waterbodies, 1 more county/metro parks, 1.7 miles more steep slopes, 1.8 miles more sidehill construction, and is near 115 more residential-type buildings. Based on our review and the fact that the purpose of the route variation was intended to minimize impacts on residential areas, we do not find the Route 21 Route Variation provides a significant environmental advantage when compared to the corresponding segment of the proposed route and do not recommend that this variation be incorporated as part of the Projects.

3.4.6 Mount Eaton Road Route Variation

The Mount Eaton Road Variation was proposed by a landowner who is concerned about how the proposed pipeline would impact the flow of runoff water above and below ground near their property and about safety issues related to having the proposed pipeline routed in close proximity to the residence. The proposed variation runs north of the proposed route diverging from the NGT mainline at MP 54.5 and rejoining the NGT mainline at MP 56.1 (see figure 3.4.6-1 and table 3.4.6-1).

Factor	Route Variation	Proposed Route
Length (miles)	1.5	1.5
Greenfield Construction (miles) ^a	1.4	1.4
Perennial Waterbody Crossings (no.)	1	1
Agricultural Land (acres) ^b	20	20
Forested Land (acres) ^c	0.9	0.9
Steep Slopes (miles) ^d	<0.1	<0.1
Sidehill Construction (miles) ^e	<0.1	<0.1
Residential-type Structures within 150 feet Pipe Centerline (no.) ^f	4	3

a	Based on the absence of adjacent or parallel rights-of-way within 300 feet of the pipe centerline.
b	Based on a 125-foot-wide construction right-of-way in agricultural land.
c	Based on a 75-foot-wide construction right-of-way in forested land.
d	Calculated by identifying slopes greater than 20 percent.
e	Calculated by identifying slopes greater than 20 percent, and determining if the pipeline direction differed from the direction of the ground aspect.
f	Includes dwellings, detached dwellings, garages, sheds, and other buildings often associated with a residence.

The Mount Eaton Road Route Variation and the corresponding portion of the proposed route are of equal length and their impact on most environmental features would be nearly identical. There appears to be no advantage to the route variation, whereas the only disadvantage to the variation is that it would be near one additional residence-type structure. This represents merely a shift of impacts from one area and group of landowners to another area and group of landowners. To address the landowner's concerns about the flow of runoff water on their property, NEXUS would implement erosion control and revegetation procedures outlined in its *E&SCP* to ensure that construction and operation of the pipeline does not create drainage problems along the pipeline route and the proposed pipeline does not impact surface or subsurface water quality or quantities. Based on our review of the routes, we do not find the Mount Eaton Road Route Variation provides a significant environmental advantage when compared to the corresponding segment of the proposed route and do not recommend that this variation be incorporated as part of the Projects.

3.4.7 Eastern Road North Route Variation

The Eastern Road North Route Variation was suggested by a landowner concerned about impacts on forested areas and wildlife on their property. Furthermore, the landowner is concerned that placement of the proposed route would restrict their ability to construct additional buildings on their property. The variation diverges from the NGT mainline at MP 55.7 and runs north of the proposed route before it crosses to the south side and rejoins the NGT mainline at MP 62.0 (see figure 3.4.7-1 and table 3.4.7-1).

Factor	Route Variation	Proposed Route
Length (miles)	7.7	6.3
Greenfield Construction (miles) ^a	6.6	5.2
Wetland Affected (acres) ^b	0.0	0.6
Perennial Waterbody Crossings (no.)	2	1
WHPA (no.)	2	2
Agricultural Land (acres) ^c	90.9	77.3
Forested Land (acres) ^b	2.7	5.5
Steep Slopes (miles) ^d	0.2	<0.1
Sidehill Construction (miles) ^e	0.2	0.0
Residential-type Structures within 150 feet Pipe Centerline (no.) ^f	20	14
<p>a Based on the absence of adjacent or parallel rights-of-way within 300 feet of the pipe centerline.</p> <p>b Based on a 75-foot-wide construction right-of-way in wetlands and forested land.</p> <p>c Based on a 125-foot-wide construction right-of-way in agricultural land.</p> <p>d Calculated by identifying slopes greater than 20 percent.</p> <p>e Calculated by identifying slopes greater than 20 percent, and determining if the pipeline direction differed from the direction of the ground aspect.</p> <p>f Includes dwellings, detached dwellings, garages, sheds, and other buildings often associated with a residence.</p>		

The Eastern Road North Route Variation is 7.7 miles in length. The routes would have similar impacts on perennial waterbodies, WHPAs, and rugged terrain. The advantages of the route variation are that it would cross no wetlands and 2.7 acres less forested land. Conversely, the disadvantages of the variation are that it would be 1.4 miles longer, have 1.4 miles more greenfield construction, cross one more waterbody, cross 13.6 acres more agricultural land, and would be near six more residential-type structures. The purpose of the route variation is to minimize impacts on forested land, wildlife, and future development. Although it may meet some of these objectives, it would also affect more land and shift greater impacts to waterbodies, agricultural land, and residential areas. Regarding future development, landowners would continue to be able to develop their property following construction provided it does not interfere with the easement rights granted to NEXUS for construction and operation of the pipeline facilities. Based on our review of the routes, we do not find the Eastern Road North Route Variation provides a significant environmental advantage when compared to the corresponding segment of the proposed route and do not recommend that this variation be incorporated as part of the Projects.

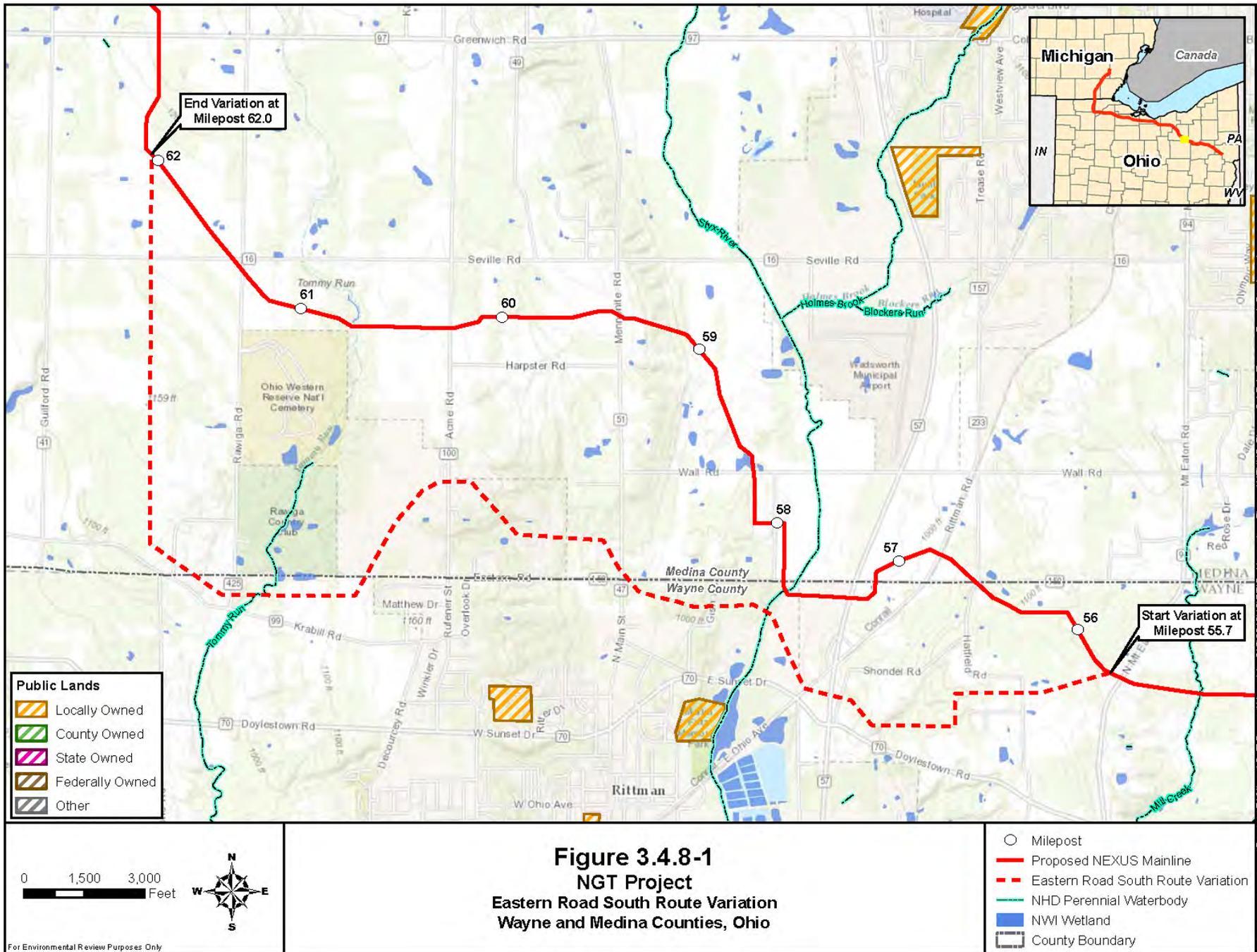
3.4.8 Eastern Road South Route Variation

The Eastern Road South Route Variation was proposed by the same landowner that proposed the Eastern Road North Route Variation, and for the same reasons. The route variation diverges from the NGT mainline at MP 55.7 and runs south of the proposed route until it rejoins the NGT mainline at MP 62.0 (see figure 3.4.8-1 and table 3.4.8-1).

Factor	Route Variation	Proposed Route
Length (miles)	9.9	6.3
Greenfield Construction (miles) ^a	6.3	5.2
Wetland Affected (acres) ^b	0	0.8
Perennial Waterbody Crossings (no.)	2	1
WHPA (no.)	2	2
Agricultural Land (acres) ^c	86.4	77.3
Forested Land (acres) ^b	9.1	5.5
Steep Slopes (miles) ^d	0.3	<0.1
Sidehill Construction (miles) ^e	0.2	0.0
Residential-type Structures within 150 feet Pipe Centerline (no.) ^f	29	14

a Based on the absence of adjacent or parallel rights-of-way within 300 feet of the pipe centerline.
b Based on a 75-foot-wide construction right-of-way in wetlands and forested land.
c Based on a 125-foot-wide construction right-of-way in agricultural land.
d Calculated by identifying slopes greater than 20 percent.
e Calculated by identifying slopes greater than 20 percent, and determining if the pipeline direction differed from the direction of the ground aspect.
f Includes dwellings, detached dwellings, garages, sheds, and other buildings often associated with a residence.

The Eastern Road South Route Variation is 9.9 mile in length. The routes would have similar impacts on perennial waterbodies, WHPAs, and rugged terrain. The advantage of the route variation is that it crosses no wetlands. Conversely, the disadvantages of the variation are that it would be 3.6 miles longer than the proposed route, have 1.1 miles more greenfield construction, cross 1 additional waterbody, cross 9.1 acre more agricultural land, cross 3.6 acre more forested land, and is near 15 more residential structures. The purpose of the route variation is to minimize impacts on forested land, wildlife, and future development. The route variation does not meet these objectives and would increase impacts on other resources. Regarding future development, landowners would continue to be able to develop their property following construction provided it does not interfere with the easement rights granted to NEXUS for construction and operation of the pipeline facilities. Based on our review of these routes, we do not find the Eastern Road South Route Variation provides a significant environmental advantage when compared to the corresponding segment of the proposed route and do not recommend that this variation be incorporated as part of the Projects.



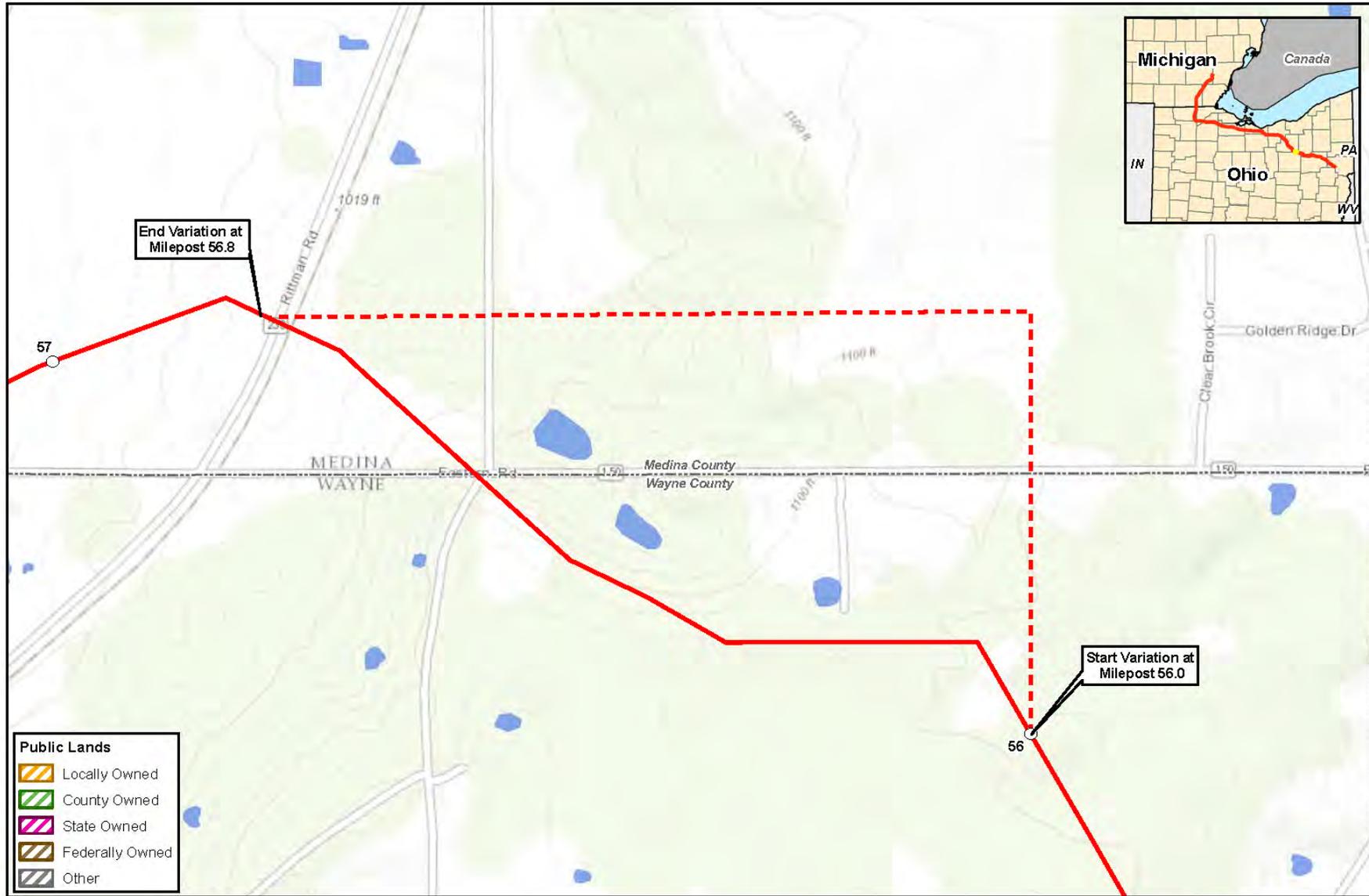
3.4.9 Pifer Road Route Variation

The Pifer Road Route Variation was proposed by a landowner that was concerned about the impacts on wildlife and spring fed wells located on their property. The variation diverges from the NGT mainline at MP 56.0 and runs north and then west along a sewer line easement until it rejoins the NGT mainline at MP 56.8 (see figure 3.4.9-1 and table 3.4.9-1).

Factor	Route Variation	Proposed Route
Length (miles)	1.0	0.8
Greenfield Construction (miles) ^a	0.7	0.6
Agricultural Land (acres) ^b	6.1	7.6
Forested Land (acres) ^c	4.5	1.8
Steep Slopes (miles) ^d	0.0	<0.1
Sidehill Construction (miles) ^e	0.0	<0.1
Residential-type Structures within 150 feet Pipe Centerline (no.) ^f	1	4

a	Based on the absence of adjacent or parallel rights-of-way within 300 feet of the pipe centerline.
b	Based on a 125-foot-wide construction right-of-way in agricultural land.
c	Based on a 75-foot-wide construction right-of-way in forested land.
d	Calculated by identifying slopes greater than 20 percent.
e	Calculated by identifying slopes greater than 20 percent, and determining if the pipeline direction differed from the direction of the ground aspect.
f	Includes dwellings, detached dwellings, garages, sheds, and other buildings often associated with a residence.

The Pifer Road Route Variation is 1.0 mile in length. The route variation and proposed route would have similar impacts on most resources. The main advantages of the route variation are that it would cross 1.5 acres less agricultural land and is near three fewer residential-type structures. Conversely, the main disadvantage of route variation is that it has crosses 2.7 acres more forested land. The purpose of the route variation is to reduce impacts on wildlife and spring fed wells located on their property. We note that the proposed route is not within 150 feet of any recorded wells on the landowner’s property and the additional forest clearing associated with the variation may actually increase impacts on wildlife. Further, the variation appears to merely shift impacts to a different group of landowners. Based on our comparison of the environmental impacts of the two routes, we do not find the Pifer Road Route Variation provides a significant environmental advantage when compared to the corresponding segment of the proposed route and do not recommend that this variation be incorporated as part of the Projects.



Public Lands

- Locally Owned
- County Owned
- State Owned
- Federally Owned
- Other

0 300 600 Feet

Figure 3.4.9-1
NGT Project
Pifer Road Route Variation
Wayne and Medina Counties, Ohio

- Milepost
- Proposed NEXUS Mainline
- Pifer Road Route Variation
- NHD Perennial Waterbody
- NWI Wetland
- County Boundary

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Source: USGS, National Wetland Inventory, 2001; USGS, National Hydrography Dataset, 2004; USGS, National Topographic Map Series, 2004; USGS, National Wetland Inventory, 2001; USGS, National Hydrography Dataset, 2004; USGS, National Topographic Map Series, 2004

3.4.10 Mennonite Road Route Variation

The Mennonite Road Route Variation was proposed by a landowner with concerns about the potential impacts the proposed route would have on the watershed and drain tile subsystem located on his property. This variation diverges from the NGT mainline at MP 59.6 and rejoins NGT mainline at MP 60.2 (see figure 3.4.10-1 and table 3.4.10-1).

TABLE 3.4.10-1		
Analysis of the Mennonite Road Route Variation		
Factor	Route Variation	Proposed Route
Length (miles)	0.6	0.6
Greenfield Construction (miles) ^a	0.6	0.6
Agricultural Land (acres) ^b	9.1	7.6
Forested Land (acres) ^c	0.5	0.5
<hr/> a Based on not having an adjacent or parallel rights-of-way within 300 feet of the pipe centerline. b Based on a 125-foot-wide construction right-of-way in agricultural land. c Based on a 75-foot-wide construction right-of-way in forested land.		

The Mennonite Road Route Variation is the same length as the proposed route and the impacts on environmental features would be identical, except that the route variation crosses 1.5 acres more agricultural land. The variation appears to merely shift impacts from one group of landowners to a different group of landowners. NEXUS developed a *Drain Tile Mitigation Plan* to address landowner concerns about impacts on drain tile systems. The plan identifies procedures to be implemented before, during, and after construction to minimize impacts on drain tile systems. Prior to the start of construction, NEXUS would work with landowners to identify the type of drain system in place and to develop strategies to mitigate impacts. After completion of construction, NEXUS would repair drain tiles, as needed, restore the area to preconstruction conditions, and conduct post-construction monitoring to ensure successful restoration of the area. Based on our comparison of the environmental impacts of each route, and our review of NEXUS' *Drain Tile Mitigation Plan*, we do not find the Mennonite Road Route Variation provides a significant environmental advantage when compared to the corresponding segment of the proposed route and do not recommend that this variation be incorporated as part of the Projects.

3.4.11 Chippewa Lake Route Variations

Stakeholders expressed concern regarding the impacts that the proposed route would have near Chippewa Lake on the local hydrology and flooding, the watershed district, Buck Creek, Chippewa Lake, Buckeye Woods Park, and a number of housing developments and other facilities. One landowner was particularly concerned that forest clearing upstream of the Muskingum Watershed Conservancy District’s Flood Control Structure II-A (Structure II-A) could adversely affect runoff and exacerbate the already problematic flooding that occurs periodically in the area. Stakeholders and NEXUS suggested various route variations to address these issues. Those route variations are the subject of the Chippewa Lake A, Chippewa Lake B, and Chippewa Lake C Route Variations discussed below.

The Chippewa Subdistrict of the Muskingum Watershed Conservancy District (Chippewa MWCD) operates eight different flood control dams throughout the 120,320-acre watershed (Chippewa MWCD, 2016). Structure II-A was constructed along Buck Creek in 1969 and has an upstream drainage area of 1,665 acres. The landowner has also expressed concern that the proposed pipeline route would increase flooding upstream of Structure II-A by converting the permanent right-of-way from forested land to an open grassland.

The proposed project intersects forested land within the 1,616-acre watershed that drains into Structure II-A for a total of 0.7 mile. The permanent easement throughout the subwatershed would be 50 feet wide, resulting in the conversion of 4.0 acres of forest to grassland. The change in runoff that would result from this conversion was calculated using the rational method (Chin, 2000). The rational method is one of the most commonly used procedures for calculating peak discharge from small watersheds and calculates discharge based on a combination of rainfall intensity, drainage area, and a runoff coefficient specific to land use.

Small drainages ranging from 285.6 to 616.9 acres were delineated for the proposed route based on topography in order to assess the impacts of right-of-way conversion on peak discharge using the rational method. The 10-year, 1-hour rainfall for this part of Ohio is approximately 1.7 inches and the 100-year, 1-hour rainfall is approximately 2.6 inches. The post-construction analysis involved converting all forested land (runoff coefficient of 0.15) within the 50-foot permanent right-of-way to maintained grassland (runoff coefficient of 0.30). The proposed project crosses Drainages B, C, and D (see figure 3.4.11-1). The analysis evaluates the relative changes in rainfall-runoff processes as a result of the proposed project.

Table 3.4.11-1 shows that the impact of converting the right-of-way from forested to grassland within the Structure II-A drainage area is minor; it only increases the 10-year flood flow by 1.1 cubic feet per second (cfs) (0.15 percent) and increases the 100-year flood flow by 1.7 cfs (0.14 percent).

Measurement	Drainage A	Drainage B	Drainage C	Drainage D	Total
Size (acres)	616.9	285.6	400.9	312.9	1616.3
Pre-construction					
Runoff Coefficient	0.2870	0.2505	0.2447	0.2837	0.2694 (area weighted avg.)
10-year peak discharge (cfs)	301.0	121.6	166.7	150.9	740.2
100-year peak discharge (cfs)	478.0	193.1	264.8	239.7	1175.6
Post-construction					
Runoff Coefficient	0.2870	0.2506	0.2457	0.2842	0.2698 (area weighted avg.)
10-year peak discharge (cfs)	301.0	121.7	167.5	151.2	741.3
100-year peak discharge (cfs)	478.0	193.2	266.0	240.1	1177.3

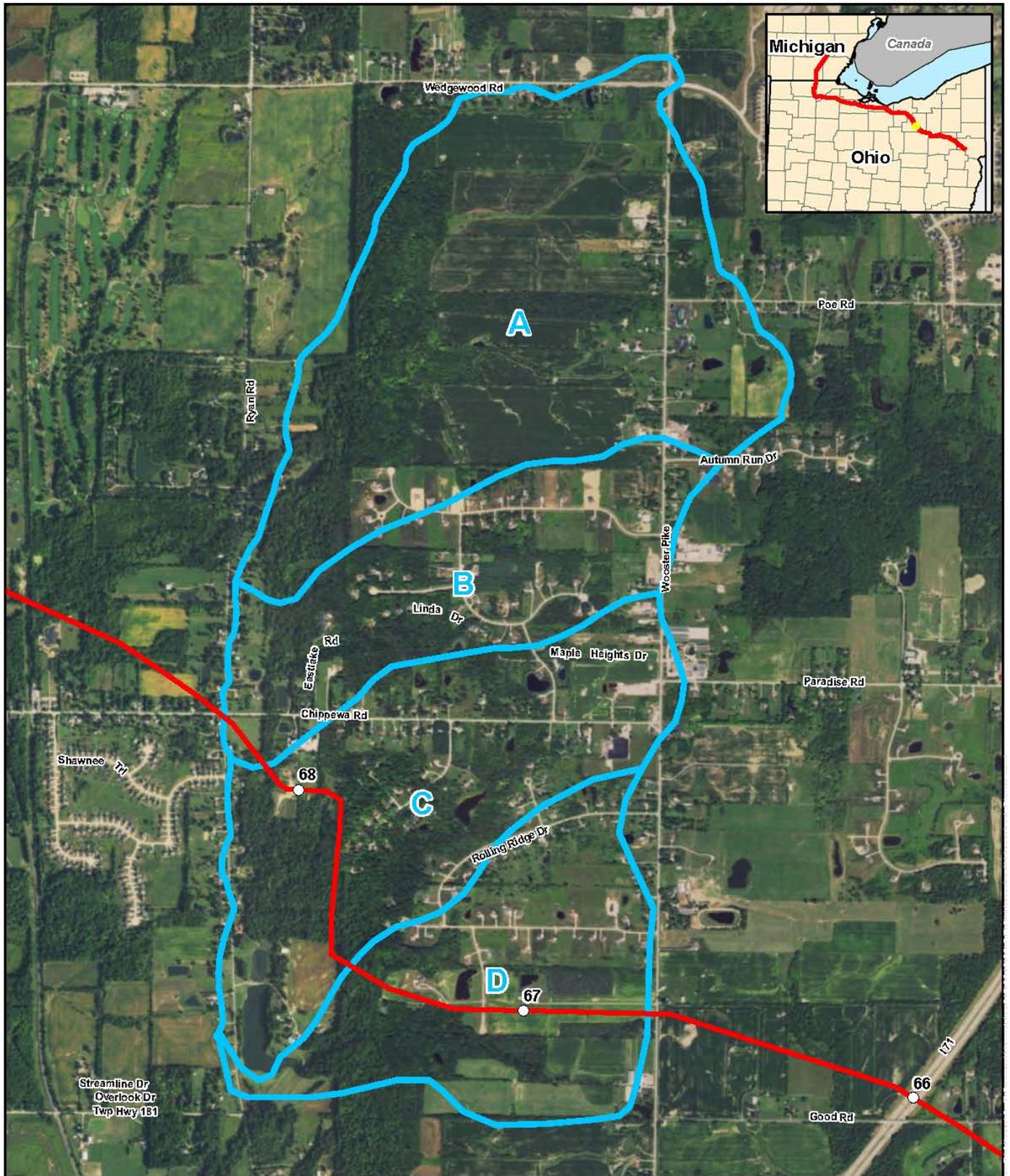


Figure 3.4.11-1
NGT Project
Chippewa Hydrologic Assessment

- Milepost
- Proposed NEXUS Mainline Pipeline
- Drainage

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The Chippewa Lake A Route Variation diverges from the NGT Mainline at MP 66.1 and runs east of the proposed route, then rejoins the NGT mainline at MP 71.4. The Chippewa Lake B Route Variation is similar to the Chippewa Lake A Route variation as it deviates from the proposed route at MP 66.1, but rejoins the route farther to the north at MP 73.6. The Chippewa Lake C Route Variation diverges from the NGT Mainline at MP 66.1 and runs east of the proposed route, then rejoins the NGT mainline at MP 72.5. See figure 3.4.11-2 and tables 3.4.11-2 through 3.4.11-4 for comparisons of each variation and the proposed route.

Factor	Route Variation	Proposed Route
Length (miles)	5.8	5.4
Greenfield Construction (miles) ^a	4.7	4.9
Wetland Affected (acres) ^b	4.5	4.5
Perennial Waterbody Crossings (no.)	1	4
Agricultural Land (acres) ^c	54.5	53.0
Forested Land (acres) ^b	12.7	14.5
County/Metro Parks (no./mile)	1/0.7 ^d	2/0.2 ^e
Steep Slopes (miles) ^f	<0.1	0.1
Sidehill Construction (miles) ^g	<0.1	0.1
Residential-type Structures within 150 feet Pipe Centerline (no.) ^h	12	18

a	Based on the absence of adjacent or parallel rights-of-way within 300 feet of the pipe centerline.
b	Based on a 75-foot-wide construction right-of-way in wetlands and forested land.
c	Based on a 125-foot-wide construction right-of-way in agricultural land.
d	Buckeye Woods Park.
e	Buckeye Woods Park; Chippewa Lake Nature Areas.
f	Calculated by identifying slopes greater than 20 percent.
g	Calculated by identifying slopes greater than 20 percent, and determining if the pipeline direction differed from the direction of the ground aspect.
h	Includes dwellings, detached dwellings, garages, sheds, and other buildings often associated with a residence.

The Chippewa Lake A Route Variation is 5.8 miles in length, which is 0.4 mile longer than the proposed route. Both routes would cross equal amounts of wetlands and would result in similar impact from greenfield construction, crossing steep slopes, and sidehill construction. The advantages of the route variation are that it would cross three fewer perennial waterbodies, minimizes construction impacts on residential areas, avoids one designated nature area, and reduces impacts associated with crossing forested land. Although the variation would avoid crossing the Chippewa Lake Nature Areas, it increases the crossing and impacts on Buckeye Woods Park. Overall, it appears that the proposed route meets more stakeholder concerns than the route alternative in that it would have only minor impacts on local hydrology, flooding, and the watershed district; the proposed route does not directly cross Buck Creek or Chippewa Lake; and the proposed route minimizes the crossing of Buckeye Woods Park. Therefore, we do not recommend that the Chippewa Lake A Route Variation be incorporated as part of the Projects.

TABLE 3.4.11-3

Analysis of the Chippewa Lake B Route Variation

Factor	Route Variation	Proposed Route
Length (miles)	7.5	7.6
Greenfield Construction (miles) ^a	4.0	6.5
Wetland Affected (acres) ^b	0.2	0.6
Perennial Waterbody Crossings (no.)	1	4
Agricultural Land (acres) ^c	62.1	74.2
Forested Land (acres) ^b	21.8	19.1
County/Metro Parks (no./mile)	1/0.1 ^d	2/0.2 ^e
Steep Slopes (miles) ^f	0.1	0.1
Sidehill Construction (miles) ^g	0.1	0.2
Residential-type Structures within 150 feet Pipe Centerline (no.) ^h	18	28

a Based on the absence of adjacent or parallel rights-of-way within 300 feet of the pipe centerline.

b Based on a 75-foot-wide construction right-of-way in wetlands and forested land.

c Based on a 125-foot-wide construction right-of-way in agricultural land.

d Buckeye Woods Park.

e Buckeye Woods Park; Chippewa Lake Nature Areas.

f Calculated by identifying slopes greater than 20 percent.

g Calculated by identifying slopes greater than 20 percent, and determining if the pipeline direction differed from the direction of the ground aspect.

h Includes dwellings, detached dwellings, garages, sheds, and other buildings often associated with a residence.

The Chippewa Lake B Route Variation is 7.5 miles long, which is similar in length to the proposed route and would result in similar impacts from crossing steep slopes and sidehill construction. The advantages of the route variation are that it would have 2.5 fewer miles of greenfield construction, cross 3.6 acres less wetlands, 3 fewer perennial waterbodies, 2 fewer WHPAs, 12.1 acres less agricultural land, and is near 10 fewer residential-type structures. The variation also avoids crossing the Chippewa Lake Nature Areas. Conversely, the primary disadvantages of the route variation are that it would result in clearing 2.7 acres more forested land. Based on the environmental comparison of the two routes, it appears that the Chippewa Lake B Route Variation may be preferable; however, the Chippewa Lake D Route Variation (see below and table 3.4.11-4), which shares much of the same route as Chippewa Lake B, appears to have an even greater advantage and has been recommended for incorporation in the Projects. Based on the recommendation to adopt the Chippewa Lake D Route Variation below, we do not recommend that the Chippewa Lake B Route Variation be incorporated as part of the Projects.

The Chippewa Lake C Route Variation is 7.2 miles in length, which is 0.7 mile longer than the proposed route. The routes would have similar impacts related to crossing steep slopes and sidehill construction. The advantages of the route variation are that it would have 1.5 fewer miles of greenfield construction, crosses 3 fewer perennial waterbodies, minimizes wetland crossings, and reduces construction impacts on residential areas by about half. The variation also avoids crossing the Chippewa Lake Nature Areas. Conversely, the minor disadvantages of the variation are the long-term impacts for crossing 1.8 acres more forested land and the construction related impacts associated with longer length.

TABLE 3.4.11-4

Analysis of the Chippewa Lake C Route Variation

Factor	Route Variation	Proposed Route
Length (miles)	7.2	6.5
Greenfield Construction (miles) ^a	4.4	5.9
Wetland Affected (acres) ^b	0.9	4.5
Perennial Waterbody Crossings (no.)	1	4
Agricultural Land (acres) ^c	59.1	62.1
Forested Land (acres) ^b	19.1	17.3
County/Metro Parks (no./mile)	1/0.1 ^d	2/0.2 ^e
Steep Slopes (miles) ^f	<0.1	0.1
Sidehill Construction (miles) ^g	<0.1	0.1
Residential-type Structures within 150 feet Pipe Centerline (no.) ^h	10	23

a Based on the absence of adjacent or parallel rights-of-way within 300 feet of the pipe centerline.
b Based on a 75-foot-wide construction right-of-way in wetlands and forested land.
c Based on a 125-foot-wide construction right-of-way in agricultural land.
d Buckeye Woods Park.
e Buckeye Woods Park; Chippewa Lake Nature Areas.
f Calculated by identifying slopes greater than 20 percent.
g Calculated by identifying slopes greater than 20 percent, and determining if the pipeline direction differed from the direction of the ground aspect.
h Includes dwellings, detached dwellings, garages, sheds, and other buildings often associated with a residence.

In the draft EIS, we concluded that the Chippewa Lake C Route Variation offered a substantial environmental advantage in comparison to the corresponding segment of the proposed route and recommended that NEXUS incorporate the variation into the NGT Project route. However, during the draft EIS comment period, NEXUS identified certain constraints within the variation, and proposed revisions to address these constraints (see Response 14a of NEXUS' July 26, 2016 filing to the Commission in FERC accession number 20160726-5168, and Response 14a of NEXUS' August 26, 2016 filing to the Commission in FERC accession number 20160826-5230). The revised variation proposed by NEXUS is referred to as the Chippewa Lake D Route Variation in this EIS.

The Chippewa Lake D Route Variation diverges from the NGT Mainline at MP 66.1 and runs east of the proposed route, then rejoins the NGT mainline at MP 72.5. The Chippewa Lake D Route Variation is similar to the Chippewa Lake C Route variation, but has been adjusted in several location to avoid impacts on wetlands, forests, residential structures, planned developments, and an unmarked cemetery. Notably, Friends of Medina County Parks, Inc. indicated during the draft EIS comment period that a small section of the Buckeye Woods Park known as the County Home Cemetery would have been crossed by the Chippewa Lake C Route Variation. According to Friends of Medina County Parks, Inc., this section of the park contains an unmapped, unmarked cemetery that was used for the burial of indigent residents of the county home for many years. NEXUS revised the route in this area to avoid the park and cemetery. Also, the owner of the Medina Country Club indicated during the draft EIS comment period that the proposed Chippewa Lake C Route Variation would cross an area of planned residential development. NEXUS coordinated with the owner to identify a route across the owner's property that would not conflict with the planned developments, as reflected in the Chippewa Lake D Route Variation. See figure 3.4.11-2 and table 3.4.11-5 for a comparisons of the variation and the proposed route.

TABLE 3.4.11-5

Analysis of the Chippewa Lake D Route Variation

Factor	Route Variation	Proposed Route
Length (miles)	6.8	6.5
Greenfield Construction (miles) ^a	5.2	5.9
Wetland Affected (acres) ^b	1.50	4.5
Perennial Waterbody Crossings (no.)	1	4
Agricultural Land (acres) ^c	69.4	62.9
Forested Land (acres) ^b	11.1	17.3
County/Metro Parks (no./mile)	0/0.0	2/0.2 ^d
Steep Slopes (miles) ^e	<0.1	0.1
Sidehill Construction (miles) ^f	<0.1	0.1
Residential-type Structures within 150 feet Pipe Centerline (no.) ^g	11	23

^a Based on the absence of adjacent or parallel rights-of-way within 300 feet of the pipe centerline.
^b Based on a 75-foot-wide construction right-of-way in wetlands and forested land.
^c Based on a 125-foot-wide construction right-of-way in agricultural land.
^d Buckeye Woods Park; Chippewa Lake Nature Areas.
^e Calculated by identifying slopes greater than 20 percent.
^f Calculated by identifying slopes greater than 20 percent, and determining if the pipeline direction differed from the direction of the ground aspect.
^g Includes dwellings, detached dwellings, garages, sheds, and other buildings often associated with a residence.

The Chippewa Lake D Route Variation is 6.8 miles in length, which is 0.3 mile longer than the proposed route. The routes would have similar impacts related to crossing steep slopes and sidehill construction. The advantages of the route variation are that it would have 0.7 fewer miles of greenfield construction, crosses 3 fewer perennial waterbodies, reduces wetland crossings, reduces forested crossings, and reduces construction impacts on residential areas by about half. The variation would also completely avoid the crossing of county/metro parks, including the County Home Cemetery. The only disadvantages of the variation are the construction-related impacts associated with its slightly longer length and crossing of more agricultural land.

On October 6, 2016, the Commission staff provided all newly identified potentially affected landowners along the Chippewa D Route Variation with the opportunity to participate in the environmental review process. Since these parties had only recently been identified as potentially affected, FERC provided a special comment period ending November 7, 2016.

During the draft EIS comment period, NEXUS also identified workspace changes that would be required to accommodate the Chippewa Lake D Route Variation. Table 3.4.11-6 summarizes the workspace changes proposed by NEXUS. Appendices F-4, F-5, and F-6 list each ATWS, staging area, and access road change, respectively.

TABLE 3.4.11-6

Summary of Proposed Workspace Changes to Accommodate the Chippewa Lake D Route Variation

Workspace Type	Change in Temporary Workspace	Change in Permanent Easement
Pipeline Right-of-Way ^a	+ 6.6 acres	+ 1.7 acres
ATWS	- 9.0 acres	-
Staging Areas	- 1.2 acres	-
Access Roads	+ 2.5 acres	-
Total	- 1.1 acres	+ 1.7 acres

^a Includes temporary and permanent easements for cathodic protection anode beds.

We note that NEXUS placed portions of three ATWS (ATWS-4583, -4689, and -4592) on the Chippewa Lake D Route variation in wetlands even though the area is not farmed and does not appear to be previously disturbed. In all three cases we find the placement of ATWS within wetlands acceptable because the workspaces are necessary for road crossing construction. ATWS, staging area, and access roads modifications that would be required for the Chippewa Lake D Route Variation are listed by milepost in appendices F-4, F-5, and F-6, respectively. Overall, it appears that the Chippewa Lake D Route Variation offers a substantial environmental advantage in comparison to the corresponding segment of the proposed route. Therefore, **we recommend that:**

- **Prior to construction, NEXUS should incorporate into its NGT Project plans the proposed centerline adjustments and workspace modifications associated with the Chippewa Lake D Route Variation from MP 66.1 to MP 72.5, as identified on the alignment sheets provided in Attachment 4 – Response 14a-2 of its August 26, 2016 filing to the Commission (see FERC accession number 20160826-5230).**

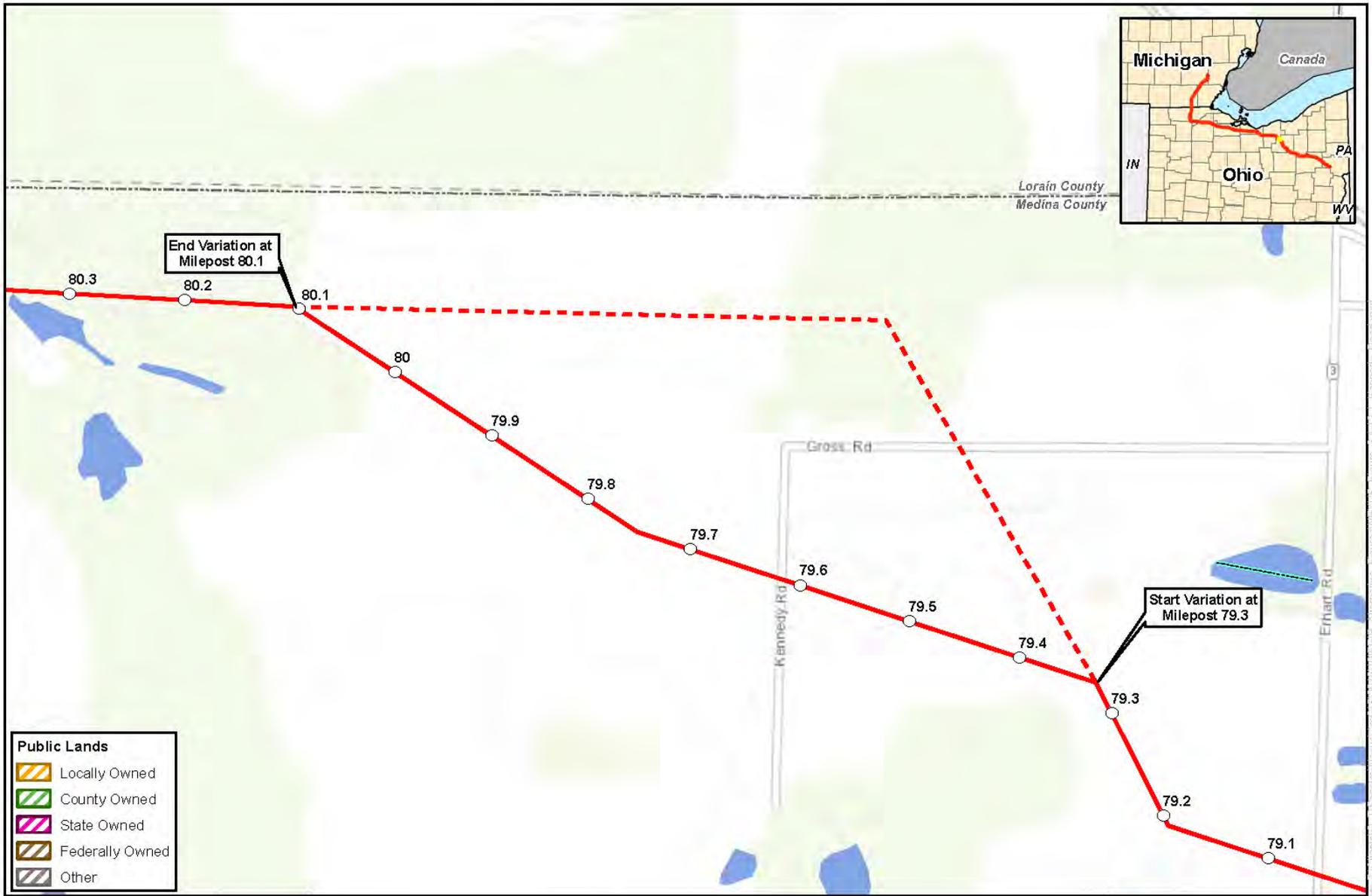
3.4.12 Kennedy Road Route Variation

The Kennedy Road Route Variation was proposed by a landowner with concerns about the proximity of the proposed route to their residence and the potential for damage to drain tile systems within their agricultural fields. The variation diverges from the NGT mainline at MP 79.3 and rejoins the NGT mainline at MP 80.1 (see figure 3.4.12-1 and table 3.4.12-1).

Factor	Route Variation	Proposed Route
Length (miles)	0.9	0.8
Greenfield Construction (miles) ^a	0.5	0.5
Agricultural Land (acres) ^b	10.6	12.1
Forested Land (acres) ^c	1.8	0.0

a Based on the absence of adjacent or parallel rights-of-way within 300 feet of the pipe centerline.
b Based on a 125-foot-wide construction right-of-way in agricultural land.
c Based on a 75-foot-wide construction right-of-way in forested land.

The Kennedy Road Route Variation is 0.9 mile long. The routes have similar impacts related on most resources, except that less agricultural land and more forested land would be affected by the route variation. Overall, the route variation appears to merely shift impacts from one set of landowners to another. The landowner who requested the route variation has a home that is about 325 feet from the proposed route centerline. The pipeline must be designed, constructed, operated, and maintained in accordance with DOT safety standards, which are intended to ensure adequate protection for the public and nearby homeowners. With regard to drain tiles, NEXUS developed a *Drain Tile Mitigation Plan* that identifies procedures to be implemented before, during, and after construction to minimize impacts on drain tile systems. Based on our environmental review of both routes, we do not find the Kennedy Road Route Variation provides a significant environmental advantage when compared to the corresponding segment of the proposed route and do not recommend that this variation be incorporated as part of the Projects.



Public Lands	
	Locally Owned
	County Owned
	State Owned
	Federally Owned
	Other

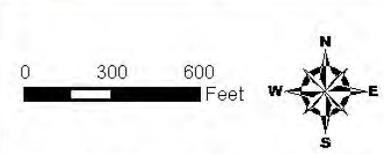


Figure 3.4.12-1
NGT Project
Kennedy Road Route Variation
Medina County, Ohio

- Milepost
- Proposed NEXUS Mainline
- Kennedy Road Route Variation
- NHD Perennial Waterbody
- NWI Wetland
- County Boundary

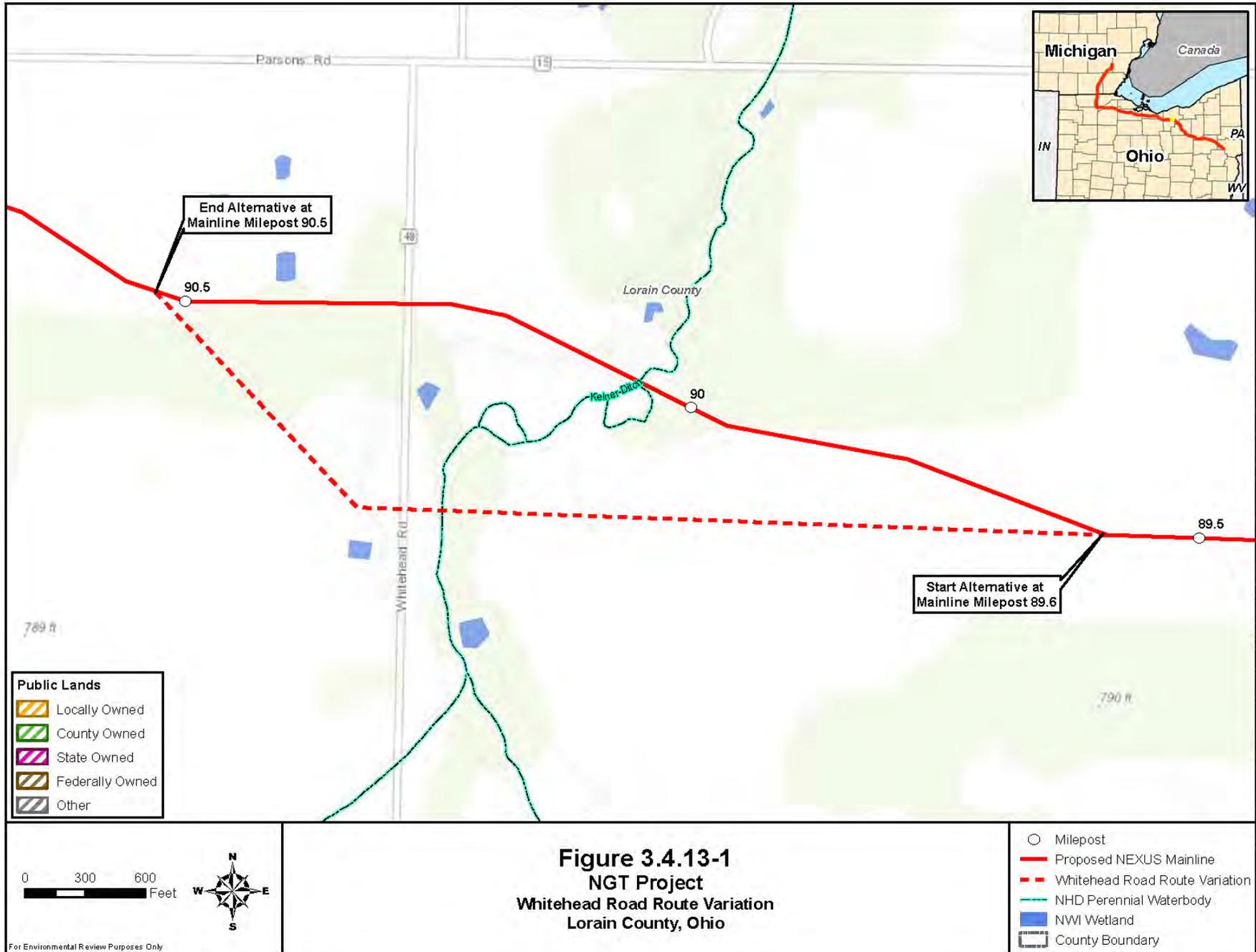
3.4.13 Whitehead Road Route Variation

The Whitehead Road Route Variation was proposed by a landowner who requested that the route be moved to co-locate with the existing pipeline on their property instead of cutting diagonally across their property. The route variation diverges from the NGT mainline at MP 89.6 and rejoins the NGT mainline at MP 90.5 (see figure 3.4.13-1 and table 3.4.13-1).

TABLE 3.4.13-1		
Analysis of the Whitehead Road Route Variation		
Factor	Route Variation	Proposed Route
Length (miles)	1.0	0.9
Greenfield Construction (miles) ^a	0.2	0.8

^a Based on the absence of adjacent or parallel rights-of-way within 300 feet of the pipe centerline.

The Whitehead Road Route Variation is 1.0 mile long, which is 0.1 mile longer than the proposed route. The advantages of the route variation is that it would be co-located with an existing pipeline on the landowner’s parcel. However, the pipeline would need to diverge from the existing pipeline on neighboring parcels and cross diagonally through those parcels instead. Based on our review, the Whitehead Road Route Variation does not provide a significant environmental advantage over the proposed route and we do not recommend that this variation be incorporated as part of the Projects.



3.4.14 Reserve Avenue Route Variation

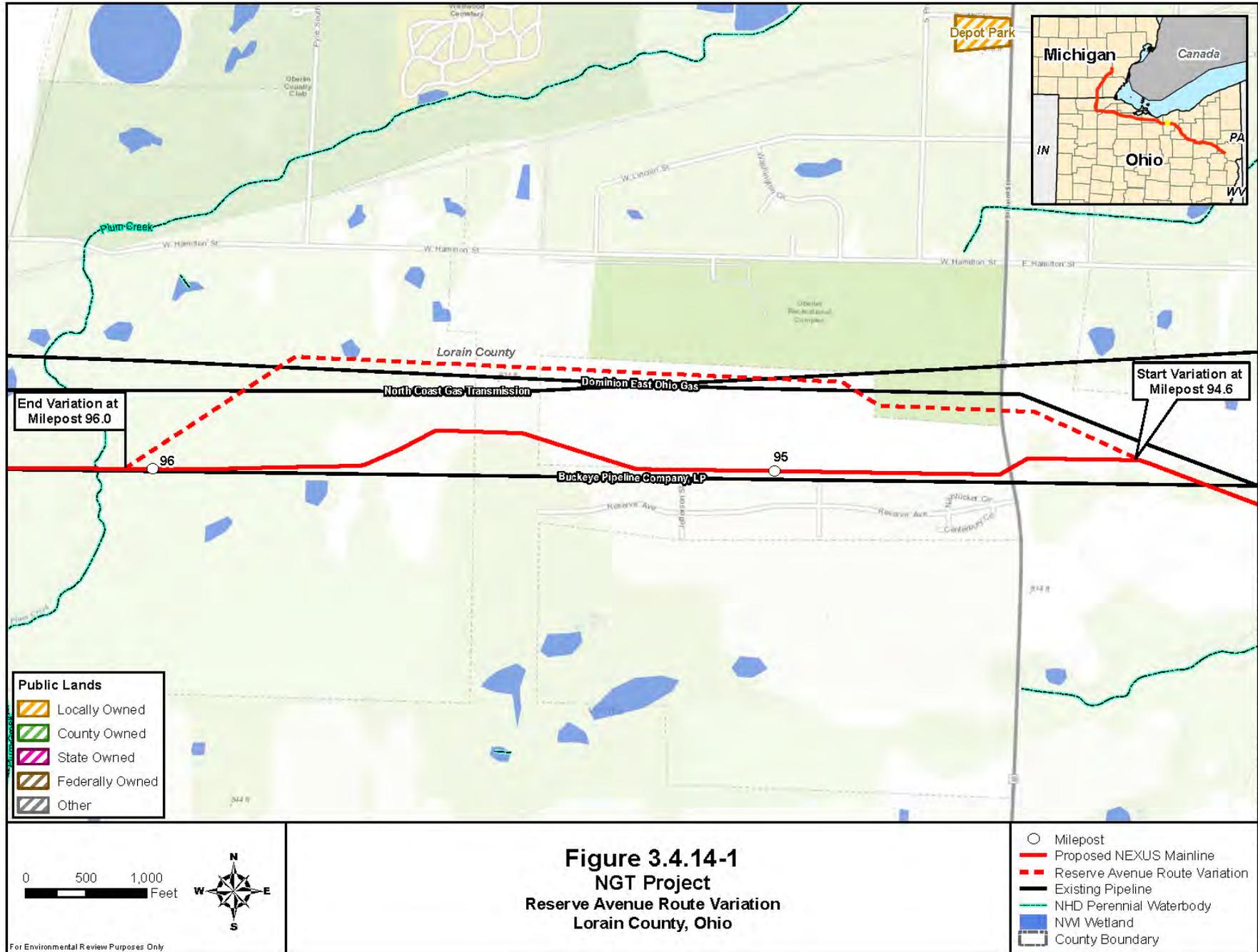
The Reserve Avenue Route Variation was proposed by a condominium owner who is concerned with the close proximity of the proposed route to their residence and other single family residences in the area. The landowner’s primary concern is that the proposed route would be unsafe and would negatively impact their property values. The variation diverges from the NGT mainline at MP 94.6 and rejoins the NGT mainline at MP 96.0 (see figure 3.4.14-1 and table 3.4.14-1).

Factor	Route Variation	Proposed Route
Length (miles)	1.7	1.6
Greenfield Construction (miles) ^a	0.4	0.4
Co-location with Existing Utility ^b	1.3	1.2
Agricultural Land (acres) ^d	22.7	19.7
Forested Land (acres) ^c	0.0	1.8
Residential-type Structures within 150 feet Pipe Centerline (no.) ^e	9	25

^a Based on the absence of adjacent or parallel rights-of-way within 300 feet of the pipe centerline.
^b Based on the presence of adjacent or parallel rights-of-way within 300 feet of the pipe centerline.
^c Based on a 75-foot-wide construction right-of-way in wetlands and forested land.
^d Based on a 125-foot-wide construction right-of-way in agricultural land.
^e Includes dwellings, detached dwellings, garages, sheds, and other buildings often associated with a residence.

The Reserve Avenue Route Variation is 1.7 miles long, which is 0.1 mile longer than the proposed route. The routes have similar impacts on most resources, except that the route variation would have no impact on forested land and reduces construction impacts on residential areas compared to the proposed route. The disadvantages of the route variation are that it is 0.1 mile longer and crosses 0.2 more mile of agricultural land. As we discussed for the Chippewa Lake Variations, the Projects must be constructed in accordance with DOT's safety regulations, and would be considered safe regardless of population density.

NEXUS filed information during the draft EIS comment period specifically illustrating the location of existing underground pipelines in the vicinity of the proposed route and route variation. Based on this information, it is evident that the route variation would conflict with existing pipelines in several areas and require multiple pipeline crossovers, whereas the proposed route would be more suitable for a new pipeline. Further, NEXUS filed information indicating that one of the main landowners affected by the Projects requested that the pipeline on their property be aligned along the proposed route to avoid conflicts with future development. For these reasons, we do not find the Reserve Avenue Route Variation provides a significant environmental advantage when compared to the corresponding segment of the proposed route and do not recommend that this variation be incorporated as part of the Projects.



3.4.15 Butler Road Route Variation

The Butler Road Route Variation was developed at the request of a landowner with concerns about the proposed route crossing their land. This variation proposed by the landowner would reroute the proposed pipeline behind a forested area which would act as a buffer between the landowner’s residences and would not limit the use of their land for farming. The route variation diverges from the NGT mainline at MP 102.4 and rejoins NGT mainline at MP 103.7 (see figure 3.4.15-1 and table 3.4.15-1).

Factor	Route Variation	Proposed Route
Length (miles)	1.4	1.4
Greenfield Construction (miles) ^a	1.4	1.4
Agricultural Land (acres) ^b	21.2	25.8

a Based on the absence of adjacent or parallel rights-of-way within 300 feet of the pipe centerline.
b Based on a 125-foot-wide construction right-of-way in agricultural land.

The Butler Road Route Variation is 1.4 miles in length, which is the same as the proposed route. The environmental effects of the route variation and proposed route are similar, except that the route variation crosses slightly less agricultural land than the proposed route.

During the draft EIS comment period we received a comment suggesting that in addition to affecting more agricultural land, the proposed route also would disturb a waterbody that provides in-stream migratory fish habitat and monarch butterfly habitat on the streambank. The commenter also indicated the proposed route would be nearer to three residences than the variation, which would put the safety of the residents at risk and reduce property values.

A review of aerial photography confirms that both the proposed route and route variation would cross a tributary to Frankenburg Creek. NEXUS is proposing to cross the waterbody using a dry cut method, which is intended to minimize construction impacts on the waterbody bed and banks (see section 4.3.2.2). The tributary is not designated as containing federally or state-listed threatened or endangered species and/or critical habitats, nor is it afforded any national or state designated status as a sensitive surface water. Any individual or cumulative impacts on migratory fish or monarch butterfly habitat would be insignificant.

There are no residences within 150 feet of either the proposed route or route variation. Although the proposed route may be closer to three residences than the variation, the nearest residences to the proposed route are more than 250 feet away. With regard to pipeline safety, we reiterate that DOT safety standards are intended to ensure adequate protection regardless of proximity to residences. The pipelines must be designed, constructed, operated, and maintained in accordance with these safety standards (see section 4.13). As for comments on property values, we refer the reader to section 4.10.8 of this EIS where we find no conclusive evidence indicating that natural gas pipeline easements would have a negative impact on property values. NEXUS would compensate landowners for an easement on their property and landowners would continue to have use of their property following construction provided it does not interfere with the easement rights granted to NEXUS for construction and operation of the pipeline facilities. For example, no new trees or structures would be allowed within the 50-foot-wide permanent right-of-way, including houses, decks, playgrounds, tool sheds, garages, poles, guy wires, catch basins, swimming pools, trailers, leach fields, septic tanks, or other structures not easily removed. Semi-permanent structures that would be permitted to be used on the permanent right-of-way include items such as swing sets, sporting equipment, miniature swimming pools, doghouses, and gardens that are easily removed.

During the draft EIS comment period, the landowner submitted a map with a slightly different version of the route variation than discussed above. The Revised Butler Road Route Variation is shorter than the original route variation and would diverge from the NGT mainline at MP 102.6 and rejoin the NGT mainline at MP 103.4 (see figure 3.4.15-1 and table 3.4.15-2).

Factor	Route Variation	Proposed Route
Length (miles)	0.9	0.8
Greenfield Construction (miles) ^a	0.9	0.8
Agricultural Land (acres) ^b	13.6	12.6

a Based on the absence of adjacent or parallel rights-of-way within 300 feet of the pipe centerline.
b Based on a 125-foot-wide construction right-of-way in agricultural land.

The environmental effects of the Revised Butler Road Route Variation and proposed route are similar. No new or additional impacts would be avoided or mitigated by the revised route variation. Based on our environmental review of both routes, we do not find the Butler Road Route Variation or Revised Butler Road Route Variation provides a significant environmental advantage when compared to the corresponding segment of the proposed route and do not recommend that either variation be incorporated as part of the Projects.

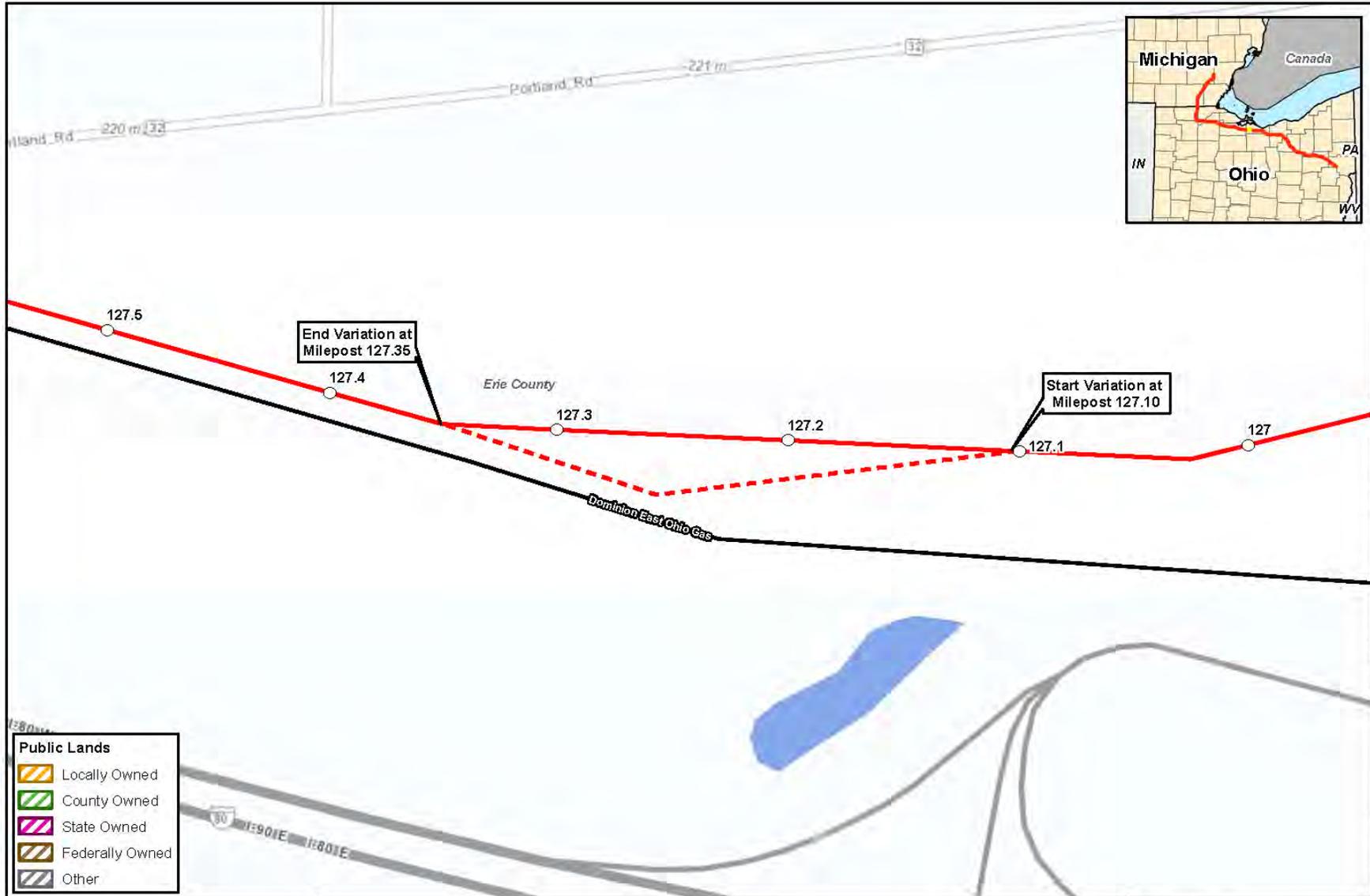
3.4.16 Parkertown Route Variation

The Parkertown Route Variation was proposed by a landowner that was concerned about future development of their land and suggested the route be moved a few hundred feet to the south and be co-located with two existing pipelines in the vicinity. The variation diverges from the NGT mainline at MP 127.2 and rejoins the NGT mainline at MP 127.6 (see figure 3.4.16-1 and table 3.4.16-1).

Factor	Route Variation	Proposed Route
Length (miles)	0.3	0.3
Agricultural Land (acres) ^a	3.8	3.8

a Based on a 125-foot-wide construction right-of-way in agricultural land.

The Parkertown Route Variation is 0.3 mile long and would have almost the same environmental impacts as the proposed route. This route variation would necessitate realigning the pipeline on neighboring parcels so that the proposed route meets up with two existing pipelines *before* entering the landowner's property, instead of meeting up with the existing pipelines *after* leaving the landowner's parcel. Both the route variation and proposed route are within 200 feet of the existing pipeline, but the route variation would move the NGT pipeline about 100 to 150 feet closer, for a distance of about 600 feet. Moving the route variation more than 100 to 150 feet would necessitate crossing over the existing pipelines, affecting a new landowner, and then crossing back. Based on our review, we do not find that the Parkertown Route Variation provides a significant environmental advantage over the proposed route and do not recommend that this variation be incorporated as part of the Projects.



Public Lands	
	Locally Owned
	County Owned
	State Owned
	Federally Owned
	Other



Figure 3.4.16-1
NGT Project
Parkertown Route Variation
Erie County, Ohio

- Milepost
- Proposed NEXUS Mainline
- Parkertown Route Variation
- Existing Pipeline
- NHD Perennial Waterbody
- NWI Wetland
- County Boundary

For Environmental Review Purposes Only

3.4.17 Luckey Road Route Variation

The Luckey Road Route Variation was proposed by a landowner concerned about impacts on drain tiles, an 8-foot-deep ditch, and Conservation Reserve Program (CRP) filter strips on their property adjacent to Luckey Road. The variation diverges from the NGT mainline at MP 168.1 and rejoins the NGT mainline at MP 168.5 (see figure 3.4.17-1 and table 3.4.17-1).

Factor	Route Variation	Proposed Route
Length (miles)	0.5	0.4
Total Waterbody Crossings (no.)	1	1
Agricultural Land (acres) ^a	7.6	6.1
Potential for Subsidence (miles)	0.5	0.4

a Based on a 125-foot-wide construction right-of-way in agricultural land.

The Luckey Road Route Variation is 0.5 miles in length, which is about 0.1 mile longer than the proposed route. The environmental effects of the route variation and proposed route are similar, except that the route variation crosses slightly more agricultural land and more land with the potential for subsidence. According to the landowner, the advantages of the route variation are that it would avoid crossing drain tiles on the property, an 8-foot-deep ditch, and CRP filter strips. Although drain tile on the property would be avoided by the route variation, NEXUS developed a *Drain Tile Mitigation Plan* that identifies procedures to be implemented before, during, and after construction to minimize impacts on and make repairs to drain tile systems. With regard to the 8-foot-deep ditch, the route variation would still cross a ditch, although this would occur about 1,100 feet to the east where the ditch may not be as deep. With regard to CRP land, NEXUS would restore the right-of-way to meet the long-term objectives for the land enrolled in this program. Further, toward this end, we recommended in section 4.9.5.3 that, prior to construction, NEXUS should file with the Secretary, for review and written approval of the Director of OEP, its revised *E&SCPs* to commit to ensuring lands crossed that are under conservation practices, such as CRP lands, would be restored to pre-construction conditions, or in accordance with the landowner's request.

One additional factor we considered in evaluating the route variation is the fact that the proposed route is co-located with and offset by about 75 feet from two existing pipelines on the property. The route variation would not follow the existing pipelines on the property, but would instead cross under the pipelines, extend about 1,500 feet north and west, then cross back under the pipelines before rejoining the proposed route west of Luckey Road. ATWS would be required at both crossovers to accommodate construction. This variation would be further complicated by existing powerline cross-overs in the same area. Based on our environmental review of both routes and because of the crossovers, we do not find the route variation provides a significant environmental advantage when compared to the corresponding segment of the proposed route and do not recommend that this variation be incorporated as part of the Projects.

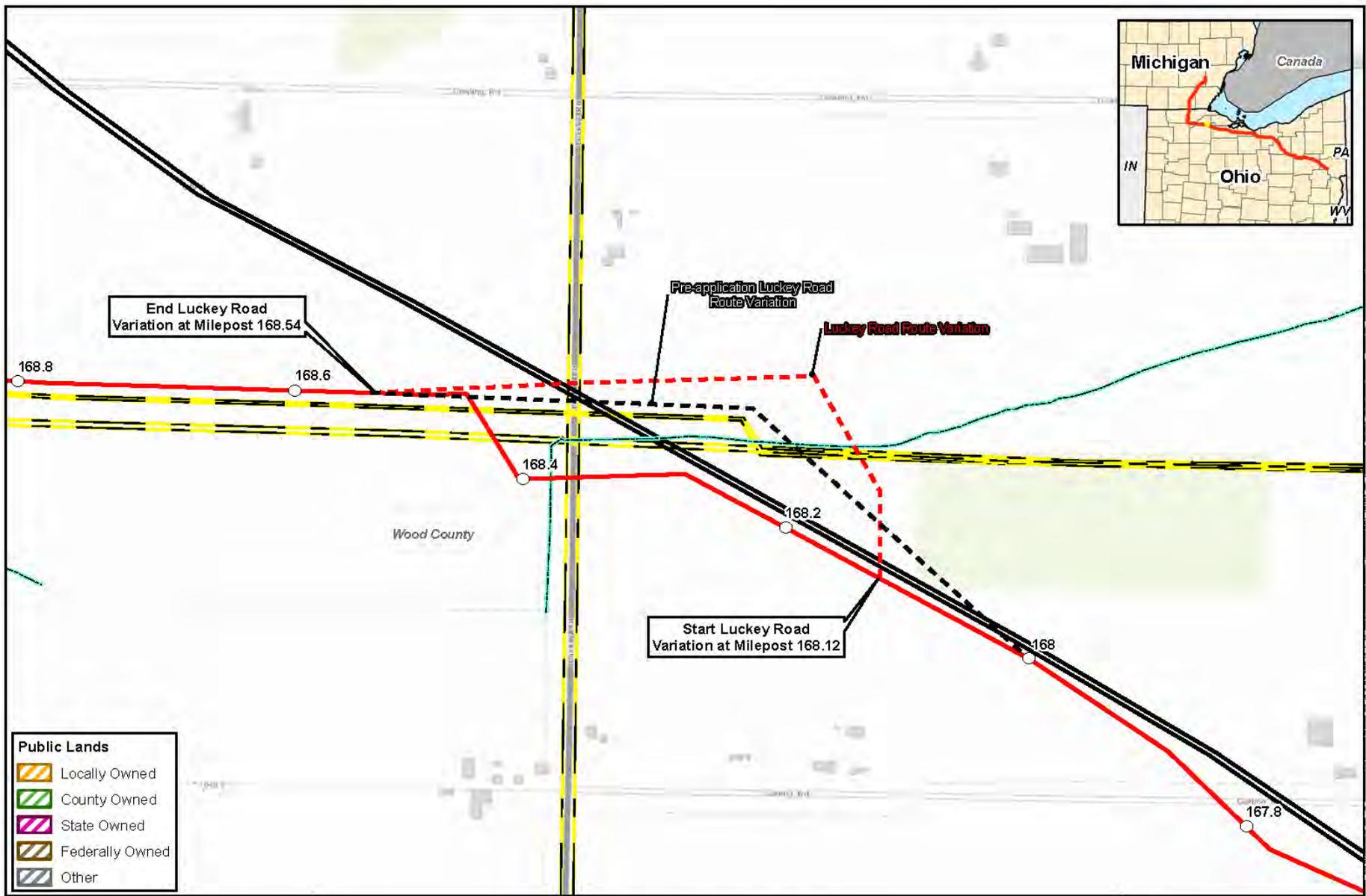
During the draft EIS comment period, the landowner raised a concern that construction equipment would not be able to access the work site from Luckey Road because that the proposed route does not come out to Luckey Road, as does the route variation. We have evaluated this concern and do not find that it has merit. Both routes cross Luckey Road within about 325 feet of one another. Further, as part of its project planning, NEXUS identified temporary and permanent access roads it proposes to use to construct and

operate the pipeline. NEXUS has indicated it would use existing public roads for access as well as new and existing non-public roads. NEXUS submitted a list the non-public access roads for our review in this EIS, including ones in the general vicinity of this route variation (see appendix C-4).

The landowner also requested during the draft EIS comment period that the original route identified in NEXUS' June 2015 pre-application materials be considered in lieu of the proposed route. The pre-application route is similar to the route variation, except that it crosses over the existing pipelines at MP 168.0 just before entering the landowner's property, then extends north and west before crossing back over the existing pipelines to rejoin the propose route at MP 168.5 (see figure 3.4.17-1 and table 3.4.17-2).

Factor	Route Variation	Proposed Route
Length (miles)	0.6	0.6
Total Waterbody Crossings (no.)	1	1
Agricultural Land (acres) ^a	7.6	8.0
Forested/Shrub Land (acres) ^b	0.4	0.0
Potential for Subsidence (miles)	0.5	0.4
<hr/> a Based on a 125-foot-wide construction right-of-way in agricultural land. b Based on a 75-foot-wide construction right-of-way in forested land.		

The Pre-Application Luckey Road Route Variation is 0.5 mile in length, which is about 0.1 mile longer than the proposed route. The environmental effects of the pre-application route variation are similar to those discussed above, except that pre-application route variation also crosses 0.4 acre of a forested/shrub lot. The pre-application route variation avoids the landowner's property entirely, and the route variation appears to merely shift the impacts from one landowner to another. Based on our review, we do not find the route variation provides a significant environmental advantage when compared to the corresponding segment of the proposed route and do not recommend that this variation be incorporated as part of the Projects.



Public Lands

	Locally Owned
	County Owned
	State Owned
	Federally Owned
	Other

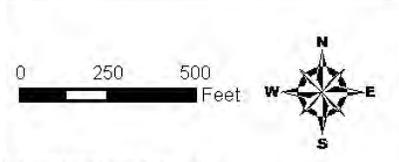


Figure 3.4.17-1
NGT Project
Luckey Road Route Variations
Wood County, Ohio

	Milepost
	Proposed NEXUS Mainline
	Existing Pipeline
	Existing Powerline
	NHD Perennial Waterbody
	NWI Wetland
	County Boundary

For Environmental Review Purposes Only

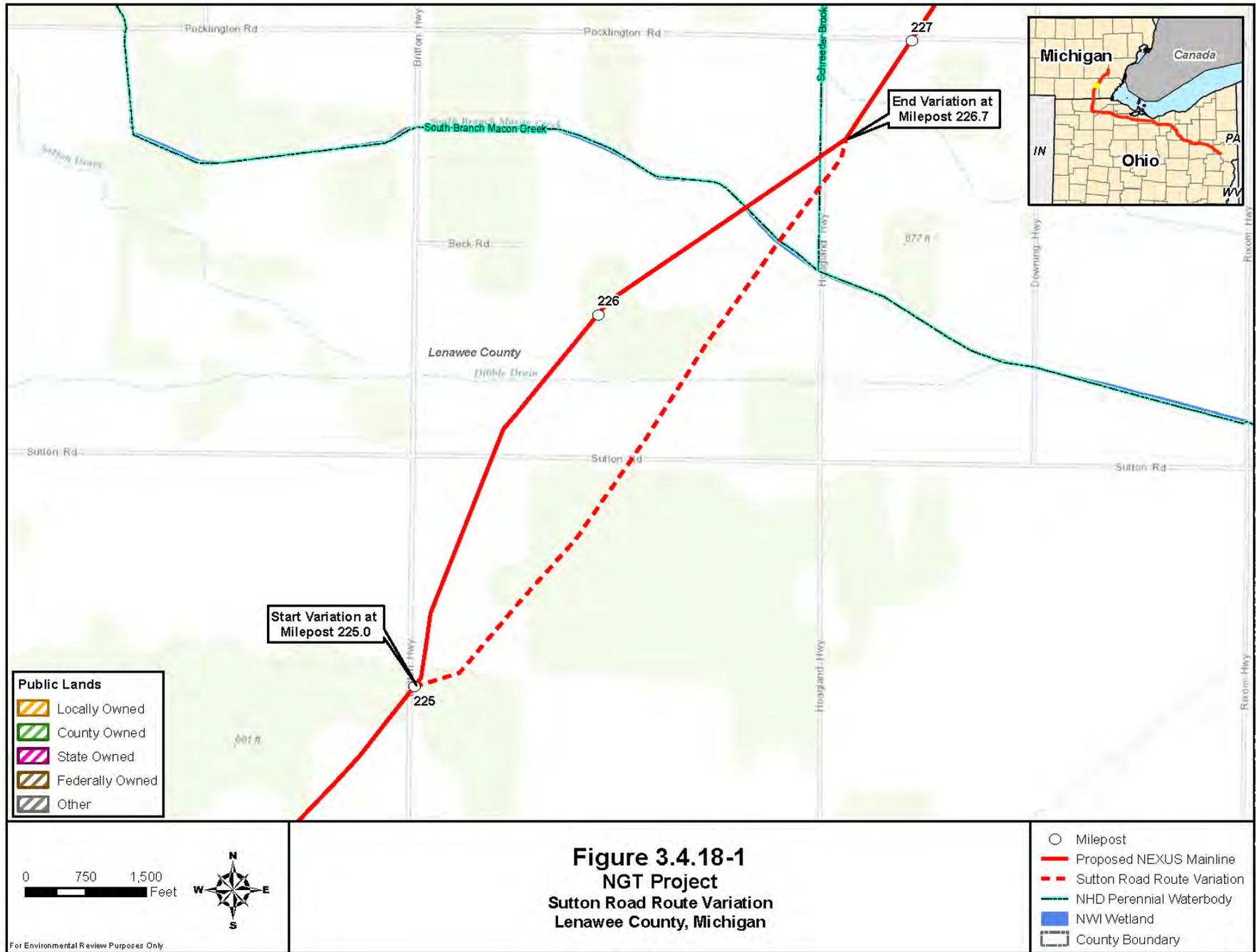
3.4.18 Sutton Road Route Variation

The Sutton Road Route Variation was proposed by a landowner who would prefer that the pipeline be co-located with an existing pipeline in the vicinity due to safety concerns with routing the pipeline near residences. The route variation diverges from the NGT mainline at MP 225.0 and rejoins the NGT mainline at MP 226.7 (see figure 3.4.18-1 and table 3.4.18-1).

Factor	Route Variation	Proposed Route
Length (miles)	1.7	1.7
Greenfield Construction (miles) ^a	0.0	1.3
Agricultural Land (acres) ^b	24.4	24.8

a Based on the absence of adjacent or parallel rights-of-way within 300 feet of the pipe centerline.
b Based on a 125-foot-wide construction right-of-way in agricultural land.

The Sutton Road Route Variation is 1.7 miles in length, which is the same as the proposed route. The main advantage of the route variation is that it has 1.3 less miles of greenfield construction. The main disadvantage of the route variation is it would cut across two patches of forested land. In order to avoid the forested land, the route variation would need to cross the existing pipeline twice: once near the beginning of the route variation and once near the end. There are no residences within 150 feet of the centerline of either the route variation or proposed route. There is one residence within 500 feet of the route variation (about 160 feet away if forested land is crossed, or about 260 feet if the route variation crosses over the existing pipelines to avoid forested land). There are three residences within 500 feet of the proposed route (about 270, 310, and 430 feet away). With regard to pipeline safety, we reiterate that DOT safety standards are intended to ensure adequate protection regardless of proximity to residences. The pipelines must be designed, constructed, operated, and maintained in accordance with these safety standards (see section 4.13). Based on our review, the Sutton Road Route Variation does not provide a significant environmental advantage over the proposed route and do not recommend that this variation be incorporated as part of the Projects.

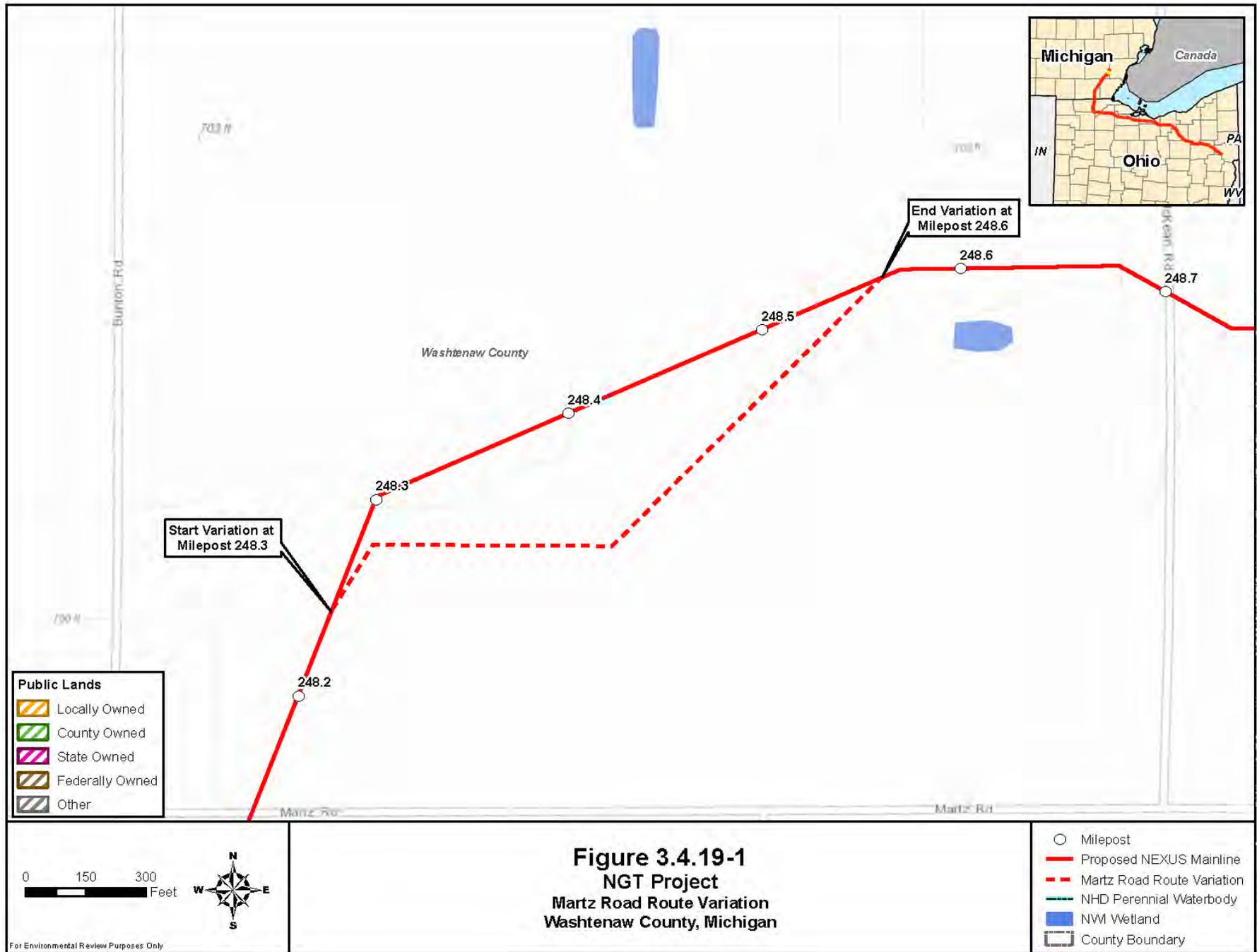


3.4.19 Martz Road Route Variation

The Martz Road Route Variation was proposed by a landowner that was concerned the proposed route running diagonally through their land would preclude their ability to subdivide the land and allow their children to build on their property. The variation diverges from the NGT mainline at MP 248.3 and rejoins the NGT mainline at MP 248.6 (see figure 3.4.19-1 and table 3.4.19-1).

TABLE 3.4.19-1		
Analysis of the Martz Road Route Variation		
Factor	Route Variation	Proposed Route
Length (miles)	0.3	0.3
Greenfield Construction (miles) ^a	0.3	0.3
Agricultural Land (acres) ^b	3.0	3.0
Forested Land (acres) ^c	0.9	0.9
<hr/> a Based on the absence of adjacent or parallel rights-of-way within 300 feet of the pipe centerline. b Based on a 125-foot-wide construction right-of-way in agricultural land. c Based on a 75-foot-wide construction right-of-way in forested land.		

The Martz Road Route Variation is 0.3 mile in length, which is the same as the proposed route. Both the route variation and proposed route would have virtually identical impacts. Based on our environmental review of both routes, we do not find the Martz Road Route Variation provides a significant environmental advantage when compared to the corresponding segment of the proposed route and do not recommend that this variation be incorporated as part of the Projects.



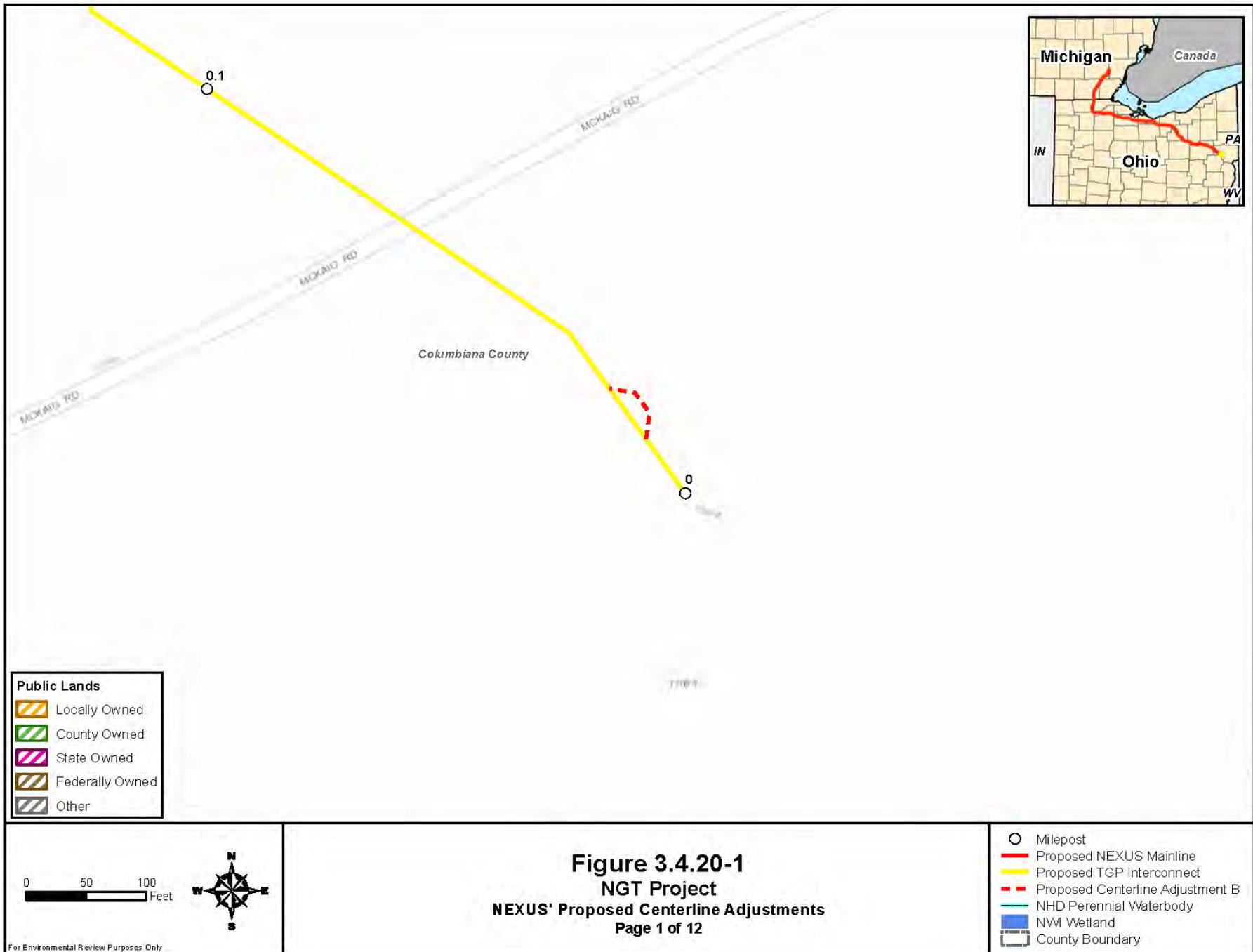
3.4.20 NEXUS' Proposed Centerline Adjustments and Workspace Changes

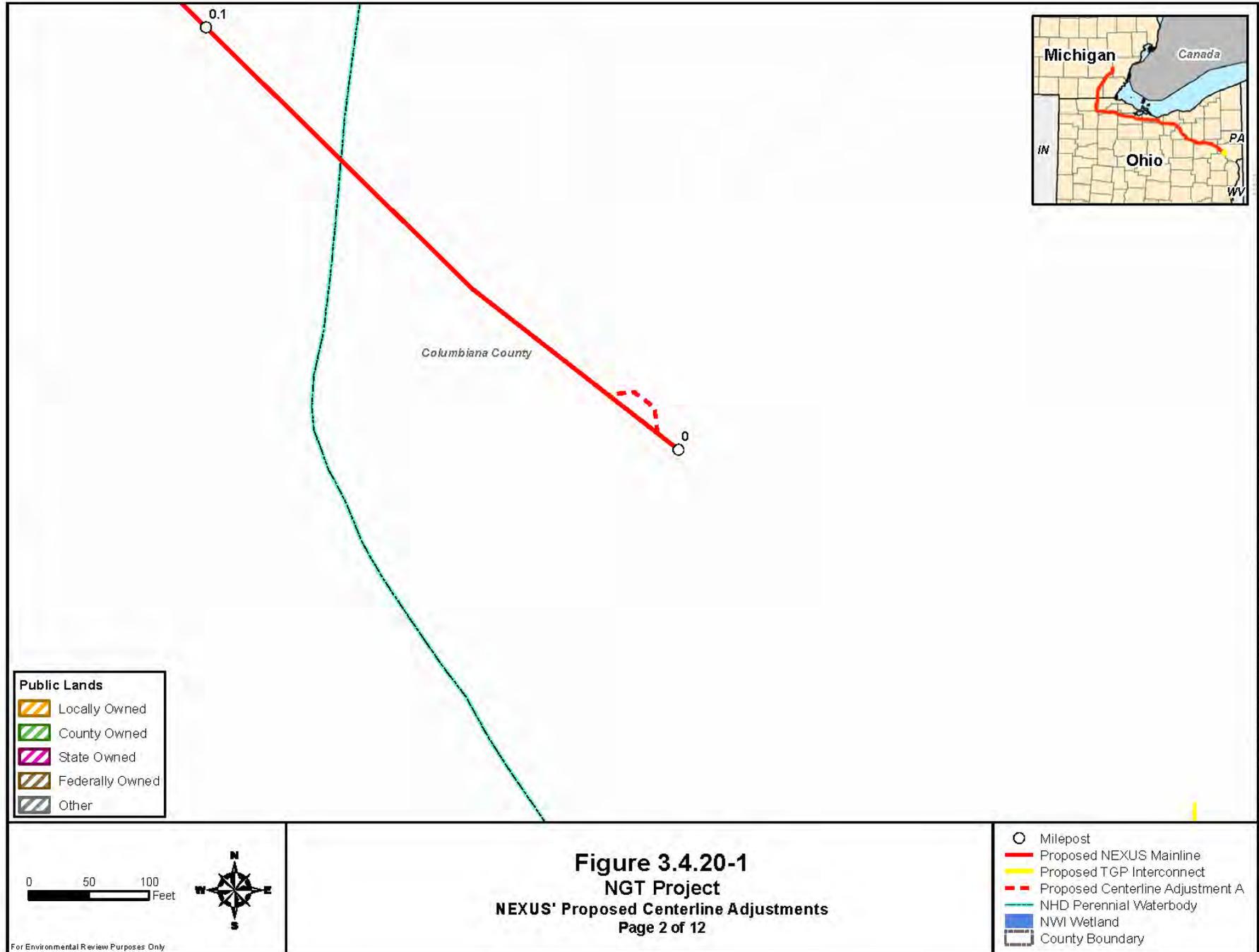
In addition to the Chippewa D Route Variation (see section 3.4.11), NEXUS proposed 12 centerline adjustments during the draft EIS comment period (see response 14a of NEXUS' August 26, 2016 filing to the Commission in FERC accession number 20160826-5230). The centerline adjustments were to respond to landowner requests, reduce impacts, and/or address engineering constraints. Five of the centerline adjustments diverge 25 feet or less away from the proposed route. The remaining seven centerline adjustments diverge between 120 and 745 feet (see figure 3.4.20-1 and table 3.4.20-1).

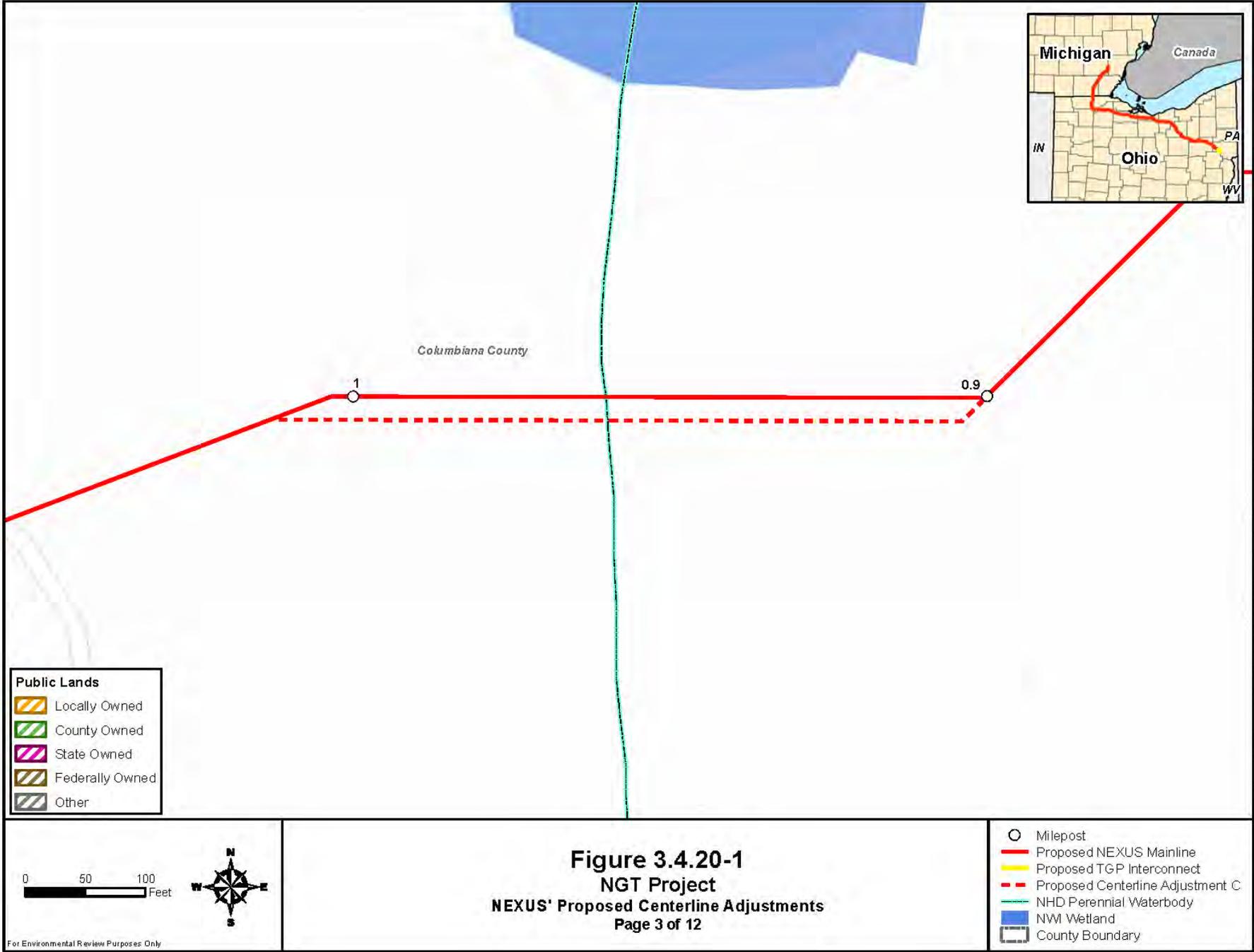
ID	Begin MP ^a	End MP ^a	Length (mi.)	Approximate Maximum Offset (ft.)	Summary of Impact Changes
A	0.0 TGP	0.0 TGP	<0.1	15	No new or additional resources would be affected.
B	0.0	0.0	<0.1	15	No new or additional resources would be affected.
C	0.9	1.0	0.1	20	No new or additional resources would be affected.
D	33.1	33.3	0.2	225	The realignment would move the centerline 15 feet closer to two commercial buildings (from 40 feet away to 25 feet away), but the redesigned construction workspace would be 5 feet farther away (from 10 feet away to 15 feet away).
E	39.4	39.6	0.2	460	The realignment would move the construction workspace farther away from one residence (from 35 feet away to 80 feet away).
F	42.2	42.6	0.4	380	The realignment would avoid one wetland and move the construction workspace farther away from one residence (from 155 feet away to 300 feet away), while moving it closer to another (from 515 feet away to 130 feet away).
G	73.3	73.4	0.1	575	No new or additional resources would be affected.
H	78.3	78.9	0.6	545	The realignment would avoid bisecting an agricultural field, but would move the construction workspace closer to one residence (from 325 feet away to 100 feet away).
I	85.9	86.1	0.2	25	No new or additional resources would be affected.
J	150.1	150.6	0.5	20	The realignment would move the construction workspace farther away from one residence (from 70 feet away to 80 feet away), while moving it closer to another residence (from 155 feet away to 130 feet away).
K	190.5	191.0	0.5	745	The realignment would move the construction workspace farther away from one residence (from 175 feet away to 380 feet away).
L	248.0	248.1	0.1	120	No new or additional resources would be affected.

^a Mileposts followed by a "TGP" indicate the realignment is on the TGP Interconnect Pipeline. Mileposts without a "TGP" indicate the realignment is on the NGT mainline.

NEXUS also identified several workspace changes (e.g., ATWS, yards/staging areas, and access roads) during the draft EIS comment period. Many of the changes were in response to the proposed centerline adjustments and occur where the centerline diverges from the proposed route. Other workspace changes occur at various locations along the proposed route. We note that NEXUS placed portions of ATWS along the adjusted route within 50 feet of some wetlands or waterbodies. We found the placement of ATWS acceptable because the areas where the workspace was placed is cultivated or rotated cropland or other disturbed land. Table 3.4.20-2 summarizes the workspace changes proposed by NEXUS. Appendices F-4, F-5, and F-6 list each ATWS, yard/staging area, and access road change, respectively.







Public Lands	
	Locally Owned
	County Owned
	State Owned
	Federally Owned
	Other

0 50 100 Feet

For Environmental Review Purposes Only

Figure 3.4.20-1
NGT Project
NEXUS' Proposed Centerline Adjustments
 Page 3 of 12

	Milepost
	Proposed NEXUS Mainline
	Proposed TGP Interconnect
	Proposed Centerline Adjustment C
	NHD Perennial Waterbody
	NWM Wetland
	County Boundary

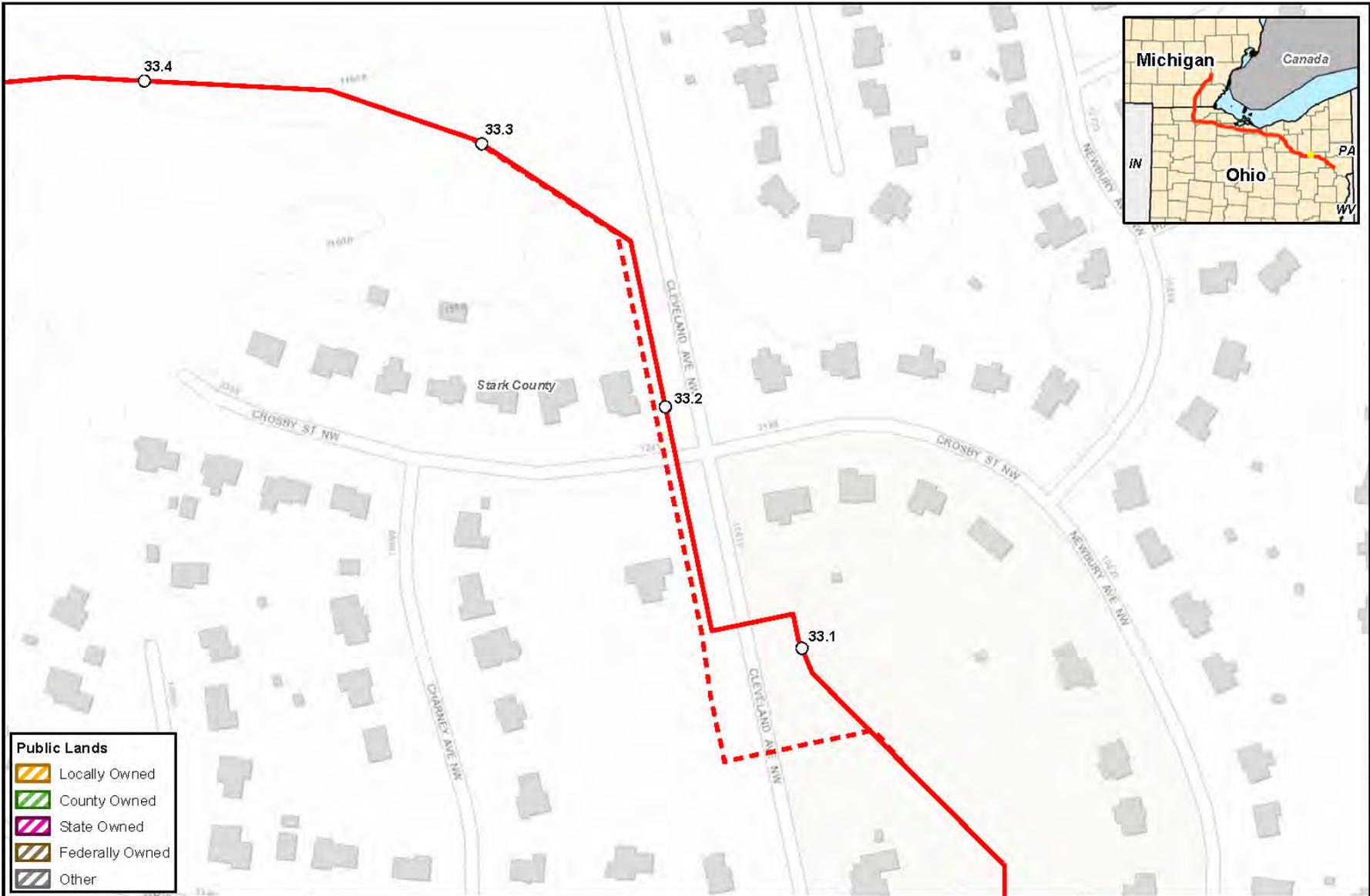
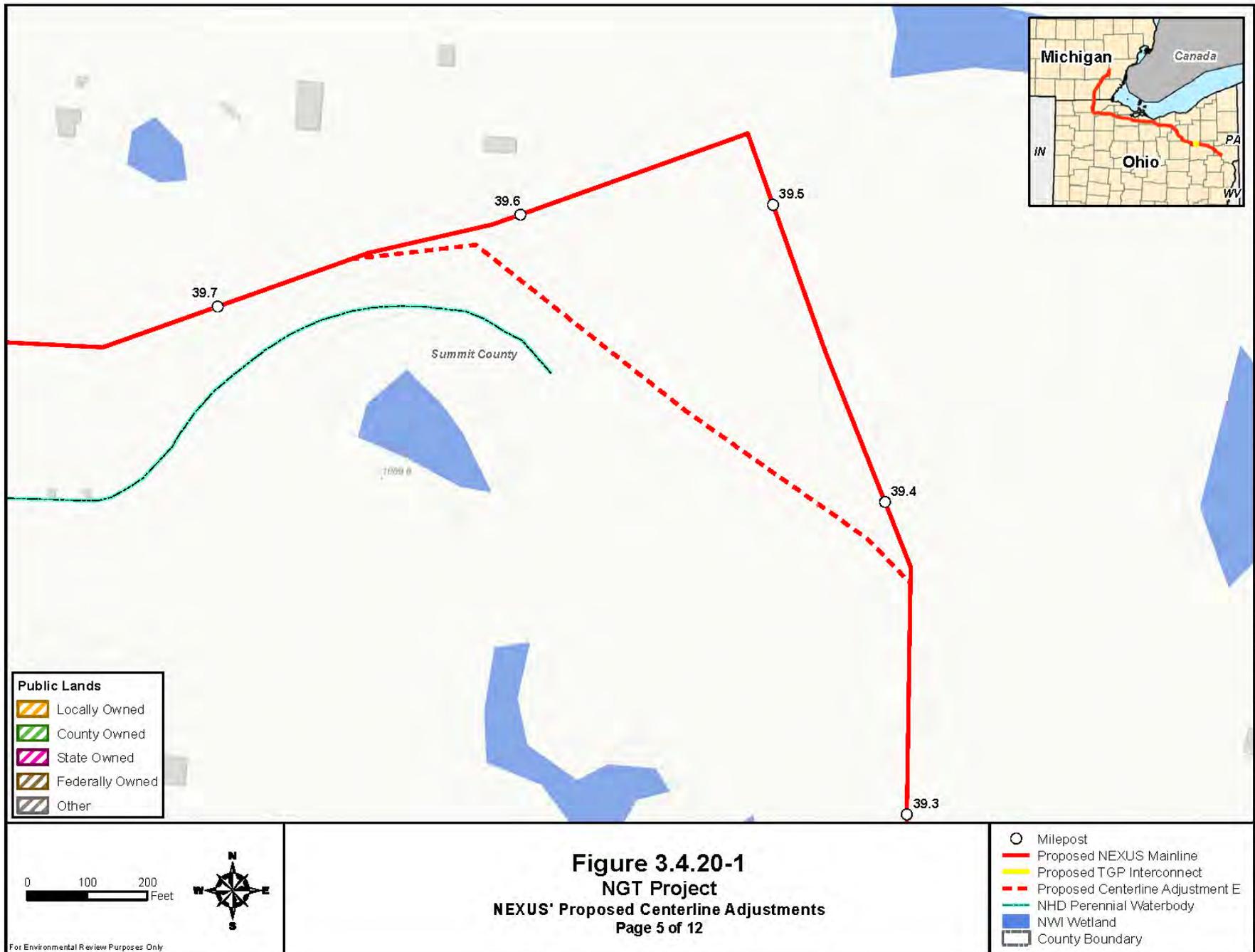
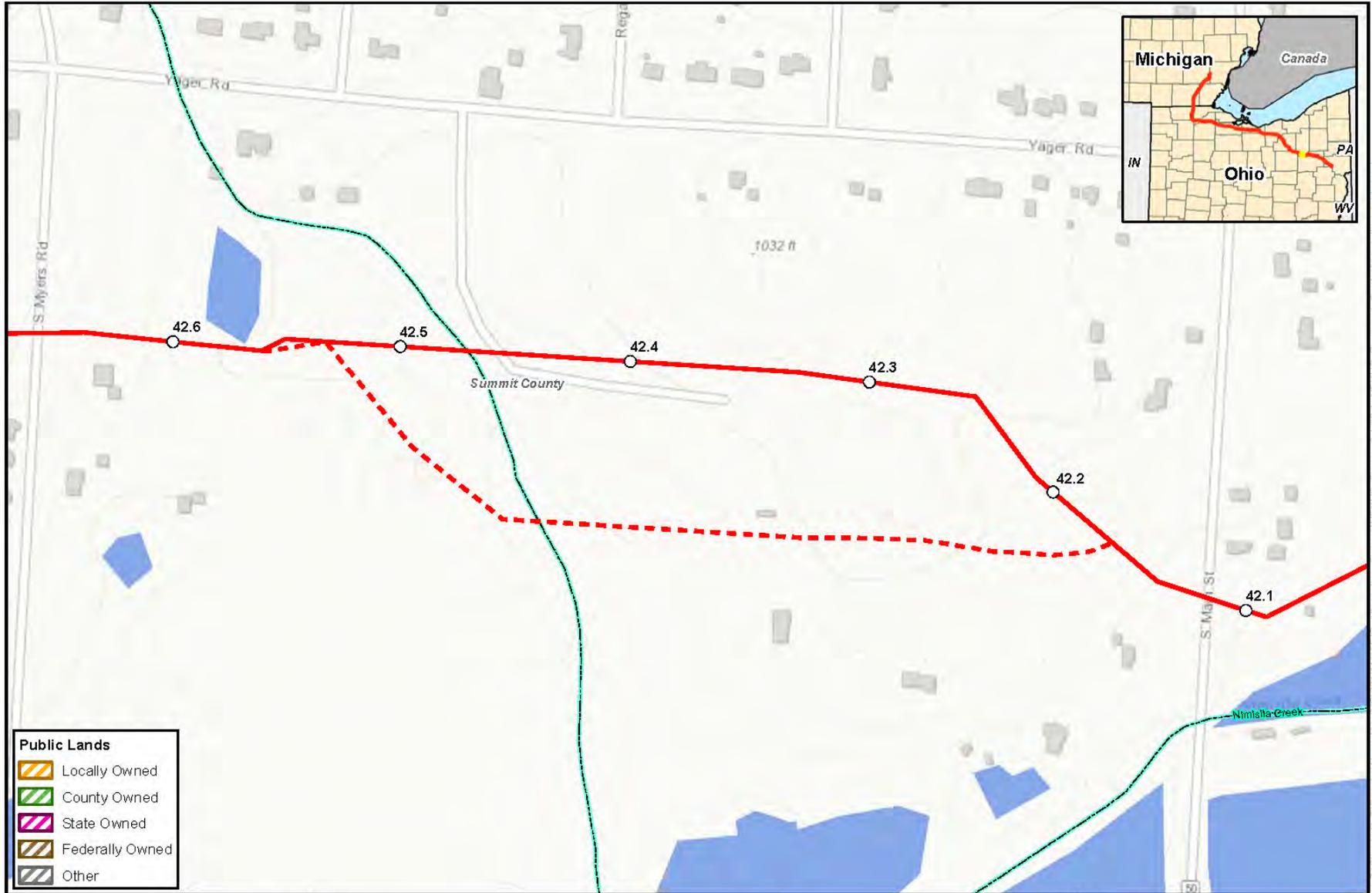


Figure 3.4.20-1
NGT Project
NEXUS' Proposed Centerline Adjustments
 Page 4 of 12

- Milepost
- Proposed NEXUS Mainline
- Proposed TGP Interconnect
- - - Proposed Centerline Adjustment D
- NHD Perennial Waterbody
- NWM Wetland
- County Boundary

For Environmental Review Purposes Only





Public Lands	
	Locally Owned
	County Owned
	State Owned
	Federally Owned
	Other

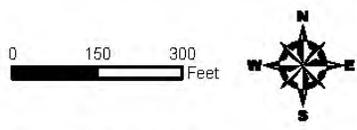
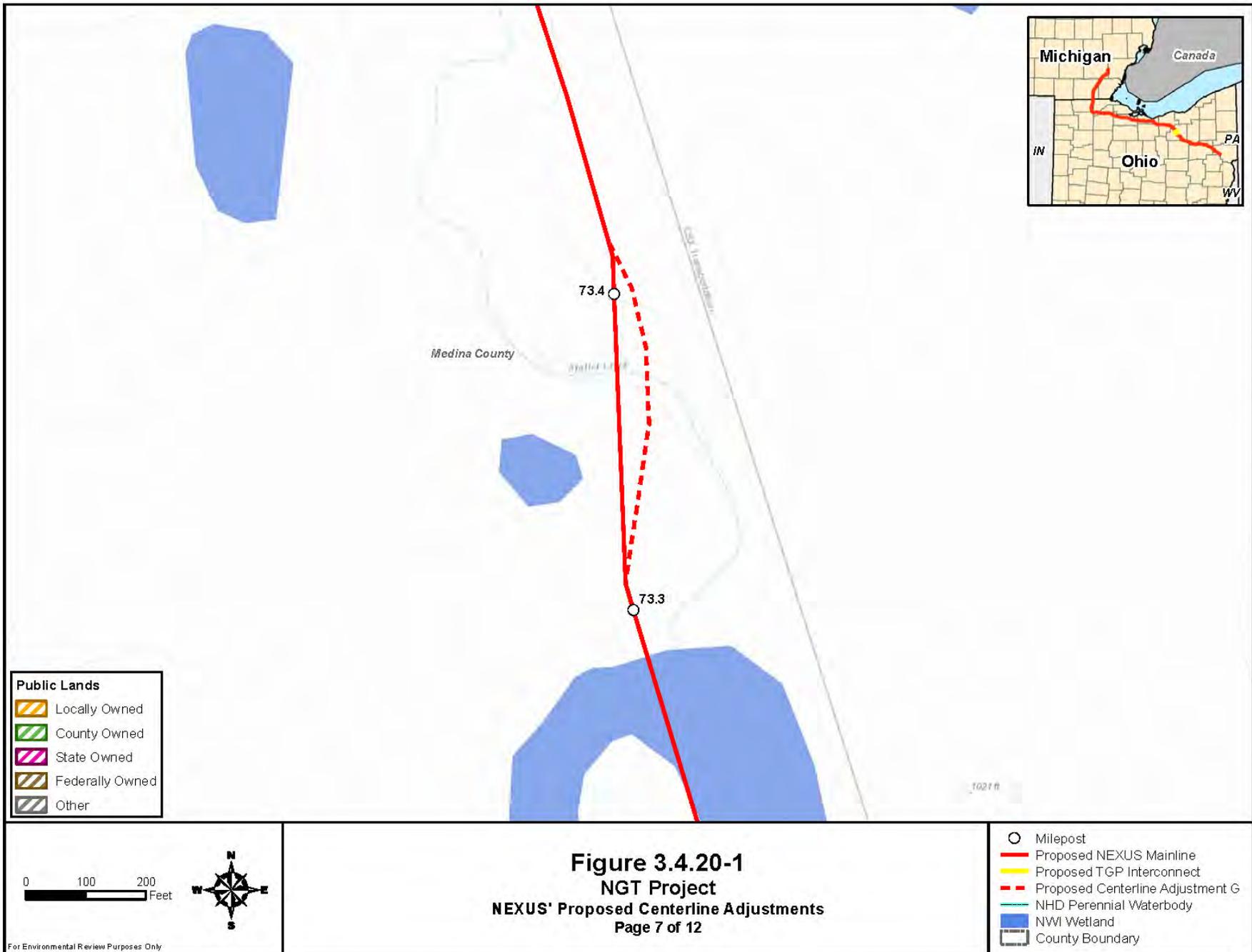
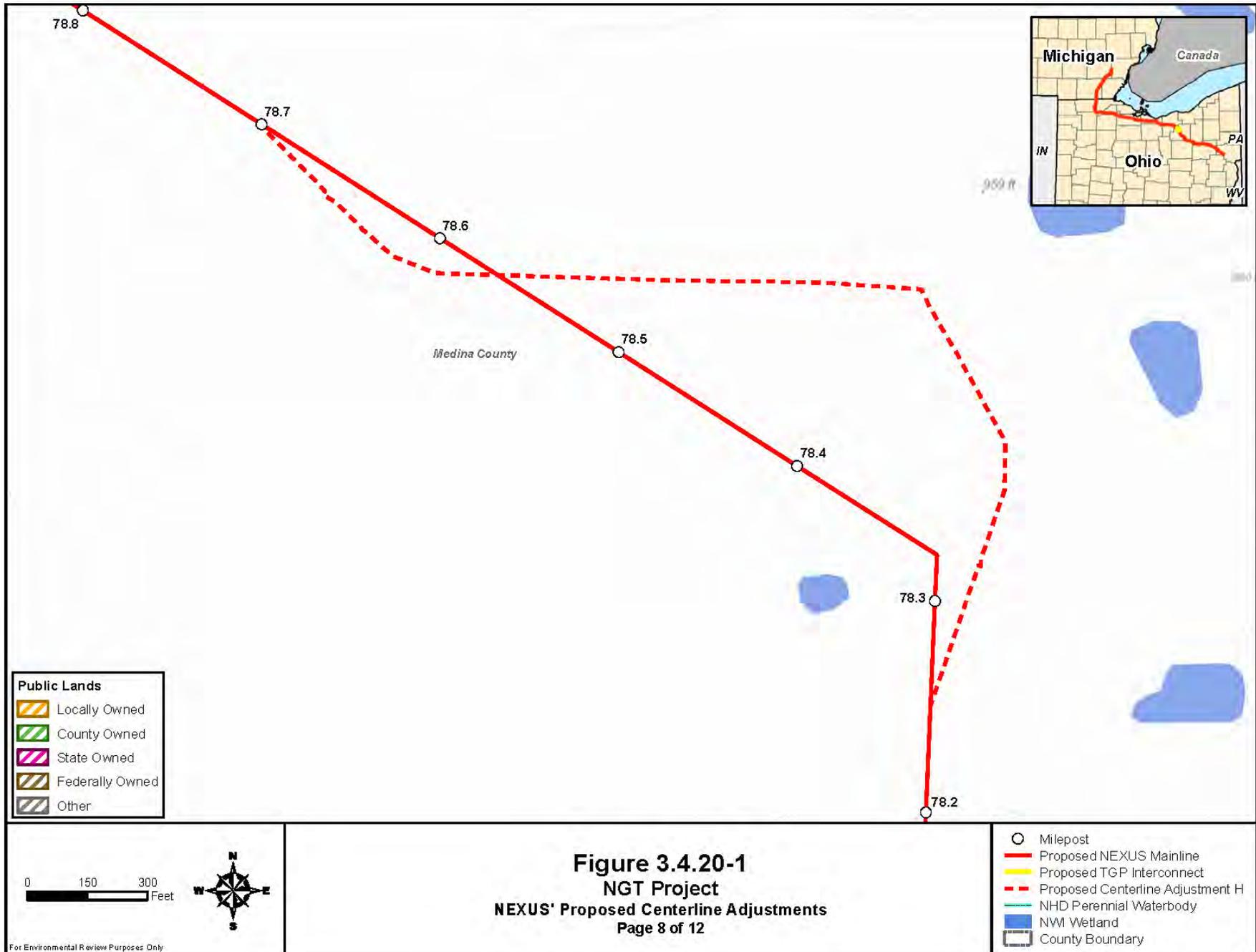


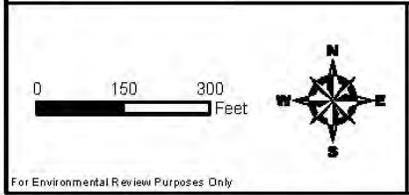
Figure 3.4.20-1
NGT Project
NEXUS' Proposed Centerline Adjustments
 Page 6 of 12

- Milepost
- Proposed NEXUS Mainline
- Proposed TGP Interconnect
- Proposed Centerline Adjustment F
- NHD Perennial Waterbody
- NWI Wetland
- County Boundary

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Figure 3.4.20-1
NGT Project
NEXUS' Proposed Centerline Adjustments
Page 10 of 12

- Milepost
- Proposed NEXUS Mainline
- Proposed TGP Interconnect
- - - Proposed Centerline Adjustment J
- NHD Perennial Waterbody
- NWI Wetland
- ▭ County Boundary

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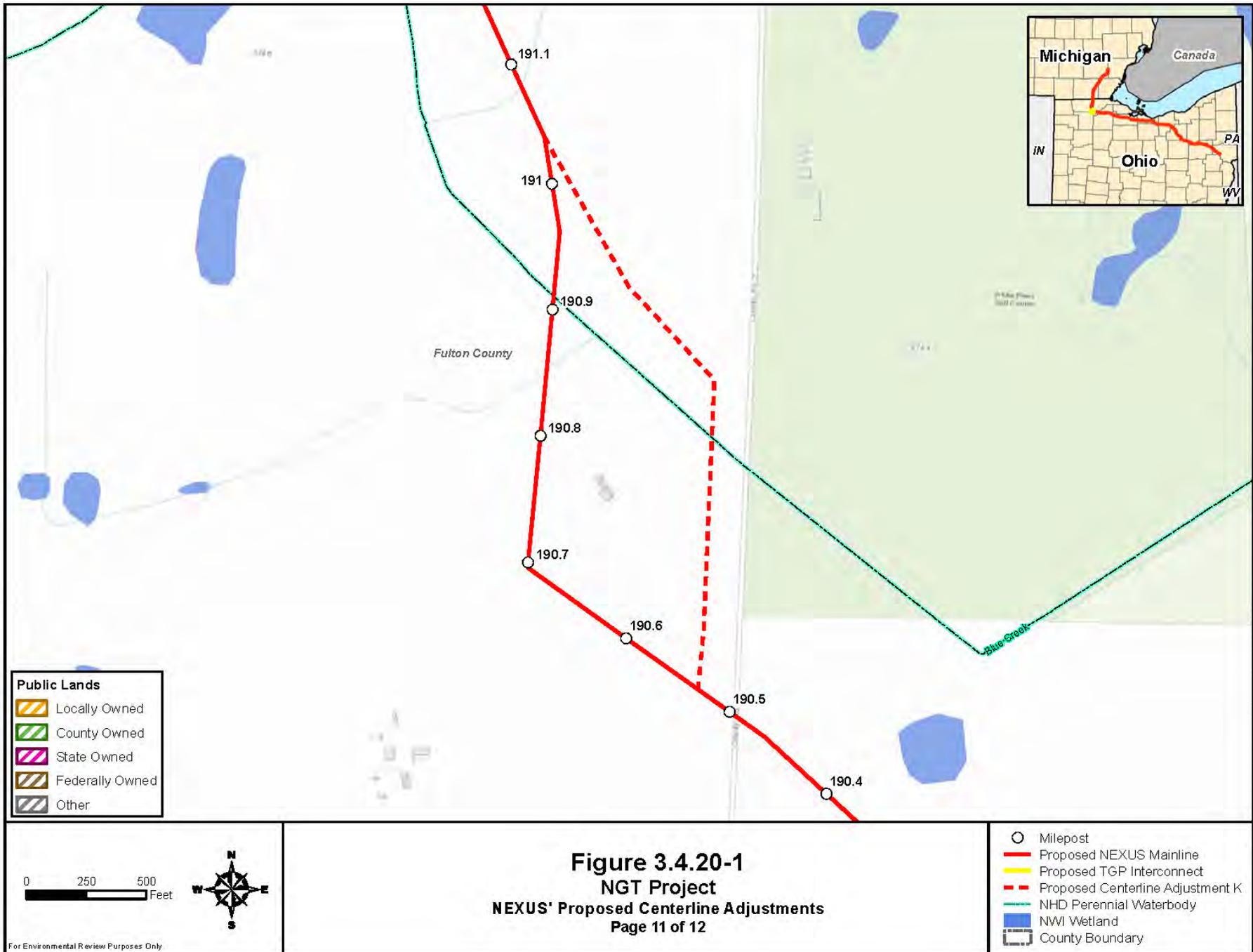
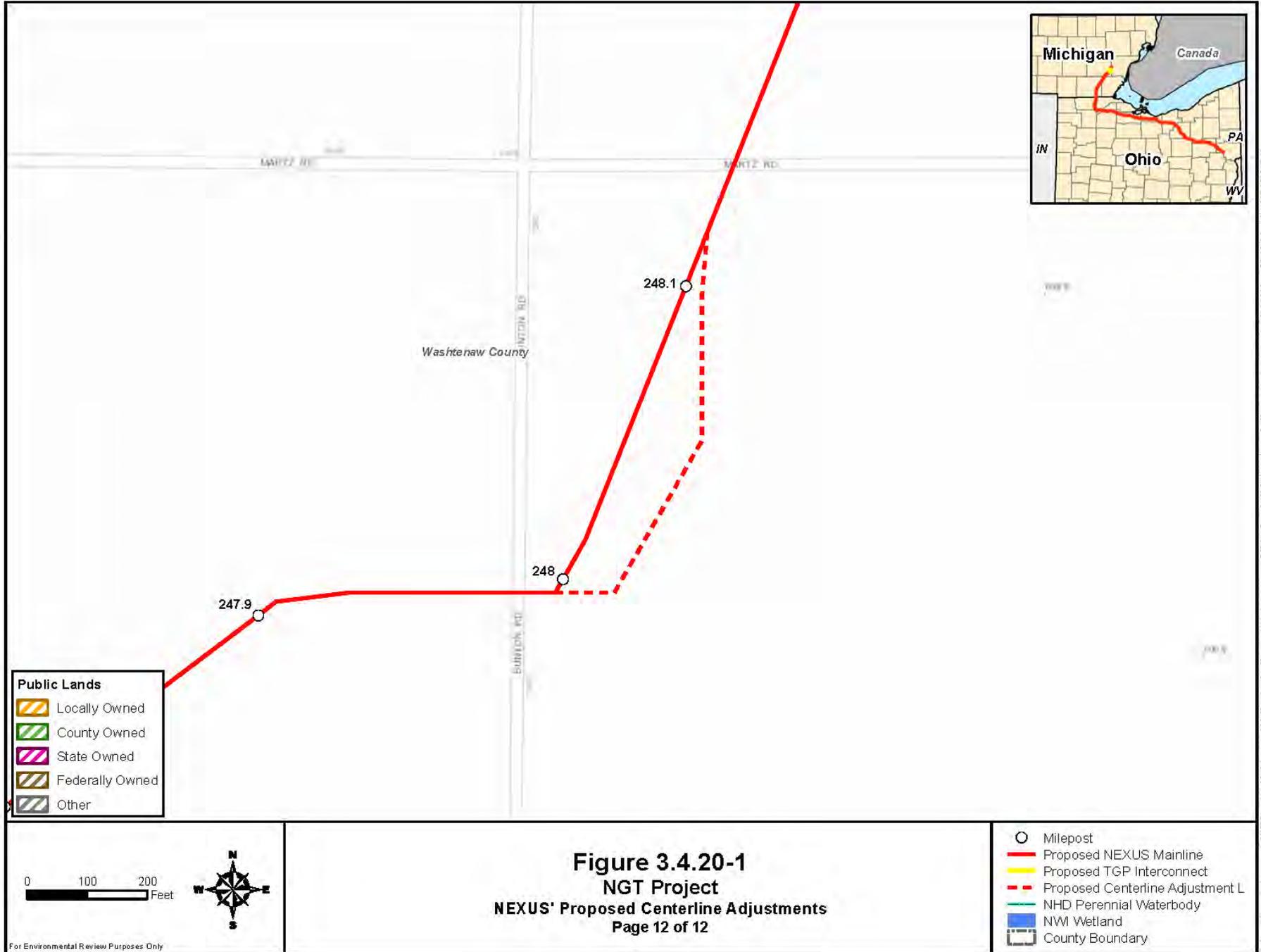


Figure 3.4.20-1
NGT Project
NEXUS' Proposed Centerline Adjustments
 Page 11 of 12

0 250 500 Feet

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Workspace Type	Change in Temporary Workspace	Change in Permanent Easement
Pipeline Right-of-Way ^a	- 1.3 acres	- 0.1 acres
Aboveground Facility Sites	+ 6.0 acres	-
ATWS	- 7.7 acres	-
Yards & Staging Areas	- 100.8 acres	-
Access Roads	- 0.6 acres	- <0.1 acres
Total	- 104.4 acres	- 0.1 acres

a Includes temporary and permanent easements for cathodic protection anode beds.

One of the main benefits of the centerline adjustments and workspace modifications would be that the changes would result in 51 fewer dwellings within 50 feet of the construction work area (from 78 dwellings to 27 dwellings). Appendix F-7 includes site-specific RCPs for the 27 dwellings as well as plans for other areas.

The centerline adjustments and workspace modifications occur at various locations from MP 0.0 to MP 66.1 and MP 75.2 to MP 255.0. We have reviewed each of the adjustments and modifications. Based on our review, we find that none of the changes would result in significant adverse environmental impacts and that each of the changes is environmentally acceptable. For these reasons and because NEXUS would like to adopt these changes in response to landowner requests, to reduce environmental impacts, and/or to address engineering constraints, **we recommend that:**

- Prior to construction, NEXUS should incorporate into its NGT Project plans the proposed centerline adjustments and workspace modifications (excluding those associated with the Chippewa Lake D Route Variation from MP 66.1 to MP 72.5 [see section 3.4.11]) as identified on the alignment sheets provided in Attachment 4 – Response 14a-2 of its August 26, 2016 filing to the Commission (see FERC accession number 20160826-5230).**

3.4.21 Wadsworth Road Route Variations

Two route variations in the vicinity of Wadsworth Road were proposed by a landowner concerned about the impacts on a wooded portion of their property and future development of their parcel. The first variation, known as the Wadsworth Road A Route Variation, diverges from the NGT mainline at MP 55.8, extends south and west of the proposed route, then rejoins the NGT mainline at MP 60.6 (see figure 3.4.21-1 and table 3.4.21-1).

Factor	Route Variation	Proposed Route
Length (miles)	4.3	4.9
Greenfield Construction (miles) ^a	3.4	3.8
Wetland Affected (acres) ^b	0.1	0.8
Agricultural Land (acres) ^c	44.3	61
Forested Land (acres) ^b	6.5	3.2
Steep Slopes (miles) ^d	0.2	0.1

TABLE 3.4.21-1 (cont'd)		
Analysis of the Wadsworth Road A Route Variation		
Factor	Route Variation	Proposed Route
Sidehill Construction (miles) ^e	0.2	0.0
Residential-type Structures within 150 feet Pipe Centerline (no.) ^f	17	22
a	Based on the absence of adjacent or parallel rights-of-way within 300 feet of the pipe centerline.	
b	Based on a 75-foot-wide construction right-of-way in wetlands and forested land.	
c	Based on a 125-foot-wide construction right-of-way in agricultural land.	
d	Calculated by identifying slopes greater than 20 percent.	
e	Calculated by identifying slopes greater than 20 percent, and determining if the pipeline direction differed from the direction of the ground aspect.	
f	Includes dwellings, detached dwellings, garages, sheds, and other buildings often associated with a residence.	

The Wadsworth Road A Route Variation is 4.3 miles in length. The main advantages of the route variation are that it crosses 0.4 mile fewer greenfield construction, affects 0.7 less acres of wetlands, and is near five fewer residential-type structures. Conversely, the main disadvantage of the route variation is that it crosses 3.3 more acres of forested land. As mentioned above, this variation was suggested by a landowner to avoid impacts on a wooded area on the landowner's parcel. However, the Wadsworth Road A Route Variation actually increases forested impacts overall, and shifts those impacts onto other landowners. The variation was also suggested by the landowner to avoid conflicts with future development of the parcel. We note that the landowners would continue to be able to develop their property following construction provided it does not interfere with the easement rights granted to NEXUS for construction and operation of the pipeline facilities. For these reasons, we do not recommend that this variation be incorporated as part of the Projects.

The second route variation, known as the Wadsworth Road B Route Variation, diverges from the NGT mainline at MP 55.8, runs north of the NGT mainline before crossing the mainline and running south and west, then rejoins the NGT mainline at MP 60.6 (see figure 3.4.21-2 and table 3.4.21-2).

TABLE 3.4.21-2		
Analysis of the Wadsworth Road B Route Variation		
Factor	Route Variation	Proposed Route
Length (miles)	4.6	4.9
Greenfield Construction (miles) ^a	4.0	3.8
Wetland Affected (acres) ^b	0.0	0.8
Agricultural Land (acres) ^c	51.9	61
Forested Land (acres) ^b	5	3.2
Sidehill Construction (miles) ^e	0.1	0.0
Residential-type Structures within 150 feet Pipe Centerline (no.) ^f	12	22
a	Based on the absence of adjacent or parallel rights-of-way within 300 feet of the pipe centerline.	
b	Based on a 75-foot-wide construction right-of-way in wetlands and forested land.	
c	Based on a 125-foot-wide construction right-of-way in agricultural land.	
d	Calculated by identifying slopes greater than 20 percent.	
e	Calculated by identifying slopes greater than 20 percent, and determining if the pipeline direction differed from the direction of the ground aspect.	
f	Includes dwellings, detached dwellings, garages, sheds, and other buildings often associated with a residence.	

The Wadsworth Road B Route Variation is 4.6 miles in length. The main advantages of the route variation are that it affects 0.8 less acres of wetlands and is near 10 fewer residential-type structures. Conversely, the main disadvantages of the route variation are that it affects 0.2 more miles of greenfield construction and crosses 1.8 more acres of forested land. For the same reasons that we did not recommend the Wadsworth Road A Route Variation, we do not recommend that the Wadsworth Road B Route Variation be incorporated as part of the Projects.

3.5 ABOVEGROUND FACILITY SITE ALTERNATIVES

An evaluation of the siting process for the layout and location of the aboveground facilities along the proposed route was conducted for the NGT and TEAL Projects. We evaluated the locations of the five proposed new compressor station sites (four on the NGT Project and one on the TEAL Project) to determine whether environmental impacts would be reduced or mitigated by the use of alternative sites for these facilities. Our evaluation involved inspection of aerial photography and mapping. The following sections address the placement of the compressor stations.

We evaluated alternative locations for only one other aboveground facility site, MR06, based on landowner concerns raised during the draft EIS comment period. The locations of the other five new M&R station sites were not evaluated as no specific concerns were raised during the draft EIS comment period and the M&R station sites generally are limited to those locations where shippers have indicated they would deliver or receive natural gas, which are essential to the project objective as previously discussed. We also did not evaluate alternative locations for new MLVs, pig launchers, pig receivers, or communication towers because they are either co-located with other aboveground facilities, are located entirely within the permanent pipeline right-of-way, or their locations are partly determined by regulations. For example, for MLVs, DOT regulations specify the maximum distance between sectionalizing block valves and require that these facilities be located in readily accessible areas. All MLVs are proposed within the permanent pipeline right-of-way and we did not identify any significant environmental constraints with the proposed valve locations. Further, we did not receive comments concerning the locations of the valves. Given these considerations, alternatives to their locations were not evaluated.

Finally, we did not evaluate alternative locations where modification to existing aboveground facilities are being proposed. Additional work would be required at or immediately adjacent to those sites and we did not identify any significant environmental constraints with the proposed locations. Further, we did not receive comments concerning those locations. Given these considerations, alternatives to their locations were not evaluated.

3.5.1 NGT Compressor Station Alternatives

NEXUS proposed four compressor stations along the proposed routes. During the pre-filing process, NEXUS identified and evaluated alternative locations for all four compressor stations as part of its site-selection process. Our analysis of alternative compressor sites was driven by comments discussing specific issues of concern with the sites and our independent consideration of the sites' impacts. As a result, we considered all the alternative sites evaluated by NEXUS and also considered our own alternative to one of the sites. Consideration of alternative sites concentrates on avoiding or minimizing impacts on forested land, wetlands, waterbodies, and noise sensitive areas (NSA). Additionally, evaluation of potential sites must consider presence of suitable access roads; availability of nearby ancillary facilities, such as electric distribution lines; and whether the parcel is available for purchase.

3.5.1.1 Hanoverton Compressor Station (CS 1, Columbiana County)

Three alternative sites were evaluated for the Hanoverton Compressor Station (see figure 3.5.1-1 and table 3.5.1-1). NEXUS considered two alternatives, while we added an additional alternative based on stakeholders' requests to place the compressor station adjacent to the existing cryogenic plant near the town of Hanoverton.

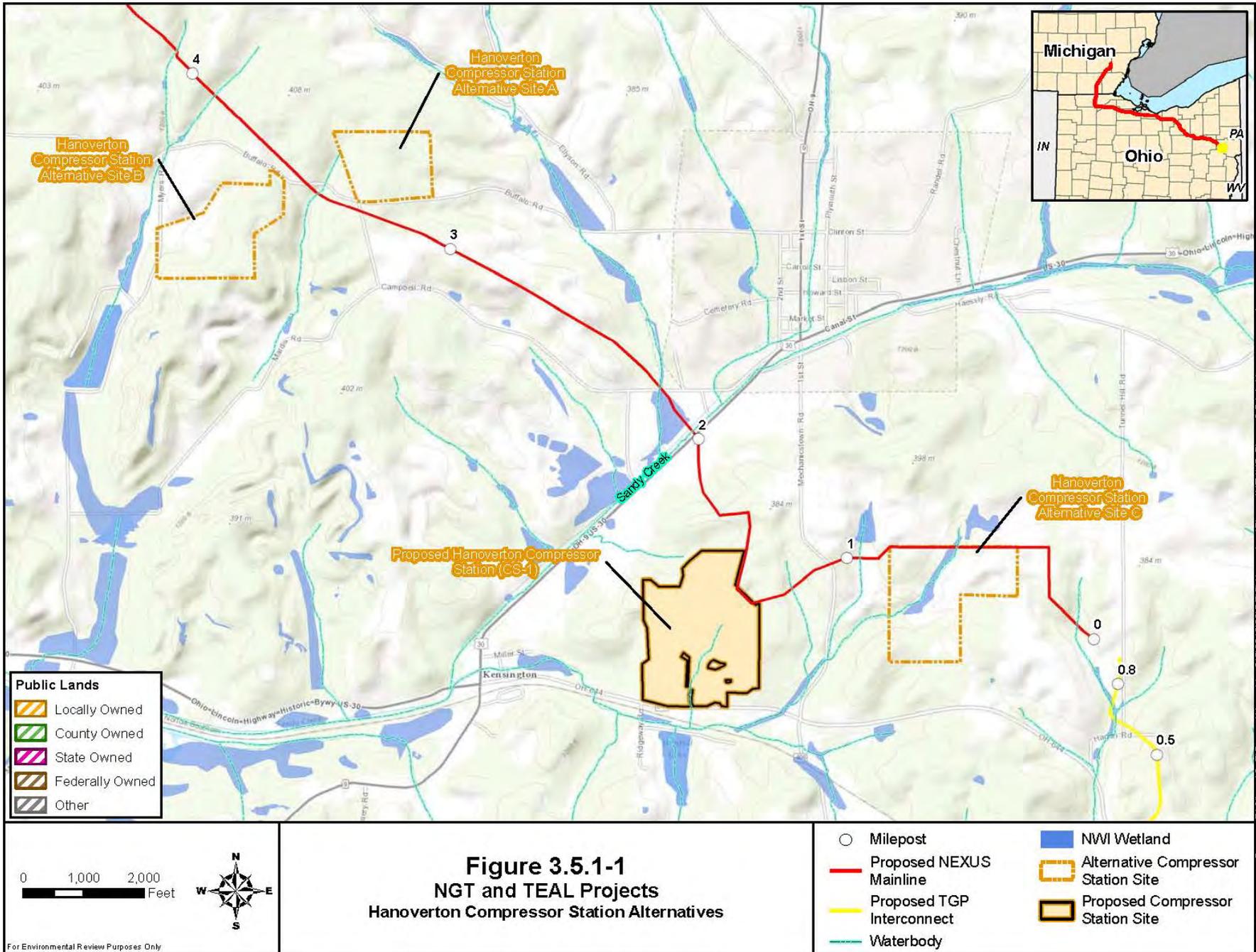
TABLE 3.5.1-1

Comparison of Alternatives for the Hanoverton Compressor Station (CS 1)

Property and Resources Evaluated	Alternative Site A	Alternative Site B	Alternative Site C (adjacent to existing cryogenic plant)	Proposed Site
Approximate Milepost	3.3	3.6	0.4	1.4
Property Size (acres)	37.0	54.5	68.9	93.3
Wetlands (acres)	0.0	0.0	3.9	0.0
Waterbodies (linear feet)	0	0	1,706	1,245
Agricultural Land (acres)	31.3	43.6	63.0	75.6
Forested Land (acres)	4.9	9.2	5.9	0.0
Open Land (acres)	0.8	1.7	0.0	16.0
Distance to Pipeline (feet)	200	75	0 (intersects)	0 (intersects)
Distance to Nearest NSA (feet)	350 ^a	180 ^a	423 ^a	1,040
Potentially Available for Purchase	Unknown	Yes	Unknown	Yes

a Distance from the *property boundary* to the nearest NSA.

The proposed site for the Hanoverton Compressor Station encompasses 93.3 acres (see table 3.5.1-1). The primary advantages of the proposed site are that it is situated on top of the proposed pipeline route (i.e., it wouldn't require realigning the proposed route or building suction/discharge lines to the compressor station) and would not affect wetlands or forested land. The disadvantages of the proposed site are that it is the largest of all the sites and contains a waterbody within the site boundaries. According to NEXUS, the site would be developed without affecting forested land, wetlands, or the waterbody at the site. Conversely, Alternative Site A, which is the smallest site, would require about two acres of forest clearing due to constraints associated with designing the station around three existing pipelines on the property.



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As discussed in section 4.12.2.2, the sound contribution of operating the compressor station at the proposed site (including blowdowns) would remain below our 55 A-weighted decibels (dBA) day-night sound level (L_{dn}) criterion at the nearest NSAs (e.g., schools, hospitals, residences). The EPA has indicated that an L_{dn} of 55 dBA protects the public from indoor and outdoor activity interference. Our acoustical analysis of the proposed site in section 4.12.2.2 estimates an increase in noise at the nearest NSA of 5.9 dB. Although the increase in noise would be noticeable, it would not be significant.

There do not appear to be substantial disadvantages to the proposed site as compared to the alternative sites; therefore, the alternative sites are not evaluated further.

3.5.1.2 Wadsworth Compressor Station (CS 2, Medina County)

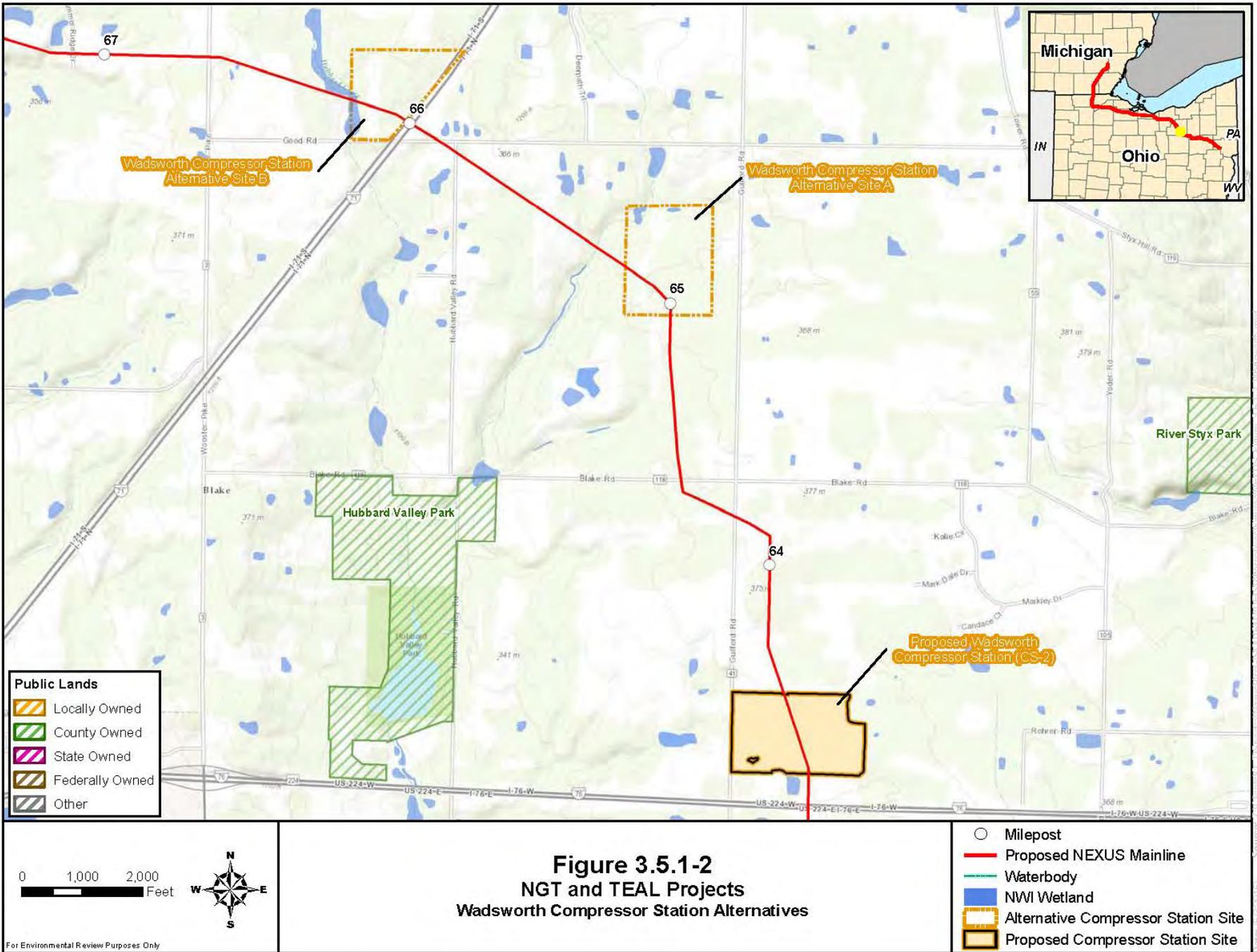
Two alternative sites were analyzed for the Wadsworth Compressor Station (see figure 3.5.1-2 and table 3.5.1-2). NEXUS was the originator of both alternatives. We received a number of comments during scoping suggesting that the Wadsworth Compressor Station should be relocated to a less populated area because of concerns about potential air and noise pollution caused by the facility. We also received a comment during scoping suggesting that the Wadsworth Compressor Station should be moved out of the Upper Chippewa Creek Watershed in accordance with the Upper Chippewa Creek Balanced Growth Plan. Several stakeholders suggested during the draft EIS comment period that the Wadsworth Compressor Station should be sited in zoned industrial areas in Wadsworth, Seville, or Medina. These concerns are discussed below.

Property and Resources Evaluated	Alternative Site A	Alternative Site B	Proposed Site
Approximate Milepost	65.0	66.1	63.3
Property Size (acres)	60.1	42.8	63.8
Wetlands (acres)	1.2	1.9	0.0
Waterbodies (linear feet)	1,687	912	0
Agricultural Land (acres)	46.7	31.3	63.0
Forested Land (acres)	13.4	5.1	0.0
Open Land (acres)	0.0	5.0	0.3
Distance to Nearest NSA (feet)	112 ^a	615 ^a	1,800
Potentially Available for Purchase	Unknown	Unknown	Yes

^a Distance from the *property boundary* to the nearest NSA.

The proposed site for the Wadsworth Compressor Station encompasses 63.8 acres. According to NEXUS, the site would be developed without affecting wetlands, waterbodies, or forested land. As discussed in section 4.12.1.3, potential impacts on air quality associated with construction and operation of the Wadsworth Compressor Station would be minimized by strict adherence to all applicable federal and state regulations that are designed to be protective of air quality. NEXUS' facilities would comply with the National Ambient Air Quality Standards (NAAQS) that were designed to protect human health, including sensitive populations, and the environment. The compressor station would be a minor source under all federal air quality permitting programs. Based on the analysis presented in section 4.12.1.3, the compressor station would not have a significant impact on regional air quality.

As discussed above and in section 4.12.2.2, the sound contribution of operating the compressor station would remain below our 55 dBA L_{dn} criterion at the nearest NSA, which protects the public from indoor and outdoor activity interference. Our acoustical analysis of the proposed site in section 4.12.2.2 estimates an increase in noise at the nearby NSAs of up to 1.9 dB. This increase would barely be perceivable. Based on the analysis presented in section 4.12.2.2, we conclude that the noise resulting from operation of the compressor station would not have a significant impact on the surrounding ambient noise environment.



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Source: Z. Valenti et al. "Geospatial Analysis of Public Lands in the Wadsworth Area." Figure 3.5.1-2. Wadsworth.mxd. Date: 10/23/2016.

Regarding moving the compressor station into industrial zoned areas in Wadsworth, Seville, or Medina, the proposed Wadsworth Compressor Station site is located in a semi-rural area of Guilford Township on a parcel zoned as residential. A large portion of the parcel is cultivated farmland. According to township zoning ordinances, the purpose of the residential zone is to provide for rural residential development at a low density which will promote the continuation of the predominant rural character of the township. Residential zones further encourage the continuance of agricultural production within the township. Notwithstanding, township ordinances conditionally allow for over two dozen other types of development, including transportation facilities, as well as other non-specified uses subject to approval.

The compressor station could potentially be moved to an industrial zone within Wadsworth, Seville, or Medina if a suitable site were available. Although such a site would be zoned industrial, locating the compressor station within the limits of a developed community would likely place the facility in proximity to more residences and other NSAs than the proposed, semi-rural location. Relocating the compressor station would also require routing the pipeline through more heavily developed and congested areas, affecting more landowners. In addition, relocating the compressor station could alter the hydraulics of the pipeline, potentially requiring that other compressor stations be moved and/or the size of the compressor engines be changed. Based on our review of the proposed site, we find that air, noise, and visual impacts would be adequately mitigated (see sections 4.12.1, 4.12.2 and 4.9.10, respectively) and conclude that moving the compressor station site within one of the communities of Wadsworth, Seville, or Medina would not provide a significant environmental advantage over the proposed site.

Regarding moving the compressor station out of the Upper Chippewa Creek Watershed in accordance with the Upper Chippewa Creek Balanced Growth Plan, the Ohio Balanced Growth Program is a program for watershed-based regional planning and water quality-oriented best local land use practices. The goal of the program is to protect and restore Lake Erie, the Ohio River, and Ohio's watersheds and drinking water source areas to assure long-term economic competitiveness, ecological health, and quality of life. The Chippewa Creek Watershed Balanced Growth Plan targets areas in the following categories: conservation, agricultural, and development. Some land falls into one or more of these categories; however, much of the land within the watershed does not fall into any category. In the case of the proposed Wadsworth Compressor Station, the site does not fall into any category: the land is not targeted for conservation, agriculture, or development. Therefore, we have concluded that the proposed compressor station site is not inconsistent with the Upper Chippewa Creek Balanced Growth Plan.

There do not appear to be substantial disadvantages to the proposed site as compared to the alternative sites; therefore, the alternative sites are not evaluated further.

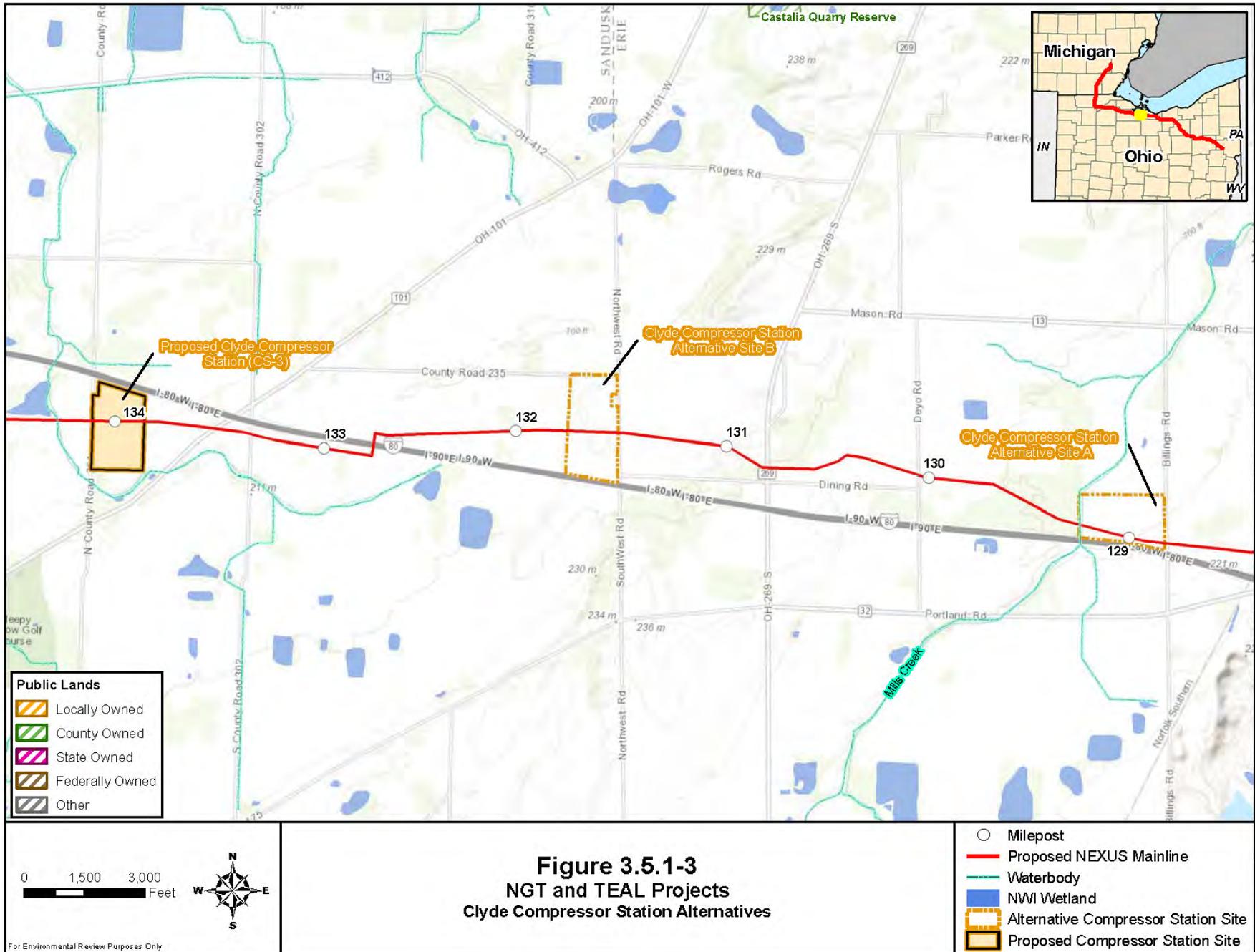
3.5.1.3 Clyde Compressor Station (CS 3, Erie and Sandusky Counties)

Two alternative sites were analyzed for the Clyde Compressor Station (see figure 3.5.1-3 and table 3.5.1-3). NEXUS was the originator of both alternatives. We did not receive stakeholder comments specific to the location or siting of the Clyde Compressor Station.

Property and Resources Evaluated	Alternative Site A	Alternative Site B	Proposed Site
Approximate Milepost	129.0	131.6	133.9
Property Size (acres)	58.7	71.9	59.4
Waterbodies (linear feet)	1,069	0	0
Agricultural Land (acres)	56.6	70.6	54.5
Open Land (acres)	1.0	0.5	4.8
Within Floodplain	Yes	Yes	No
Distance to Nearest NSA (feet)	0 ^a	40 ^a	810
Potentially Available for Purchase	Yes	No	Yes

^a Distance from the *property boundary* to the nearest NSA.

The proposed site for the Clyde Compressor Station encompasses 59.4 acres. According to NEXUS, the site would be developed without affecting wetlands, waterbodies, floodplains, or forested land. As with other proposed compressor station sites, the sound contribution of operating the compressor station would remain below our 55 dBA L_{dn} criterion at the nearest NSA. Our acoustical analysis of the proposed site in section 4.12.2.2 estimates an increase in noise at the nearby NSAs of up to 3.5 dB, which would be minor. There do not appear to be disadvantages to the proposed site as compared to the alternative sites; therefore, the alternative sites are not evaluated further.



3.5.1.4 Waterville Compressor Station (CS 4, Lucas County)

Two alternative sites were analyzed for the Waterville Compressor Station (see figure 3.5.1-4 and table 3.5.1-4). NEXUS was the originator of both alternatives. We received a number of comments suggesting that the compressor station should be relocated to a less populated area because of concerns about potential air and noise pollution caused by the facility. These concerns are discussed below.

Property and Resources Evaluated	Alternative Site A	Alternative Site B	Proposed Site
Approximate Milepost	183.4	186.6	183.5
Property Size (acres)	44.4	76.2	37.3
Wetlands (acres)	0.0	12.1	0.0
Waterbodies (linear feet)	1,735	1,810	0
Agricultural Land (acres)	44.1	62.8	37.3
Forested Land (acres)	0.0	11.8	0.0
Open Land (acres)	0.2	0.9	0.0
Distance to Nearest NSA (feet)	1,085 ^a	158 ^a	1,390
Within Floodplain	No	Yes	No
Potentially Available for Purchase	Yes	Yes	Yes

^a Distance from the *property boundary* to the nearest NSA.

The site proposed for the Waterville Compressor Station encompasses 37.3 acres. According to NEXUS, the site would be developed without affecting wetlands, waterbodies, floodplains, or forested land. The proposed site also has good access to public roads, water, electric lines, whereas the alternatives have limited access.

Regarding comments about relocating the compressor station to a less populated area because of concerns about potential air and noise pollution, we have concluded the compressor station would not have a significant impact on air quality or noise. As discussed in section 4.12.1.3, potential impacts on air quality associated with construction and operation of the Waterville Compressor Station would be minimized by strict adherence to all applicable federal and state regulations that are designed to be protective of air quality. NEXUS' facilities would comply with the NAAQS that were designed to protect human health, including sensitive populations, and the environment. The compressor station would be a minor source under all federal air quality permitting programs. Based on the analysis presented in section 4.12.1.3, the compressor station would not have a significant impact on regional air quality.

As discussed above and in section 4.12.2.2, the sound contribution of operating the compressor station would remain below our 55 dBA L_{dn} criterion at the nearest NSA, which protects the public from indoor and outdoor activity interference. Our acoustical analysis of the proposed site in section 4.12.2.2 estimates an increase in noise at the nearby NSAs of up to 1.3 dB. This increase would not be noticeable. Based on the analysis presented in section 4.12.2.2, we conclude that the noise resulting from operation of the compressor station would not have a significant impact on the surrounding ambient noise environment.

There do not appear to be any substantial disadvantages to the proposed site as compared to the alternative sites; therefore, the alternative sites are not evaluated further.

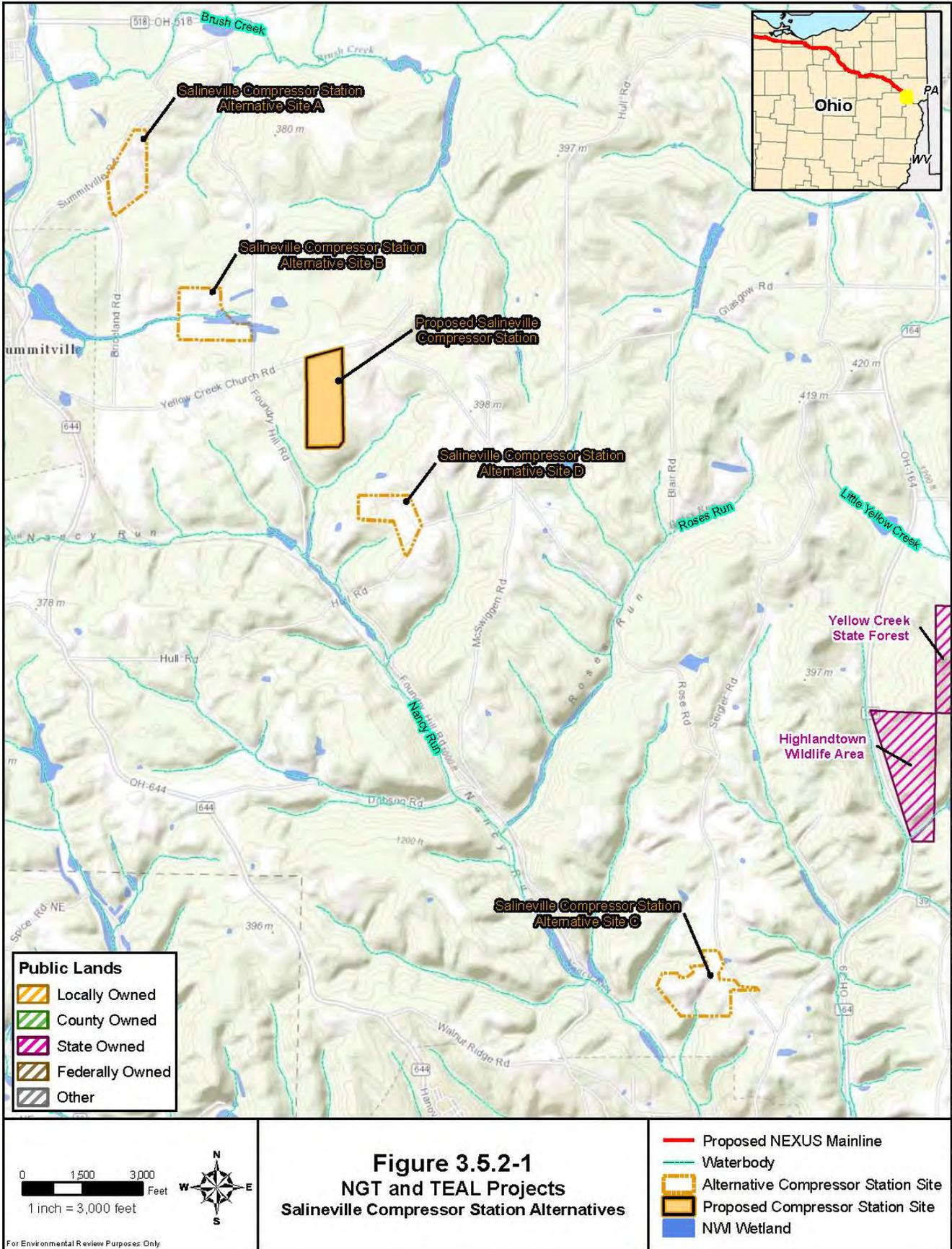
3.5.2 TEAL Compressor Station Alternatives

Four alternative sites were analyzed for the Salineville Compressor Station (see figure 3.5.2-1 and table 3.5.2-1). NEXUS was the originator of all the alternatives. We did not receive stakeholder comments specific to the location or siting of the Salineville Compressor Station.

Property and Resources Evaluated	Alternative Site A	Alternative Site B	Alternative Site C	Alternative Site D	Proposed Alternative
Property Size (acres)	32.3	40.1	46.4	28.0	47.3
Wetlands (acres)	0.0	3.2	0.0	0.0	0.0
Waterbodies (linear feet)	0	1,235	357	0	0
Agricultural Land (acres)	30.3	34.8	30.1	24.3	44.7
Forested Land (acres)	0.3	5.1	15.0	2.9	0.0
Open Land (acres)	2.4	0.2	1.3	0.8	0.5
Cultural Resources Sites	1	0	0	2	2
Distance to Nearest NSA (feet)	80 ^a	95 ^a	50 ^a	0 ^a	1,490
Potentially Available for Purchase	Unknown	Unknown	Unknown	Unknown	Yes

a Distance from the *property boundary* to the nearest NSA.

The proposed site for the Salineville Compressor Station encompasses 47.3 acres. According to Texas Eastern, the site would be developed without affecting wetlands, waterbodies, or forested land. Also, the cultural resources at the proposed site isolated finds are not eligible for listing on the National Register of Historic Properties (NRHP). For these reasons, there do not appear to be any substantial disadvantages to the proposed site as compared to the alternative sites; therefore, the alternative sites are not evaluated further.



3.5.3 Electric Compressors

Because electric compressors have the ability to reduce air and noise impacts, we analyzed the feasibility of using electric motor-driven compressor units in lieu of the proposed natural gas-fired compressor units at the NGT and TEAL compressor stations. Although technically feasible, the use of electric units would require additional time to install and require electrical supply to each compressor station site as well as the greater capital and operating costs associated with electric units.

Electric power required to operate each compressor station would exceed local electric distribution grids' ability to meet the demand. The existing overhead single phase service would need to be converted to three phase service and other constructed electric transmission facilities could be necessary. A utility power system study would be needed in order to determine the capability of the existing transmission system. Any new facilities would likely result in additional environmental impacts and additional burdens on landowners. The proposed gas-driven compressor stations could be supported with the existing power lines located in proximity to the selected sites.

Finally, gas-driven turbines provide reliable, uninterrupted natural gas transmission because the fuel supply does not require a third-party for operation. Gas-driven emergency generators with capacity to power electric compressors would be infeasible and significantly larger than the proposed turbines. Gas turbines would not be affected by an electrical outage at the compressor station. For these reasons, we conclude that electric-driven compressor units at the proposed NGT and TEAL compressor stations would not offer a significant environmental advantage over the proposed gas-driven turbines.

3.5.4 M&R Station Alternatives

NEXUS proposed six M&R stations along the proposed routes. Our analysis of alternative M&R station sites was driven by comments discussing specific issues of concern with the sites and our independent consideration of the sites' impacts. As a result, we considered alternative locations for only MR06 based on landowner concerns raised during the draft EIS comment period.

3.5.4.1 MR06 Alternative

During the draft EIS comment period, we received a comment from a landowner requesting that the MR06 site on their property be moved off cultivated land and into a wooded area to the west. If that would not be practical, the landowner requested that the M&R station site be moved to the northwest corner of the cultivated field, otherwise a portion of their field near the M&R site would be cut off from farming because their agricultural equipment would not be able to maneuver in that space.

During our review, we considered re-siting MR06 at MP 159.3 into the wooded area, however, dismissed that option because of the amount of forest clearing that would be required. Further, re-siting MR06 into the wooded area would necessitate constructing a new interconnecting pipeline from the M&R station back to the customer's pipelines in the cultivated field. The interconnecting pipelines would need to be bored under the adjacent railroad tracks, and a tap with an aboveground operator would need to be installed in the cultivated field where the interconnecting pipeline connects to the customer pipelines.

We also considered re-siting MR06 into the northwest corner of the cultivated field to minimize the amount of land that would be taken out of agricultural production (see figure 3.5.4-1). We estimate that about 8 acres of agricultural land would be taken out of service by constructing on the proposed MR06 site. This would be reduced to about 3 acres by constructing on the alternative site in the northwest corner of the field. We note that moving the M&R site would necessitate crossing over existing pipelines on the property as well as installing a permanent access road over the existing pipelines. Neither of these undertakings is

impossible, and neither substantially adds to environmental impacts. Based on our review and in order to minimize the amount of agricultural land permanently taken out of service, **we recommend that:**

- **Prior to construction, NEXUS should re-site the metering and regulating station at MP 159.3 (MR06) as depicted on figure 3.5.4-1 of the final EIS. NEXUS should, in consultation with the landowner, redesign the permanent access road to MR06 either by extending the currently proposed road or by designing a new road that would abut the adjacent railroad easement. NEXUS should file for review and written approval with the Director of the OEP updated site plans incorporating these minor design changes.**

The landowner of site MR06 also identified concerns with the location of a cathodic protection anode bed in a separate agricultural field on their property, particularly that trenching for the anode bed would damage existing drain tiles, although a specific location for an alternative site was not entirely clear. NEXUS developed a *Drain Tile Mitigation Plan* to address landowner concerns about impacts on drain tile systems. The plan identifies procedures to be implemented before, during, and after construction to minimize impacts on drain tile systems. Prior to the start of construction, NEXUS would work with landowners to identify the type of drain system in place. After completion of construction, NEXUS would repair drain tiles, as needed, restore the area to preconstruction conditions, and conduct post-construction monitoring to ensure successful restoration of the area. For these reasons, there does not appear to any substantial disadvantages to the proposed site; therefore, alternative sites have not been evaluated.

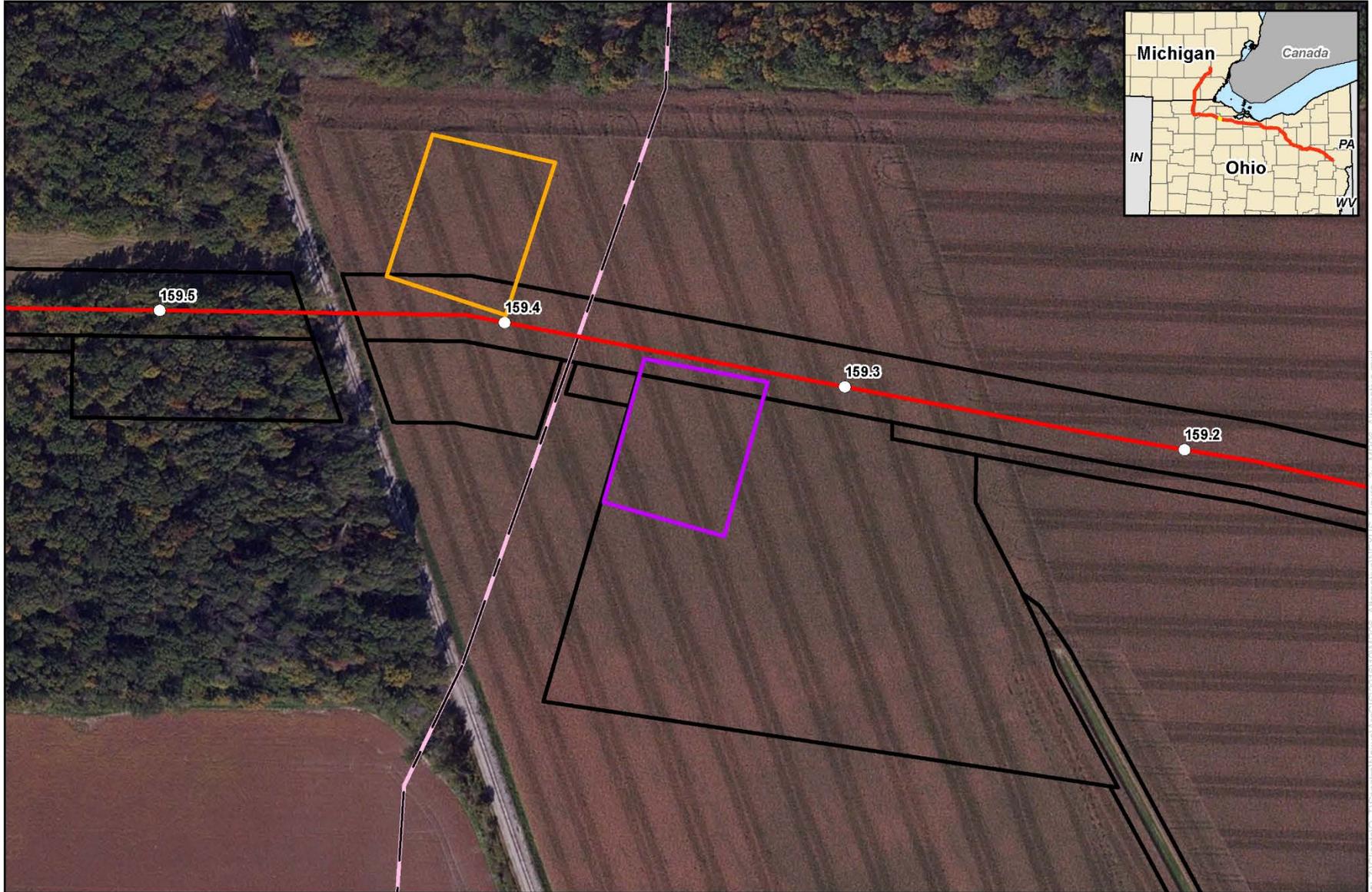


Figure 3.5.4-1
NGT Project
MR06 Alternatives
Sandusky County, Ohio

- Milepost
- Proposed NEXUS Mainline
- Existing Pipeline
- ▭ Originally Proposed MR06
- ▭ Alternative MR06
- ▭ TWS/ATWS

For Environmental Review Purposes Only

Source: (10/17/2016)

4.0 ENVIRONMENTAL ANALYSIS

This section of the EIS primarily provides our analysis of impacts associated with construction and operation of the NGT and TEAL Projects. NEXUS is also seeking a Certificate to acquire capacity in lease from Texas Eastern in Pennsylvania, West Virginia, and Ohio; from DTE Gas in southeastern Michigan; and from Vector in southeastern Michigan. Outside the United States, NEXUS would use existing capacity on the Vector system in western Ontario, Canada to access the Dawn Hub. The capacity lease of capacity would require expansion of DTE Gas' system by adding compression at an existing compressor stations. It also would involve modification of Vector's system by modifying an existing meter station and constructing approximately 0.6 mile of 30-inch-diameter pipeline. Construction of DTE Gas' expansion capacity is subject to the jurisdiction of the Michigan Public Service Commission, not the FERC, because DTE Gas is a state-regulated gas utility providing limited interstate transportation service pursuant to Title 18 CFR Section 284.224. Modification of Vector's facilities are to be conducted under Vector's blanket Certificate, which was issued by the Commission in Docket No. CP98-135-000. Vector would provide notice of the modifications after construction is complete and the facilities are placed in-service. With regard to Vector's other facilities in Canada, this EIS is specific to the United States portion of the pipeline facilities. The use of facilities in Canada would require approval from the National Energy Board of Canada. An analysis of effects of proposed actions in Canada would be the responsibility of the Canadian government.

This section describes the affected environment as it currently exists and the environmental consequences of the Projects. The section is organized by the following major resource topics: geology; soils; water resources; wetlands; vegetation; wildlife and aquatic resources; special status species; land use, recreation, special interest areas, and visual resources; socioeconomics; cultural resources; air quality and noise; reliability and safety; and cumulative impacts.

The environmental consequences of constructing and operating the Projects would vary in duration and significance. Four levels of impact duration were considered: temporary, short-term, long-term, and permanent. Temporary impacts generally occur during construction with the resource returning to pre-construction condition almost immediately afterward. Short-term impacts could continue for up to 3 years following construction. Impacts were considered long-term if the resource would require more than 3 years to recover. A permanent impact could occur as a result of any activity that modifies a resource to the extent that it would not return to pre-construction conditions during the life of the Projects.

We considered an impact to be significant if it would result in a substantial adverse change in the physical environment. The applicants, as part of their proposals, developed certain mitigation measures to reduce the impact of the Projects. In some cases, we determined that additional mitigation measures could further reduce the Projects' impacts. Our additional mitigation measures appear as bulleted, boldfaced paragraphs in the text of this section and are also included in section 5.2. We will recommend to the Commission that these measures be included as specific conditions in any Certificate the Commission may issue to the applicants for these Projects.

The conclusions in the EIS are based on our analysis of the environmental impact and the following assumptions:

- the applicants would comply with all applicable laws and regulations;
- the proposed facilities would be constructed as described in section 2.0 of the EIS;
- the applicants would implement the mitigation measures included in their applications and supplemental submittals to the FERC and cooperating agencies, and in other applicable permits and approvals; and
- the applicants would comply with our recommended mitigation measures.

4.1 GEOLOGY

4.1.1 Existing Environment

4.1.1.1 Physiography and Topography

NGT Project

The NGT Project occurs in two physiographic provinces, or large areas with characteristic landforms and similar geology, including the Appalachian Plateau Province (MP 0.0 to MP 79.0) and the Central Lowland Province (MP 79.0 to MP 255.0) (Fenneman, 1928; Milstein, 1987; Brockman, 1998; and Nicholson, et al., 2005).

The Appalachian Plateau Province forms the northwestern flank of the Appalachian Mountains from western New York to northern Alabama and is characterized by elevated, planar sedimentary rocks with differing levels of stream dissection. The Appalachian Plateau Province in the area of the NGT Project is further comprised of two sections: the Kanawha Section and the Southern New York Section. The Kanawha Section (MP 0.0 to MP 15.0) is an unglaciated plateau with moderate to high relief (300 feet to 800 feet) and elevations ranging from 1,140 to 1,310 feet above mean sea level (AMSL) in the area of the NGT Project. The Southern New York Section (MP 15.0 to MP 79.0) is a glaciated plateau with low to moderate relief (20 feet to 300 feet) and elevations ranging from 950 to 1,300 feet AMSL in the area of the NGT Project.

The Central Lowland Province occupies relatively lower elevations of the eastern interior of the United States and is characterized as having generally low relief. The Central Lowland Province in the area of the NGT Project is further comprised of two sections: the Till Plains Section and the Eastern Lake Section. The Till Plains Section (MP 79.0 to MP 110.0) consists of glacial deposits forming broad plains with little relief (20 feet to 30 feet) and localized uplands with moderate relief (up to 250 feet). The elevation of the Till Plains Section in the area of the NGT Project ranges from 575 to 1,300 feet AMSL. The Eastern Lakes Section (MP 110.0 to MP 255.0) consists largely of lacustrine deposits with only 5 to 10 feet of local relief. The elevation of the Eastern Lake Section in the area of the NGT Project ranges from 750 to 970 feet AMSL.

TEAL Project

The TEAL Project occurs entirely within the Kanawha Section of the Appalachian Plateau Province, as described above. The elevation of the Kanawha Section in the area of the TEAL Project ranges from 540 to 1,400 feet AMSL.

4.1.1.2 Bedrock Geology

NGT Project

Bedrock geologic units underlying the NGT Project are predominantly Paleozoic sedimentary rock, including siltstone, shale, sandstone, dolostone, limestone, and evaporate (Brockman, 1998) (see appendix G-1). These bedrock units were deposited in warm shallow tropical to subtropical marine seas, tidal flats, large coal-forming coastal swamps, and near-shore deltas (Slucher et al., 2006). Bedrock occurs intermittently within 10 feet of the land surface beneath 38.2 miles (22 percent) of the pipeline route between MP 0.0 and MP 175.0 (see table 4.1.1-1).

TABLE 4.1.1-1

Surficial Geology of the NGT and TEAL Projects

Project, State, Component	Milepost (mile)	Thickness (feet)	Geology Age	Unit Name
NGT PROJECT				
Ohio				
TGP Interconnect	0 - 0.9	Discontinuous or patchy	Holocene to Tertiary	Colluvial ^b sediments, discontinuous
Mainline	0 - 4.6	<100	Holocene to Tertiary	Colluvial sediments, thin
	4.6 - 12.2	<100	Late-Wisconsinan to pre-Illinoian	Glacial till sediments, mostly silty, thin
	12.2 - 15.7	<100	Late-Wisconsinan to pre-Illinoian	Glacial till sediments, mostly clayey, thin
	15.7 - 18.5	>100	Late-Wisconsinan to pre-Illinoian	Glacial till sediments, mostly clayey, thick
	18.5 - 19.2	>100	Late-Wisconsinan to pre-Illinoian	Glacial till sediments, mostly silty, thick
	19.2 - 19.4	>100	Late-Wisconsinan to pre-Illinoian	Glacial till sediments, mostly clayey, thick
	19.4 - 31.6	<100	Late-Wisconsinan to pre-Illinoian	Glacial till sediments, mostly silty, thin
	31.6 - 33.5	<100	Late-Wisconsinan to Illinoian	Glaciofluvial ^c ice-contact sediments, mostly sand and gravel, thin
	33.5 - 34.5	<100	Late-Wisconsinan to pre-Illinoian	Proglacial ^d sediments, mostly coarse-grained, thin
	34.5 - 35.7	<100	Late-Wisconsinan to pre-Illinoian	Glacial till sediments, mostly clayey, thin
	35.7 - 37.4	<100	Late-Wisconsinan to Illinoian	Glaciofluvial ice-contact sediments, mostly sand and gravel, thin
	37.4 - 41.7	>100	Late-Wisconsinan to Illinoian	Glaciofluvial ice-contact sediments, mostly sand and gravel, thick
	41.7 - 42.7	<100	Late-Wisconsinan to Illinoian	Glaciofluvial ice-contact sediments, mostly sand and gravel, thin
	42.7 - 44.4	<100	Late-Wisconsinan to pre-Illinoian	Glacial till sediments, mostly clayey, thin
	44.4 - 44.7	<100	Late-Wisconsinan to Illinoian	Glaciofluvial ice-contact sediments, mostly sand and gravel, thin
	44.7 - 54.5	<100	Late-Wisconsinan to pre-Illinoian	Glacial till sediments, mostly clayey, thin
	54.5 - 68.5	<100	Late-Wisconsinan to pre-Illinoian	Glacial till sediments, mostly silty, thin
	68.5 - 69.5	<100	Late-Wisconsinan to pre-Illinoian	Glacial till sediments, mostly clayey, thin
	69.5 - 70.8	>100	Late-Wisconsinan to pre-Illinoian	Proglacial sediments, mostly fine grained, thick
	70.8 - 72	<100	Late-Wisconsinan to pre-Illinoian	Proglacial sediments, mostly fine grained, thin
	72 - 91.9	<100	Late-Wisconsinan to pre-Illinoian	Glacial till sediments, mostly clayey, thin
	91.9 - 93.6	>100	Late-Wisconsinan to pre-Illinoian	Glacial till sediments, mostly clayey, thick
	93.6 - 99.2	<100	Late-Wisconsinan to pre-Illinoian	Glacial till sediments, mostly clayey, thin
	99.2 - 99.9	>100	Late-Wisconsinan to pre-Illinoian	Glacial till sediments, mostly clayey, thick
	99.9 - 113.6	<100	Late-Wisconsinan to pre-Illinoian	Glacial till sediments, mostly clayey, thin
	113.6 - 113.9	<100	Late-Wisconsinan to pre-Illinoian	Proglacial sediments, mostly fine grained, thin
	113.9 - 118.9	<100	Late-Wisconsinan to pre-Illinoian	Proglacial sediments, mostly coarse-grained, thin
118.9 - 120.7	<100	Late-Wisconsinan to pre-Illinoian	Proglacial sediments, mostly fine grained, thin	
120.7 - 136.3	<100	Late-Wisconsinan to pre-Illinoian	Glacial till sediments, mostly clayey, thin	
136.3 - 150.5	<100	Late-Wisconsinan to pre-Illinoian	Proglacial sediments, mostly fine grained, thin	
150.5 - 181	<100	Late-Wisconsinan to pre-Illinoian	Glacial till sediments, mostly clayey, thin	
181 - 181.8	<100	Late-Wisconsinan to pre-Illinoian	Proglacial sediments, mostly fine grained, thin	
181.8 - 198.2	<100	Late-Wisconsinan to pre-Illinoian	Proglacial sediments, mostly coarse-grained, thin	
198.2 - 207.9	>100	Late-Wisconsinan to pre-Illinoian	Proglacial sediments, mostly coarse-grained, thick	

TABLE 4.1.1-1 (continued)

Surficial Geology of the NGT and TEAL Projects

Project, State, Component	Milepost (mile)	Thickness (feet)	Geology Age	Unit Name
	207.9 – 208.3	>100	Late-Wisconsinan to pre-Illinoian	Proglacial sediments, mostly fine grained, thick
Hanoverton Compressor Station (CS-1)	1.4	<100	Holocene to Tertiary	Colluvial sediments, thin
Wadsworth Compressor Station (CS-2)	63.5	<100	Late-Wisconsinan to pre-Illinoian	Glacial till sediments, mostly silty, thin
Clyde Compressor Station (CS-3)	134.0	<100	Late-Wisconsinan to pre-Illinoian	Glacial till sediments, mostly clayey, thin
Waterville Compressor Station (CS-4)	183.5	<100	Late-Wisconsinan to pre-Illinoian	Proglacial sediments, mostly coarse-grained, thin
Michigan				
Mainline	208.3 - 214.3	>100	Late-Wisconsinan to pre-Illinoian	Proglacial sediments, mostly fine grained, thick
	214.3 - 221	>100	Late-Wisconsinan to pre-Illinoian	Proglacial sediments, mostly coarse-grained, thick
	221 - 223.2	>100	Late-Wisconsinan to pre-Illinoian	Proglacial sediments, mostly fine grained, thick
	223.2 - 231.1	<100	Late-Wisconsinan to pre-Illinoian	Proglacial sediments, mostly fine grained, thin
	231.1 - 249.1	>100	Late-Wisconsinan to pre-Illinoian	Proglacial sediments, mostly fine grained, thick
	249.1 - 255.2	>100	Late-Wisconsinan to pre-Illinoian	Proglacial sediments, mostly coarse-grained, thick
TEAL PROJECT ^a				
Ohio				
Pipeline Loop	0.0 - 4.4	Discontinuous, or patchy in distribution	Holocene to Tertiary	Colluvial sediments, discontinuous
Connecting Pipeline	0.0 - 0.3	Colluvial sediments, discontinuous	Holocene to Tertiary	Discontinuous, or patchy in distribution
Salineville Compressor Station	5.9	Discontinuous, or patchy in distribution	Holocene to Tertiary	Colluvial sediments, discontinuous
Colerain Compressor Station	49.9	Discontinuous, or patchy in distribution	Holocene to Tertiary	Colluvial sediments, discontinuous

a Line 73 Pipeline milepost designations are used

b Colluvial: Loose deposits at base of slopes or cliffs, principally de .

c Glaciofluvial: Deposits produced by streams fed by melting glaciers.

d Proglacial: Deposits just beyond outer limits of glacier and formed by or derived from glacier ice.

Source: USGS, 2009

TEAL Project

Bedrock geologic units underlying the TEAL Project are predominantly Paleozoic sedimentary rocks, including siltstone, shale, and mudstone (Nicholson et al., 2005; Ohio Division of Geologic Survey [ODGS], 1998) (see appendix G-1). These bedrock units were deposited in warm shallow tropical to subtropical marine seas, tidal flats, large coal-forming coastal swamps, and near-shore deltas built from periods of glacial melt (ODGS, 2006). Bedrock occurs within 10 feet of the land surface beneath 4 miles (89 percent) of the pipeline route (see table 4.1.1-1).

Blasting

NEXUS and Texas Eastern would attempt to remove shallow bedrock during pipeline installation and construction of aboveground facilities using conventional backhoe excavation, ripping, or hammering followed by backhoe excavation. Blasting may be necessary where shallow, hard, non-rippable bedrock occurs. As discussed in section 4.1.5, blasting could pose a safety hazard to nearby personnel and residents, damage nearby structures and infrastructure, or trigger ground subsidence. NEXUS and Texas Eastern would mitigate potential blasting-related impacts by implementing specific measures detailed in their project-specific *Blasting Plans* (see section 4.1.5).

4.1.1.3 Surficial Geology

NGT Project

Unconsolidated sand, gravel, silt, and clay occur at the land surface in the NGT Project area. These geologic materials were deposited as ice sheet moraine and till deposits, and stratified glacial (streams and lakes) melt deposits during the Pleistocene with alluvium in floodplains and swamps (ODGS, 2005) (see table 4.1.1-1).

In north central Ohio and southern Michigan (MP 110.0 to MP 255.0), the surficial geologic materials were deposited in glacial lakes Maumee and Wayne, and their associated environments. These deposits are comprised of wave-planed clay, silt, and sand overlain by beach and eolian (wind-blown) sands that were deposited as the glacial lakes receded toward present-day Lake Erie (Kelley and Farrand, 1967). An area of the NGT Project of particular geologic interest is in the Oak Openings region (MP 186.6 to MP 196.3) where a unique ecosystem of sand dunes, swamp forest, and wet prairies exists where beach ridge sands overlie lacustrine clays. Oak Openings is further discussed in section 4.5.1.1.

TEAL Project

Unconsolidated surficial deposits in the TEAL Project area consist of colluvium derived from the weathering and breakdown of the underlying bedrock and parent material (ODGS, 2005) (see table 4.1.1-1).

4.1.2 Mineral Resources

Mineral resources found in the vicinity of the Projects include non-fuel and fuel mineral resources as outlined in the following sections. Non-fuel resources include sand and gravel, clay, crushed stone, salt, sandstone, and limestone in Ohio, as well as sand and gravel, limestone, and clay in Michigan. Fuel mineral resources include coal, oil, and natural gas.

Ohio has a long history of coal production and numerous commercial coal mining operations (surface and underground) have operated since the first reported state coal production in 1800. Approximately 3.7 billion tons of coal have been mined since 1800, with underground mining accounting

for 2.3 billion tons and surface mining accounting for the remaining 1.4 billion tons (Crowell, 2005). Coal production peaked in Ohio in 1970 with 55 million tons produced that year. Since 1970, coal production in Ohio has been declining, with 25.1 million tons of coal produced in 2013 (U.S. Department of Energy [DOE], 2013). The majority of coal production has historically taken place in southeastern Ohio; however, as discussed below, coal mining has occurred in proximity to the Projects. Subsidence associated with underground mine workings poses a geologic hazard, as discussed in section 4.1.3.5.

Oil and gas have been produced from conventional and unconventional reservoirs in Ohio and Michigan. Conventional production typically involves drilling vertical wells into sandstone and limestone reservoirs, whereas unconventional production involves drilling horizontally into shale deposits and hydraulically fracturing the shale to stimulate production. Conventional drilling for oil and natural gas resources has occurred in the Projects area since the 1860s, and from 1895 to 1903 more oil was produced in Ohio than in any other state. Over the last 5 years, the use of horizontal drilling and hydraulic fracturing have resulted in oil and natural gas production from the Marcellus Shale and Utica Shale in eastern and north-central Ohio.

NGT Project

Five non-fuel mineral resource surface mines are located within 0.25 mile of the NGT Project facilities (table 4.1.2-1). As detailed below, four of these mines are active, and the remaining mine is no longer active and is undergoing restoration.

- The proposed pipeline would be 0.1 mile from the active area of the Johnson Stone Products facility near MP 99.0. In April 2016, NEXUS revised its proposed route to further avoid mining activities at this facility.
- The proposed pipeline would be 0.2 mile from the Hanson Aggregate Midwest facility near MP 127.0, but would be separated from the mine by the Ohio Turnpike and other commercial facilities.
- The proposed pipeline would be less than 0.1 mile from the Carmeuse Lime mine near MP 160.0, but would be on the opposite side of an existing right-of-way occupied by two pipelines owned by Dominion and Ohio East Gas Company.
- The proposed pipeline would be less than 0.1 mile from the former Sandco Sand & Topsoil facility near MP 192.0; however, mining activity has ceased and site restoration is underway at the facility.
- The proposed pipeline would be less than 0.1 mile from the J&T Aggregate facility near MP 248.9, but would be on the opposite side of an existing right-of-way occupied by a natural gas pipeline owned by Michcon Storage and Transportation.

Project, State, Component	Milepost (mile) ^a	Distance from Project (mile)	Mine Type (Above Ground or Under Ground)	Resource Type	Status	Producer
OHIO						
Mainline	98.8 - 98.9	0.1	Above Ground	Limestone	Active	Johnson Stone Products

TABLE 4.1.2-1 (cont'd)

Non-fuel Mineral Resource Mines within 0.25 mile of the NGT Project						
Project, State, Component	Milepost (mile) ^a	Distance from Project (mile)	Mine Type (Above Ground or Under Ground)	Resource Type	Status	Producer
MICHIGAN Mainline	127.3	0.1	Above Ground	Limestone	Active	Hanson Aggregates Midwest, LLC
	159.7 - 160.3	<0.1	Above Ground	Lime and Limestone	Active	Carmeuse Lime, Inc.
	192.0	<0.1	Above Ground	Sand and Gravel	Inactive	Sandco Sand and Topsoil Inc.
	248.9	<0.1	Above Ground	Sand and Gravel	Active	J&T Aggregate, LLC

a Line 73 Pipeline milepost designations are used.
Sources: Ohio Department of Natural Resources (ODNR), 2013a; Michigan Department of Environmental Quality (MDEQ), 2015

No non-fuel surface mineral mines are located within 0.25 mile of any aboveground facilities.

Table 4.1.2-2 summarizes the locations of known underground and surface fuel mineral mines within 0.25 mile of the NGT Project pipeline and aboveground facilities, all of which are either inactive or abandoned coal mines. No active, inactive, or abandoned fuel mineral mines are within 0.25 mile of aboveground facilities.

We received comments expressing concern that the NGT Project could cross the former underground coal mines including the Overholt Mine in Green County, Ohio, and the Myers, Theo, & Son Mine and Shotmacher Mine in the area of North Canton, Ohio. As indicated in table 4.1.2-2, the Overholt Mine is 0.2 mile from the proposed pipeline. Available data also indicates that the Myers, Theo, & Son Mine is more than 1 mile from the pipeline route, and the former Shotmacher Mine is 0.4 mile from the route. Thus, none of the proposed facilities would cross the abandoned mines raised by commenters.

Based on Ohio Department of Natural Resources (ODNR) and MDEQ data, 419 active and 480 inactive or abandoned oil and gas wells are located within 0.25 mile of the NGT Project, 765 (86 percent) of which occur between MP 0.0 and MP 100.0. A total of 11 active and 18 inactive or abandoned oil and gas wells occur within the NGT Project workspace (see appendix G-2). In addition to well pads, oil and gas facilities in the NGT Project area include gathering lines and other production facilities.

TEAL Project

No active or abandoned non-fuel mineral resource mines or active fuel mineral resource mines were identified within 0.25 mile of the TEAL Project.

TABLE 4.1.2-2

Inactive or Abandoned Fuel Mineral Resource Mines within 0.25 mile of the NGT and TEAL Projects and Aboveground Facilities

Project, State, Component	Milepost (mile) ^{-a}	Distance from Project (mile)	Mine Type (Above Ground or Under Ground)	Resource Type	Status	Producer
NGT PROJECT						
Ohio						
Mainline	1.9	<0.1	Above Ground	Coal	Abandoned	John Glenn Mining Co
	2.5	0.2	Above Ground	Coal	Inactive	Blum Coal Co
	2.5	0.1	Above Ground	Coal	Inactive	General Mines Inc.
	7.9	<0.1	Under Ground	Coal	Abandoned	King & Perien
	7.9	0.1	Under Ground	Coal	Abandoned	Stone, J.S., Coal Co.
	35.5	0.1	Under Ground	Coal	Abandoned	R And T Coal Company
	35.7	0.2	Under Ground	Coal	Abandoned	Overholt Coal Company
	42.4	0.2	Under Ground	Coal	Abandoned	Massillon - Akron Coal Company
	44.7	0.1	Under Ground	Coal	Abandoned	Akron - Massillon Coal Company
	45.5	0.2	Under Ground	Coal	Abandoned	Massillon Coal Mining Company
	50.9	0.2	Under Ground	Coal	Abandoned	Jones, J.D. Coal Co.
	52.1	0.2	Under Ground	Coal	Abandoned	Loomis, H.E.
	53.7	<0.1	Under Ground	Coal	Abandoned	Ohio Salt Co./Wayne No. 2
TEAL PROJECT ^b						
Ohio						
Pipeline Loop	0.2	0.2	Above Ground	Coal	Inactive	Consolidation Coal Co
	0.5 - 2.4	Crosses	Under Ground	Coal	Abandoned	Quarto Mining Co
Colerain Compressor Station	2.5 - 4.4	Crosses	Under Ground	Coal	Abandoned	Quarto Mining Co
	49.9	0.1	Above Ground	Coal	Abandoned	Landers Coal Co
	49.9	Crosses	Above Ground	Coal	Inactive ^b	Marietta Coal Company
	49.9	0.1	Above Ground	Coal	Inactive	Mc Kim Coal Co
	49.9	Crosses	Above Ground	Coal	Inactive	Ohio Coal & Const Corp
	49.9	0.2	Above Ground	Coal	Inactive	R & F Coal Co
	49.9	Crosses	Under Ground	Coal	Abandoned	Y & O Coal Co
	49.9	0.1	Under Ground	Coal	Abandoned	Barton Mining Co
a Line 73 Pipeline milepost designations are used.						
b ODNR database lists the Marietta Coal Company mine as active, but field reconnaissance by Texas Eastern determined mining has been completed and the area has been restored.						
Sources: ODNR, 2013a; MDEQ, 2015						

Table 4.1.2-2 summarizes inactive and abandoned coal mines within 0.25 mile of the TEAL Project based on data obtained from the ODNR. According to the ODNR, the proposed pipeline facilities cross abandoned underground coal mines between MP 0.5 and MP 4.4, and aboveground and underground coal mining occurred at the Colerain Compressor Station site. ODNR data also indicates that all of the nearby coal mines are either abandoned or inactive with the exception of Marietta Coal Company mine, which is listed as an active aboveground mine that is located within the boundary of the Colerain Compressor Station; however, Texas Eastern constructed the Colerain Compressor Station in 2015 and stated that coal mining ceased and the site was previously restored. Texas Eastern also conducted a geotechnical investigation of the Colerain Compressor Station site and found mine tailings overlying bedrock, but no indication of underground mine workings.

A total of 26 known active and inactive oil and gas wells have been identified within 0.25 mile of the TEAL Project (see appendix G-2); however Texas Eastern indicates that none within the workspace. Oil and gas facilities in the TEAL Project area may include gathering lines and other production facilities.

4.1.3 Geologic Hazards

Geologic hazards are natural, physical conditions that can result in damage to land and structures or injury to people. Potential geologic hazards in the NGT and TEAL Projects area include earthquakes, surface faults, soil liquefaction, karst, landslides, ground subsidence associated with historic underground coal mining, and flash flooding. In general, the potential for geologic hazards to significantly affect construction or operation of the proposed NGT and TEAL Projects' facilities is low.

4.1.3.1 Earthquakes and Faults

The majority of significant earthquakes around the world are associated with tectonic subduction zones, where one crustal plate is overriding another (e.g., the Japanese islands), where tectonic plates are sliding past each other (e.g., California), or where tectonic plates are converging (e.g., the Indian Sub-continent). Unlike these highly active tectonic regions, the Midwest region of the United States occurs approximately in the middle of the North American tectonic plate, which is relatively quiet. While the Midwest of the United States is relatively seismically quiet, earthquakes do occur in the Projects area, largely due to trailing edge tectonics and residual stress released from past orogenic events. The largest recorded earthquake in Ohio was a magnitude 5.4 event that occurred on March 9, 1937 in the area of the town of Anna, approximately 75 miles south from the NGT Project. The largest recorded earthquake in Michigan was a magnitude 4.6 event that occurred on August 10, 1947 in the area of the town of Kalamazoo, approximately 60 miles west of the NGT Project. Both of these earthquakes resulted in cracked foundations, cracked plaster, broken windows, and toppled chimneys in the area of the epicenters.

Earthquakes have also been associated with the deep injection of brine and other fluids derived from oil and gas production activities, most notably in Oklahoma. In Ohio, one injection well in the area of a dormant fault zone in the area of Youngstown, Ohio may have caused up to 12 earthquakes in 2011, with a maximum magnitude of 4.0 (ODNR, 2012). The injection well was ordered to be shut down in 2012 by the ODNR and the State of Ohio has since changed its rules to prohibit the drilling of injection wells into Precambrian bedrock, where dormant faults may be located.

The shaking during an earthquake can be expressed in terms of the acceleration due to gravity (g). Seismic risk can be quantified by the motions experienced by the ground surface or structures during a given earthquake, expressed in terms of g. For reference, peak ground acceleration (PGA) of 10 percent of gravity (0.1 g) is generally considered the minimum threshold for damage to older structures or structures not made to resist earthquakes.

The U.S. Geological Survey (USGS) estimates there is a 2 percent chance for an earthquake to occur within the Projects area in the next 50 years (i.e., a recurrence interval of 2,500 years) that would result in a PGA between 0.05 g and 0.07 g on the NGT Project and PGA between 0.04 and 0.06 g on the TEAL Project (Petersen et al., 2015). The USGS also estimates there is a 10 percent chance for an earthquake to occur in the next 50 years (i.e., a recurrence interval of 475 years) that would result in a PGA of between 0.01 g and 0.02 g. in the Projects area. In addition, the USGS has assessed the potential for deep fluid injection to contribute to earthquake activity in the United States, and determined there is less than a 1 percent chance for a damaging earthquake with a PGA of 0.12 g to occur in the Projects area due to combined natural or induced causes within the next year (Petersen et al., 2016). The USGS will continue to monitor induced earthquake activity and revise its risk assessment annually.

Earthquakes can result in the displacement of bedrock along fault lines. For a fault to be considered active, displacement must have taken place in the last 10,000 years (USGS, 2008). Sub-surface or blind faults are considered to present generally less potential for displacement of bedrock during earthquakes, in contrast to surface faults.

NGT Project

The NGT Project would not intersect any known, mapped, or inferred active fault lines (USGS, 2006).

Several comments were received regarding faults in the NGT Project area, specifically the Bowling Green Fault, which, in Ohio, extends from the Michigan state line in the area of Toledo, southward into Hardin County. The NGT Project crosses the Bowling Green Fault at MP 180.8 near the Maumee River. The Bowling Green Fault is not visible in surficial geology and only identified in basement rock, which is approximately 2,200 to 2,300 feet below ground surface in the area (Baranoski, 2013). The Bowling Green Fault was active between 443 to 416 million years ago (USGS, 2006). No other faults in proximity to the NGT Project exhibit evidence of activity within the last 1.6 million years, and there is no clear association between faults and small earthquakes that occur in the region (Hansen, 2015).

TEAL Project

The TEAL Project would not intersect any known, mapped, or inferred active fault lines (USGS, 2006). Mapped faults in the area of the TEAL Project area include the Highlandtown Fault in southern Columbiana County and an unnamed fault in the area of the border of Jefferson and Belmont Counties. These faults are not visible in surface geology and only identified in basement rock, which is approximately 9,000 to 11,500 feet below ground surface in the area (Baranoski, 2013). No faults identified in Ohio exhibit evidence of activity within the last 1.6 million years, and there is no clear association between faults and small earthquakes that occur in the region (Hansen, 2015).

4.1.3.2 Soil Liquefaction

Soil liquefaction is a phenomenon that occurs when granular, saturated soils temporarily lose strength and liquefy (i.e., behave like a viscous liquid) when subject to strong and prolonged shaking as may occur during an earthquake. Areas susceptible to liquefaction may include soils that are generally sandy or silty and are generally located along rivers, streams, lakes, and shorelines, or in areas with shallow groundwater (University of Washington, 2000). Structures located on or within an area experiencing soil liquefaction could sustain damage due to loss of underlying soil strength.

Granular soils with a shallow water table are expected to be found in floodplains associated with medium to large streams along NGT Project area; however, the potential for soil liquefaction to occur is

low based on the low seismicity of the region and no occurrences of soil liquefaction have been documented in the NGT Project area.

The potential for soil liquefaction to occur is low based on the low seismicity of the region and no occurrences of soil liquefaction have been documented in the TEAL Project area.

4.1.3.3 Landslides

A landslide is defined as the movement of a mass of rock, debris, or earth down a slope. Landslides can be initiated by heavy rainfall, earthquakes, changes in groundwater conditions (i.e., seasonal high water tables), and/or slope disturbance resulting from construction activity. Information on landslide incidence and susceptibility rate for the Projects was obtained from the USGS (Radbruch-Hall et al., 1982). The physiology of eastern Ohio is characterized by fine-grained clastic bedrock and high vertical relief, making the region more subject to landslides in the form of rotational slumps and earthflows (Hansen, 1995).

NGT Project

As indicated in table 4.1.3-1, the NGT Project crosses areas where geologic and topographic conditions result in low, moderate, or high susceptibility to landslides; however, the entire NGT Project is within an area where the actual incidence of landslide activity is low. The only NGT Project facilities located in an area characterized by a high susceptibility to landslides are between MP 0.0 and MP 9.0 of the proposed mainline, including the proposed Hanoverton Compressor Station, and the TGP Interconnect. Although the Hanoverton Compressor Station is within an area of high landslide susceptibility, the site of the compressor station is on open, cultivated land with approximately 50 feet of local relief. As discussed in section 4.1.5, NEXUS has committed to conducting geotechnical studies to further assess the potential for landslides to impact the proposed facilities and would implement site-specific measures to avoid or mitigate landslide risk.

TABLE 4.1.3-1			
Landslide Susceptibility and Incidence for the NGT and TEAL Projects			
Project, State, Component	Milepost (mile)	Susceptibility to Landslide	Incidence to Landslide ^a
NGT PROJECT			
TGP Interconnect	0 - 0.9	High	Low
Mainline	0 – 9.0	High	Low
	9.0 – 134.0	Low	Low
	134.0 – 148.0	Moderate	Low
	148.0 – 185.0	Low	Low
	185.0 – 193.0	Moderate	Low
	193.0 – 255.0	Low	Low
Hanoverton Compressor Station	1.4	High	Low
Wadsworth Compressor Station	63.5	Low	Low
Clyde Compressor Station	134	Low	Low
Waterville Compressor Station	183.5	Low	Low
TEAL PROJECT ^b			
Pipeline Loop	0.0 – 4.4	High	High
Connecting Pipeline	0.0 – 0.3	High	Low
Salineville Compressor Station	5.9	High	High
Colerain Compressor Station	49.9	High	High
a	Low means <1.5% area involved in landsliding; Moderate means 1.5 – 15% area involved in landsliding; High means >15% Area involved in landsliding.		
b	Line 73 Pipeline milepost designations are used		
Source: Landslide Overview Map of the Conterminous United States (Radbruch-Hall et al., 1982)			

TEAL Project

As indicated in table 4.1.3-1, the TEAL Project is located in an area characterized by high susceptibility and incidence of landslide activity. Although the Salineville and Colerain Compressor Stations are within areas of high landslide susceptibility and incidence, the Colerain Compressor Station is an existing facility situated on a generally level parcel, and the proposed Salineville Compressor Station site is on generally level, cultivated land. As discussed in section 4.1.5, Texas Eastern has committed to conducting geotechnical studies to further assess the potential for landslides to impact the proposed facilities and would implement site-specific measures to avoid or mitigate landslide risk.

4.1.3.4 Karst

Karst terrain and physiography result from the dissolution of soluble bedrock, such as limestone, dolomite, marble, or gypsum, through the circulation of groundwater that has become slightly acidic as a result of atmospheric carbon dioxide (CO₂) being dissolved in the water. Karst terrain is characterized by the presence of sinkholes, caverns, an irregular “pinnacled” bedrock surface, and springs. Any landscape that is underlain by soluble bedrock has the potential to develop karst landforms.

NGT Project

The density and type of karst features present in the NGT Project area are primarily related to the presence, thickness, and permeability of geologic units overlying the carbonate bedrock. Fracture systems within the bedrock are commonly manifested in the surface topography as lineaments. Additionally, since the flow of water through the fracture system network enhances the dissolution of soluble bedrock, karst features commonly occur in greater density along fracture and joint planes.

The most prominent type of karst features in the NGT Project area are dolines or sinkholes, which comprise the greatest potential geological hazard to any type of construction in karst terrain. Sinkholes fall into two broad categories: cover-subsidence sinkholes and vault-collapse sinkholes. The most common sinkhole type, a cover-subsidence sinkhole, forms from the migration of fine soil particles from upper soils into solution channels lower down in the bedrock. The resulting voids from this process are filled gradually over time with the surrounding soil materials (a process called piping) and form a noticeable depression on the land surface. Vault-collapse sinkholes form in areas where the overlying unconsolidated material is clay-rich. In this case, the voids are filled, but there is no subsidence, and the clay acts as a bridge or roof as the cavity migrates toward the surface until the unconsolidated clay can no longer support the span. Eventually, the bridge or roof fails, causing the rapid displacement of surface materials into the resulting void.

Sinkhole formation is slower in areas where the overlying unconsolidated material is thick or contains more clay. This natural process can be exacerbated by disturbances such as:

- an increase in water flow or redirection of overland surface water flow (e.g., due to surficial grading) or subsurface flow that could accelerate the raveling of soil fines;
- removal of vegetative cover and topsoil (e.g., stripping or grubbing), which can reduce the cohesive strength of soils; and
- sudden decrease in the water table elevation (e.g., due to drought, over-pumping of wells, or quarry dewatering), which decreases the natural buoyancy of the water supporting a soil plug in a conduit, and may result in rapid and catastrophic soil collapse.

Effects of glaciation also influence the development and preservation of karst features in the eastern and Midwestern United States. The surface expression of sinkholes is unlikely in areas where carbonate bedrock is covered by more than 50 feet of glacially derived sediments such as stratified drift and till (Weary and Doctor, 2014). Research performed in a portion of the NGT Project area concluded that sinkholes are commonly expressed when drift is less than 25 feet thick (Aden, 2013).

The USGS identifies two areas of karst terrain that would be traversed by the NGT Project (Weary and Doctor, 2014):

- Between MPs 124.0 and 202.0 in Erie, Sandusky, Wood, Lucas, and Henry Counties in Ohio. From MP 124.0 to MP 135.0 the NGT Project would cross an area referred to as the Bellevue-Castalia Karst Plain.
- Between MPs 224.0 and 248.0 in Lenawee, Monroe, and Washtenaw Counties in Michigan. Whereas the USGS identifies this area as karst terrain, the carbonate bedrock in the area of Michigan would be crossed by the NGT Project is covered by more than 50 feet of glacial sediment, and sinkholes are absent or likely absent (Monroe County, 2010; Albert et al., 2008).

Karst features within 1,500 feet of the NGT Project mainline within the Bellevue-Castalia Karst Plain are summarized in table 4.1.3-2 (Aden, 2013). As indicated in the table, the proposed pipeline would not cross any karst features. We also examined digital aerial photography of the proposed pipeline route across the Bellevue-Castalia Karst Plain and did not identify any obvious sinkholes along the pipeline alignment. Following the initial characterization of karst features via desktop analysis based on USGS and ODNR mapping (Weary and Doctor, 2014; Aden, 2013), NEXUS conducted an electromagnetic (EM) geophysical survey to identify areas of shallow bedrock between MP 124.0 and MP 202.0, including within the Bellevue-Castalia Karst Plain. These EM data are currently being analyzed to identify possible karst features along the alignment that might warrant further field investigation and engineering design.

Project, State, Component	Milepost (mile)	Distance to Project (feet)	Feature
OHIO Mainline	126.6	255	Field verified sinkhole
	127.9	260	Spring
	128.6	790	Field verified sinkhole
	130.3	800	Suspect sinkhole - field visited
	130.4	230	Field verified sinkhole
	130.7	1,475	Suspect sinkhole - field visited
	130.7	1,450	Suspect sinkhole - field visited
	130.8	980	Suspect sinkhole - field visited
	130.9	350	Suspect sinkhole - field visited
	130.9	460	Suspect sinkhole - field visited
	131.0	830	Field verified sinkhole
	131.0	460	Suspect sinkhole - field visited
	131.0	1,230	Suspect sinkhole - field visited
	131.2	990	Suspect sinkhole - field visited
	131.5	1,475	Suspect sinkhole - field visited
	131.5	1,175	Field verified sinkhole
	131.6	320	Suspect sinkhole - field visited
	131.6	1,425	Suspect sinkhole - field visited
	131.6	1,440	Suspect sinkhole - field visited
	Clyde Compressor Station	132.2	75
133.8		1,420	Spring

Source: Aden, 2013

NEXUS contacted county and state highway engineers from Erie County, Sandusky County, the Ohio Department of Transportation (ODOT), and the Ohio Turnpike Authority to determine if there have been any karst impacts on their road systems. None of these officials were aware of pavement distress within the area of the Bellevue-Castalia Karst Plain that could be attributed to karst impacts. The county engineers for Erie and Sandusky Counties, as well as the engineer for the Ohio Turnpike Authority, all reported no pavement distress within their systems attributable to karst activity. ODOT representatives reported road damage due to gypsum-related karst activity along the shore of Lake Erie in Sandusky County, at least 3 miles from the NGT Project, and in Ashland County, which is not crossed by the NGT Project.

The engineers of Sandusky and Erie Counties noted that surface flooding due to groundwater rising and flowing from karst springs is the only karst-related issue in the vicinity of the NGT Project. An example of this occurred in Bellevue, Ohio, approximately 5 miles south of the NGT Project (Pavey et al., 2012). Record high winter precipitation resulted in groundwater levels rising to a 30-year high and several flooding events occurred during the spring and summer of 2008, when groundwater welled up through several springs. This type of flooding has been recorded in the Bellevue area approximately six times since 1800 (Pavey et al., 2012). NEXUS is evaluating whether pipeline construction methods should include buoyancy control measures in closed depressions located in the Bellevue-Castalia Karst Plain and would install buoyancy control where appropriate. Current analyses indicate buoyancy control measures would only be required in situations where the trench is partially or fully water-filled during construction and would not be necessary as mitigation for flood events after construction.

TEAL Project

The bedrock beneath the TEAL Project consists of the Conemaugh, Dunkard, and Monogahela groups, which are mainly comprised of siltstone, shale, and mudstone, though individual units are locally calcareous (Nicholson et al., 2005). Thus, karst features would not be expected to have developed in the TEAL Project area. Furthermore, the TEAL Project occurs in an area not known to contain karst features (ODGS, 1999); therefore, karst geologic conditions would not be expected to impact the TEAL Project.

4.1.3.5 Surface Subsidence – Underground Mines

Underground coal mining has occurred in Ohio since the early 1800s, including in the NGT and TEAL Projects area, and is the most common method for coal extraction in Ohio today (ODGS, 2012). Ground surface subsidence over underground mine workings has been documented in Ohio, ranging from small, localized areas of collapse to broad, regional lowering of the land surface.

The two primary methods for the extraction of coal in underground mining operations are room-and-pillar mining and longwall mining. Room-and-pillar mining is the most common method used in Ohio and is one of the oldest underground mining techniques. Mine structural integrity is maintained by leaving pillars (including timbers) of the minable coal resource to provide ceiling support. The primary disadvantages of room-and-pillar mining are an increased danger of roof rock collapse and possible surface subsidence after mining ceases due to the deterioration of the supporting columns and timbers. Longwall mining is a more modern practice, results in a greater yield of the minable resource, and has become the predominant method for large-scale underground coal mines in Ohio. During active mining, a hydraulic system is used to support the roof of the mine. After coal extraction, the hydraulic system is removed, allowing the roof to collapse and potentially causing subsidence of the overlying ground surface.

The Ohio Emergency Management Agency (OEMA) estimates that there are over 7,000 underground mines across Ohio, with approximately 50 percent recorded in the ODNR database and no mapping completed for approximately 2,700 underground mines (OEMA, 2011). Therefore, it is anticipated there are additional older unidentified and unmapped underground coal mines in the eastern

portion of the NGT Project area and the entire TEAL Project area where no accurate or official records exist. The older abandoned coal mines are expected to be small room-and-pillar mines, based on the mining methods used at the time.

NGT Project

No active underground coal mines are located within 0.25 mile of the NGT Project area. Ten (10) known abandoned underground coal mines were identified within 0.25 mile of the NGT Project area between MP 0.0 and MP 52.0 (see table 4.1.2-2), but the NGT Project does not cross any of these known abandoned underground mines.

TEAL Project

No active underground coal mines are located within 0.25 mile of the TEAL Project area. However, as indicated in table 4.1.2-2, the TEAL Project overlies known, abandoned underground coal mines as summarized below:

- The former Powhatan No. 4 longwall coal mine, which was last operated by Quatro Mining Company in 1999, underlies 3.9 miles (89 percent) of the proposed loop. Texas Eastern has stated that there has been no evidence of ground subsidence along the existing mainline pipeline, which was installed in 1943.
- The Colerain Compressor Station overlies the former Y&O Coal Company room and pillar coal mine, which was abandoned in 1960. Texas Eastern performed geotechnical borings at the compressor station site that extended to a depth of approximately 60 feet and encountered approximately 40 feet of mine tailings overlying bedrock, with no indication of underground mine workings; however, underground mining occurred approximately 280 feet below the land surface at the site.

No known underground mining has occurred at the Salineville Compressor Station site and geotechnical borings installed to a maximum depth of 30 feet by Texas Eastern did not identify any mine tailings or indication of underground mine workings. Thus, surface subsidence due to underground mines would not be expected in the area of the Salineville Compressor Station.

4.1.3.6 Flash Flooding

Flash flooding has the potential to occur in streams within the Projects area, particularly in areas with narrow river valleys steep slopes, and rock bottoms. Flash flooding can also increase the likelihood of landslides within the Projects area by scouring steep slopes and eroding bedrock. Past coal strip mining in the eastern end of the Projects, mainly in Columbiana County, Ohio, has resulted in the increase of anthropogenic impacts on flooding potential by slope over-steepening as well as overburden reduction and disturbance.

Appendix H-5 identifies Federal Emergency Management Agency (FEMA) 100-year flood zones crossed by the NGT Project. All proposed aboveground facilities have been sited outside of FEMA 100-year flood zones. Small portions of pipe/contractor yards 2-1 and 3-2, which would only be used as temporary workspace, are located within mapped flood zones.

All TEAL Project facilities would be located outside of the FEMA 100-year flood zone.

4.1.4 Paleontological Resources

Many geologic formations have the potential to contain paleontological resources; however, those containing vertebrate fossils are generally considered to be the most scientifically significant.

Potential paleontological resources along the NGT Project area include Paleozoic invertebrate fossils in sedimentary rock and Pleistocene bones in glacial sediments. Paleozoic invertebrate fossils are common and not considered significant. No Mesozoic age rocks are present in Ohio and southern Michigan (ODNR, 2014); therefore, large vertebrate fossils such as dinosaurs are not present in the area of the NGT Project route. Pleistocene vertebrate fossils, including mastodons, woolly mammoths, horses, birds, reptiles, deer, caribou, bison, elk, and others have been identified in counties within the NGT Project route; however, exact locations of the finds are not available (Hansen, 1992).

Potential paleontological resources along the TEAL Project are predominantly Paleozoic invertebrate fossils in sedimentary rock. Paleozoic invertebrate fossils are common and not considered significant. Pleistocene vertebrate fossils, including mastodons, woolly mammoths, horses, tapir, deer, and flat-headed peccary have been found in some of the counties within the TEAL Project area; however, exact locations of the finds are not available (Hansen, 1992). The TEAL Project is located beyond the southern edge of the Pleistocene ice margin; therefore, surficial geology is composed of colluvium derived from the breakdown and weathering of the underlying bedrock or parent material and is often not suitable for the preservation of fossils, further limiting the potential for significant fossils to be found.

4.1.5 Impacts and Mitigation

4.1.5.1 Geology/Bedrock Geology/Surface Geology

Construction and operation of the NGT and TEAL Projects would not materially alter existing geologic conditions in the area. In addition, the overall effect of the Projects on topography would be minor. The primary impact would be limited to construction activities and would include temporary disturbance of slopes within the rights-of-way resulting from grading and trenching operations. The applicants would minimize the impacts by returning contours to preconstruction conditions to the maximum extent practicable. Grading and filling may be required to permanently create a safe and stable land surface to support aboveground facilities; however, these impacts would be minor and localized to the immediate area of the aboveground facilities.

The removal of bedrock, including by the use of blasting, may also be required if encountered within the trench depth of the pipeline facilities or during construction of aboveground facilities. Impacts on bedrock units would be minor and limited to the immediate area of construction.

In addition to bedrock removal, blasting could potentially damage nearby pipelines and other structures and could initiate landslides, karst activity, or ground subsidence over underground mines. The applicants have prepared project-specific *Blasting Plans* (see appendices E-1 and E-2) to avoid and minimize the potential effects of blasting and would comply with all federal, state, and local regulations governing the use of explosives and fugitive dust control measures. The applicants would implement the following measures, among others, to avoid and minimize potential blasting-related impacts:

- Evaluate nearby areas to blasting to assess any potential hazard to people and damage to property.

- Contact the owners of pipelines, utilities, other infrastructure, and buildings within close proximity of the work area at least 24 hours prior to blasting. Verbal notice would be confirmed with written notice.
- Request authorization from landowners to inspect any aboveground structures within 150 feet of the right-of-way (or farther, if required by local or state regulations) before and after blasting.
- Design and control the blast to focus the energy of the blast to the rock within the trench and to limit ground accelerations outside the trench. The applicants would avoid blasting within 25 feet of an existing in-service pipeline except in the case where precise, pre-blasting measurements have been taken to ensure that blasting would not impact the pipeline.
- Monitor measure peak particle velocity and decibel readings at nearby structures during blasting, and protect them from potential fly rock by using blasting mats or soil padding on the right-of-way.
- Conduct post-blasting inspections and repair damages sustained through blasting and/or compensate the landowner.

Rock excavated from the trench may be used to backfill the trench only to the top of the existing bedrock profile, provided the pipe is padded to prevent damage where there is shallow or exposed bedrock in areas of steep slopes. Rock that is not returned to the trench would be considered construction debris, unless approved for use as rock barriers to act as a right-of-way use deterrent or for some other use on the construction work areas by the landowner or land-managing agency, and would be managed in accordance with the applicants' *E&SCPs*.

As previously stated, the applicants would first attempt to remove shallow bedrock using conventional backhoe excavation, ripping, or hammering followed by backhoe excavation; however, blasting may be necessary where shallow, hard, non-rippable bedrock occurs. In those cases, the applicants would conduct blasting in accordance with applicable state and federal protocols as well as their project-specific *Blasting Plans*. We have reviewed these *Blasting Plans* and find that implementation of the measures contained therein would adequately avoid or minimize potential blasting-related impacts on existing structures, karst features, unstable slopes, and underground mines in the area.

4.1.5.2 Mineral Resources

The NGT Project does not cross any active fuel or non-fuel mineral resource mines. As discussed in section 4.1.2, the NGT Project would be in close proximity to four active non-fuel mines but the proposed facilities are sited to avoid conflicts with mining operations by routing around the property or co-locating the pipeline along existing utility or highway corridors that already constrain the mine operation. NEXUS sited the proposed facilities to avoid oil and gas facilities where feasible; however, 11 active and 18 inactive or abandoned oil and gas wells occur with the proposed NGT Project workspace. NEXUS would consult with the well owners to revise construction workspace to avoid the well, or route around the well site by an agreed-upon buffering distance. Construction of the NGT Project would require shallow excavation, and as a result, no impact would occur on the relatively deep oil and gas resources or the associated wells.

The TEAL Project does not cross any active non-fuel or fuel mineral resource mines. Several oil and gas wells are identified within 0.25 mile of the TEAL Project, but none are located within the construction workspace. If any additional wells are located, Texas Eastern would consult with the well

owner to revise construction workspace to avoid the well, or route around the well site by an agreed-upon buffering distance. Construction of the TEAL Project would require shallow excavation, and as a result, no impact would occur on the relatively deep oil and gas resources or the associated wells.

4.1.5.3 Seismic Hazards

Seismic activity, including earthquakes, surface faulting, and soil liquefaction, has the potential to damage the proposed NGT and TEAL Projects facilities, creating a possible safety hazard to nearby residents. Many comments were received concerning the safety of the pipelines during potential seismic events; however, as discussed in sections 4.1.3.1 and 4.1.3.2, the region of the Projects is relatively seismically inactive, no faults identified in Ohio or Michigan exhibit evidence of activity within the last 1.6 million years, and there is no clear correlation between faults, including the Bowling Green and Highlandtown faults, and small earthquakes that occur in the region (Hansen, 2015). In addition, the State of Ohio has prohibited the injection of drilling fluids in Precambrian rock, which had previously been associated with the occurrence of small earthquakes. The recorded magnitude of earthquakes in the NGT Project area is relatively low and the associated ground vibration would not pose a risk for a modern arc-welded steel pipeline. In a study after the Northridge, California earthquake of January 17, 1994, which included 11 earthquakes with a magnitude of 5.8 or greater, it was found that modern, arc-welded steel pipelines did not experience breaks or leaks as a result of either traveling ground waves or permanent ground deformation (O'Rourke and Palmer, 1994). Although granular, saturated soils occur in the NGT and TEAL Projects area, the low potential for strong seismic activity indicates a low risk for soil liquefaction to occur.

Project facilities would be constructed to meet DOT's Minimum Federal Standards outlined in 49 CFR 192, further reducing the potential for seismic-related damage to occur. These are the same regulations that govern the construction and operation of natural gas pipelines throughout the country, including areas with greater seismic hazards.

In conclusion, due to the low level of seismic activity in the region and construction of the proposed facilities using modern materials in accordance with current industry standards, the potential for seismic hazards to impact the NGT and TEAL Projects is low.

4.1.5.4 Landslides

As discussed in section 4.1.3.3, the NGT Project would be located in an area with a low incidence of landslide activity, whereas the TEAL Project occurs in an area with high susceptibility and incidence of landslides. A naturally occurring landslide could damage the proposed facilities and create a potential safety hazard to nearby residents. Pipeline construction on steep slopes could also initiate localized slope movement.

During the design phase, the applicants would conduct geotechnical investigations to identify and delineate areas of steep slopes and landslide risk. Based on these results, the applicants would implement measures outlined in their respective *E&SCPs* to ensure slope stability and minimize landslide risk, such as the use of slope breakers, temporary and permanent trench plugs, matting, rip rap, and other methods to control surface water runoff. To further reduce the risk of slope failure in areas of steep slopes, the upslope side of the construction right-of-way would be cut during grading and used to fill the downslope side of the right-of-way, thereby providing a safe and level surface on which to operate heavy construction equipment. During grade restoration, the spoil would be placed back in the cut, compacted to restore original contours, and reseeded. Once grade and drainage patterns have been reestablished, permanent erosion controls (e.g. slope breakers) would be installed as needed.

The construction contractor's field supervisory personnel as well as the applicants' supervisory personnel, including the Chief Inspector, Craft Inspectors, and EIs, would be trained to identify potential landslide conditions that could develop during construction. The applicants' Geotechnical Engineer(s) would be notified when potential landslide conditions are discovered and would develop appropriate measures to mitigate the risk.

Further, the proposed facilities would be constructed of modern materials in accordance with the DOT's Minimum Federal Standards presented in 49 CFR 192, which are designed to provide adequate protection from washouts, floods, unstable soils, or landslides. Pipeline installation techniques, especially padding and use of rock-free backfill, effectively insulate the pipe from minor earth movements.

We conclude that construction of the proposed facilities in accordance with applicable regulations, and implementation of the measures described previously would adequately reduce the potential for construction-related activities to trigger landslides or other slope instability.

4.1.5.5 Karst

In karst sensitive areas, the primary impact that could affect the NGT Project pipeline and aboveground facilities is the sudden development of a sinkhole that damages the facilities and poses a safety risk. In addition, flooding within closed depressions and other karst features could pose a buoyancy concern to the pipeline facilities. Other subsidence features could develop more gradually over time, but would not pose an immediate risk to the proposed facilities. Karst features could be initiated by the physical disturbance associated with trenching, grading, or HDD activity, or by diverting or discharging Project-related water into otherwise stable karst features.

NEXUS has routed the NGT Project pipeline to avoid known sinkholes. Additionally, during construction, NEXUS would implement awareness-level training for supervisory staff and all inspectors. The purpose of the training would be to understand the potential for, and consequences of, construction activities to initiate sinkhole formation, and to train staff to recognize the signs of sinkhole formation. If previously unidentified solution cavities or sinkholes are encountered during trenching, NEXUS would implement a minor reroute if possible to avoid the feature, or mitigate the feature using common practices, including first cleaning the void of unconsolidated material and backfilling to fill the void to prevent further sinkhole development. To date, NEXUS has not submitted results of karst geophysical investigation to the FERC. Therefore, **we recommend that:**

- **Prior to construction, NEXUS should file with the Secretary, the results of geophysical surveys to detect previously unidentified karst features. If previously unidentified karst features are found, NEXUS should also file for review and written approval of the Director of the OEP its plans to avoid or mitigate the features prior to construction in the vicinity of the feature.**

Regarding the potential for karst activity to damage NGT Project facilities during operation and create a potential safety hazard, the NGT Project pipeline and aboveground facilities would be designed, constructed, monitored, and maintained in accordance with DOT Pipeline and Hazardous Materials Safety Administration (PHMSA) and industry standards that are protective of public safety, which would reduce the potential for karst conditions to adversely impact the facilities. Specifically, in the NGT Project area, the largest sinkhole located during field reconnaissance within the Bellevue-Castalia Karst Plain has a maximum width of 30 to 35 feet. NEXUS calculated the proposed pipeline (36-inch-diameter, grade X70 steel with a 0.5-inch wall thickness) could span approximately 125 feet unsupported while covered with 3 feet of soil without potentially compromising the integrity of the pipeline. Based on the size of sinkholes in the NGT Project area, this span strength would further reduce the potential for a serious pipeline incident

under most sinkhole development scenarios. During operations, NEXUS would conduct route surveillance of installed pipeline facilities, in accordance with 49 CFR Part 192.613. Surveillance personnel would be trained to monitor the right-of-way for indications of sinkhole formation, which could include subsidence, surface cracks, and/or depressions. The NGT Project Geotechnical Engineer would be notified if these conditions are observed, and appropriate measures would be implemented to achieve stress-free conditions.

Based on NEXUS routing to avoid known sinkholes and the relatively low density of sinkholes in the area, the overall risk for karst activity to impact the NGT Project is low. The potential risk posed by karst activity would be further reduced by constructing and operating the facilities with modern materials and in accordance with applicable regulations, and by monitoring the facilities during operation as proposed by NEXUS. Thus, we conclude the potential for karst activity to damage the NGT Project has been adequately minimized.

4.1.5.6 Surface Subsidence – Underground Mines

Subsidence or collapse of underground mines could threaten the integrity of the proposed NGT and TEAL Projects' facilities, creating a potential safety hazard. NEXUS and Texas Eastern have routed the proposed pipeline and sited the aboveground facilities to avoid known underground mines; however, the locations of all underground mines have not been fully documented. NEXUS and Texas Eastern would implement the following measures in the event of the discovery of a previously undocumented abandoned underground mine during construction:

- Conduct a geophysical survey (potentially combined with geotechnical borings) to identify the mine footprint, depth to mine roof, and depth to mine floor.
- Reroute the pipeline to completely avoid the mine footprint, or bore/HDD beneath the mine. If either are impractical, the pipeline would be rerouted where sufficient cover is present over the mine roof so that the calculated vertical stress on the mine roof would not increase the current calculated vertical stress by more than 10 percent.
- If rerouting is infeasible, NEXUS and/or Texas Eastern would perform detailed studies to characterize and assess the mine in accordance with the *Manual for Abandoned Underground Mine Inventory and Risk Assessment (FHWA IF-99-007)* (ODOT, 1998). Following these studies, mine remediation would be completed in accordance with ODOT, 1998.

Comments received during draft EIS comment period discussed possible recent mine subsidence at Summit County parcel number 2400603. Because of the recent nature of this possible subsidence, and the presence of mapped abandoned underground mines nearby, **we recommend that:**

- **Prior to construction, NEXUS should conduct a geophysical investigation at Summit County parcel number 2400603 and file a report with the Secretary for review and written approval of the Director of the OEP. The report should identify, as necessary, measures that NEXUS would implement to avoid or mitigate subsidence areas.**

Most of the TEAL Project's 36-inch-diameter mainline pipeline loop would be located over the former Powhatan No. 4 longwall coal mine that last operated in 1999. As a longwall mine, roof support systems would have been removed as mining was completed, allowing for potential collapse to occur, and Texas Eastern has stated that there has been no evidence that the existing pipeline system has been affected by ground subsidence. According to ODNR, longwall mining typically causes surface subsidence simultaneously with active mining, and does not factor into future subsidence issues (ODNR, 2009). The Colerain Compressor Station would be located over the former Y&O Coal Company room and pillar mine

that was abandoned in 1960. Given the absence of near surface mine workings in the geotechnical borings and the known depth of former mine operation (280 feet below land surface), surface subsidence due to underground mines in the area of the Colerain Compressor Station would not be expected.

In summary, the NGT Project is in the area of, but does not cross, any known underground mines, whereas the TEAL Project would cross known underground mines at the same locations of its existing facilities, which have been unaffected by mine subsidence. NEXUS and/or Texas Eastern would also implement additional investigation and mitigation measures in the event that a previously undocumented underground mine is discovered prior to or during construction, and both companies would design, construct, and monitor the facilities in accordance with applicable industry standards and PHMSA regulations that are protective of public safety. Therefore, we conclude that the potential for underground mine collapse to damage the proposed facilities has been adequately avoided and minimized.

4.1.5.7 Flash Flooding

Seasonal and flash flooding hazards are a potential concern where the pipelines would cross or be located in the area of major streams and small watersheds. Additional discussion regarding flooding and flash floods is also provided in section 4.1.3.6. Although flooding itself does not generally present a risk to pipeline facilities, bank erosion, and/or scour could expose the pipeline or cause sections of pipe to become unsupported. All pipeline facilities are required to be designed and constructed in accordance with DOT's regulations in 49 CFR 192. These regulations include specifications for installing the pipeline at a sufficient depth to avoid possible scour at waterbody crossings.

In addition, NEXUS would implement several mitigation measures within floodplains to minimize potential impacts from flood events. These measures include:

- clearing only the vegetation needed for safe construction of the pipeline;
- installing and maintaining erosion and sediment control structures;
- restoring floodplain contours and waterbody banks to their pre-construction condition; and
- conducting post-construction monitoring to ensure successful revegetation.

By implementing these measures, we conclude that the potential for flash floods to damage the proposed pipeline facilities or aboveground facilities has been adequately minimized.

4.1.5.8 Paleontological Resources

Potential impacts on fossil resources could include direct impacts such as damage to, or destruction of, fossils resulting from construction activities, including excavation, trenching, or grading. Indirect effects on fossil beds could result from erosion caused by slope regrading, vegetation clearing, and/or unauthorized collection. No specific sites containing significant paleontological resources were identified in the NGT and TEAL Projects area. The applicants noted the slight potential for Pleistocene fossils to be discovered during construction and have developed project-specific *Unanticipated Discovery Plans* that outline the procedures for handling vertebrate remains. We have reviewed these plans and find that significant paleontological resources would be adequately protected, if encountered.

4.1.5.9 Conclusion

We conclude that constructing and operating the NGT and TEAL Projects in accordance with the applicants' proposed plans would not result in a significant impact on existing geologic conditions and resources, or result in a significant risk to public safety due to the presence of geologic hazards.

4.2 SOILS

4.2.1 Existing Environment

The types and characteristics of soils impacted by the NGT and TEAL Projects were identified using the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Soil Surveys and Soil Survey Geographic (SSURGO) databases for each county affected by the Projects. SSURGO data provides the most detailed level of information of soil mapping available from the NRCS and was designed primarily for farm and ranch landowner/user, township, county, or parish natural resource planning and management.

Based on information contained in the SSURGO database, the NGT Project would cross about 494 individual soil map units consisting of one major soil type or complexes of 2 or more soil types that can contain a minor percentage (generally not more than 10 percent) of dissimilar soils. The TEAL Project would cross about 43 individual soil map units. Our analysis focused on the major soil characteristics for the dominant soils within the map unit.

Soils in the region possess characteristics that could impact construction and restoration of the NGT and TEAL Projects, including soils that are susceptible to water and wind erosion; prime farmland; hydric soils; compaction prone soils; soils that are stony, rocky, or underlain by shallow bedrock; droughty soils; and soils with poor revegetation potential. Tables 4.2.1-1 and 4.2.1-2 identify the characteristics of soils that would be impacted by construction and operation of the Projects, respectively.

4.2.1.1 Erosion Potential

Erosion is a natural process where surface soils are worn away, generally resulting from water and wind forces that can be accelerated by human disturbance. Factors that influence the magnitude of erosion include soil texture, soil structure, length and percent of slope, existing vegetative cover, and rainfall. The most erosion-prone soils are generally bare or sparsely vegetated, non-cohesive, fine textured, and situated on moderate to steep slopes. Soils on steep, long slopes are much more susceptible to water erosion than those on short slopes because the steeper slopes accelerate the flow of surface runoff. Soils more resistant to erosion include those that are well-vegetated, well-structured with high percolation rates, and situated on flat to nearly level terrain.

Approximately 604.8 acres (12 percent) of the soils that would be crossed by the NGT Project are highly susceptible to water erosion, and 390.4 acres (8 percent) are highly susceptible to wind erosion (see table 4.2.1-1). Permanent access roads, cathodic protection sites, and aboveground facilities would permanently impact 28.5 acres of soils susceptible to water erosion and 3.4 acres of soils susceptible to wind erosion (see table 4.2.1-2).

Approximately 169.6 acres (80 percent) of the soils that would be crossed by the TEAL Project are highly susceptible to water erosion, and none of the soils are highly susceptible to wind erosion (see table 4.2.1-1). Permanent access roads, cathodic protection sites, and aboveground facilities would permanently impact 8.4 acres of soils susceptible to water erosion. There would not be any permanent impacts on soils susceptible to wind erosion (see table 4.2.1-2).

TABLE 4.2.1-1

Summary of Soil Characteristics Affected by Construction of the NGT and TEAL Projects (in acres) ^a

Project, State, Component	Total Acreage	Highly Erodible		Farmland Classifications		Hydric ^f	Compaction Prone ^g	Stony/Rocky ^h	Shallow Bedrock ⁱ	Revegetation Concern ^j
		Water ^b	Wind ^c	Prime Farmland ^d	Unique Farmland ^e					
NGT PROJECT										
Ohio										
Mainline	3,518.3	469.1	251.7	2718.2	193.9	1,151.3	1,775.0	65.6	241.9	294.0
TGP Interconnect	15.6	13.2	0.0	2.5	0.0	0.1	1.3	11.1	14.4	5.9
Staging Areas	208.2	20.0	44.9	177.9	3.3	100.1	92.6	2.9	4.5	4.0
Access Roads ^k	59.7	11.3	0.7	45.4	2.2	15.0	24.8	1.3	6.2	4.6
Aboveground Facilities ^l	292.9	90.6	4.3	198.0	2.9	61.6	61.2	26.1	62.6	51.8
Ohio Total	4,094.7	604.3	301.6	3,142.0	202.3	1,328.0	1,954.9	107.1	329.5	360.4
Michigan										
Mainline	831.1	0.5	71.4	593.6	191.6	400.6	334.5	0.0	0.0	7.9
Staging Areas	74.5	0.0	16.1	48.8	24.8	49.5	46.6	0.0	0.0	0.0
Access Roads ^k	9.2	0.0	1.3	4.8	3.4	3.2	2.3	0.0	0.0	0.0
Aboveground Facilities ^l	1.1	0.0	0.0	0.1	1.0	0.1	0.1	0.0	0.0	0.0
Michigan Total	915.9	0.5	88.8	647.3	220.8	453.3	383.5	0.0	0.0	7.9
NGT Project Total	5,010.6	604.8	390.4	3,789.3	423.1	1,781.3	2,338.4	107.1	329.5	368.3
TEAL PROJECT										
Pipeline Loop	80.3	78.8	0.0	1.5	0.0	0.0	0.4	53.0	72.1	73.9
Connecting Pipeline to NGT	14.2	13.5	0.0	0.7	0.0	0.0	0.7	7.2	13.5	7.1
Access Roads ^k	4.9	4.5	0.0	0.4	0.0	0.0	0.2	3.4	4.3	4.4
Aboveground Facilities ^l	113.7	72.8	0.0	40.9	0.0	0.0	0.4	22.6	111.0	17.7
TEAL Project Total	213.0	169.6	0.0	43.4	0.0	0.0	1.8	86.3	200.8	103.0
NGT and TEAL Projects Total	5223.6	774.4	390.4	3832.8	423.1	1781.3	2340.2	193.3	530.3	471.4

TABLE 4.2.1-2 (cont'd)										
Summary of Soil Characteristics Affected by Operation of the NGT and TEAL Projects (in acres) ^a										
Project, State, Component	Total Acreage	Highly Erodible	Farmland Classifications	Hydric ^f	Compaction Prone ^g	Stony/Rocky ^h	Shallow Bedrock ⁱ	Revegetation Concern ^j		
Access Roads ^k	0.3	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0
Aboveground Facilities ^l	0.8	0.0	0.0	0.1	0.7	0.1	0.1	0.0	0.0	0.0
Michigan Total	2.3	0.0	0.0	0.9	1.4	0.3	0.3	0.0	0.0	0.0
NGT Project Total	144.5	28.5	3.4	112.0	2.4	35.7	26.6	7.5	19.5	13.1
TEAL PROJECT										
Pipeline Loop	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Connecting Pipeline to NGT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Access Roads ^k	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.5	0.5	0.8
Aboveground Facilities ^l	16.2	7.4	0.0	8.7	0.0	0.0	0.0	3.3	15.0	4.1
TEAL Project Total	17.1	8.4	0.0	8.7	0.0	0.0	0.0	3.8	15.5	4.9
NGT and TEAL Projects Total	161.6	36.9	3.4	120.8	2.4	35.7	26.6	11.3	35.0	18.0
a	Soil map units analyzed have multiple characteristics. As a result, the sum of the rows will not equal the total acreages presented in this table.									
b	Includes soils with a non-irrigated land capability classification of 4e through 8e or a slope class of >8-15% or greater									
c	Includes soils in wind erodibility groups 1 and 2									
d	Includes soils classified in the SSURGO database as prime farmland, or prime farmland if a limiting factor is mitigated									
e	Includes soils classified in the SSURGO database as farmland of local importance or farmland of unique importance									
f	Includes soils that are classified in the SSURGO database as hydric									
g	Includes soils that have a clay loam or finer surface texture and somewhat poor, poor or very poor drainage class									
h	Includes soils with a cobbly, stony, bouldery, shaly, channery, very gravelly, or extremely gravelly modifier to the textural class of the surface layer and/or that have a surface layer that contains greater than 5 percent by weight rock fragments larger than 3 inches									
i	Includes soils that have lithic or paralithic bedrock within 60 inches of the soil surface									
j	Includes soils with a land capability classification of 4 or greater									
k	Includes permanent access roads									
l	Aboveground facilities include compressor stations and meter stations									
Note:	Sum of addends may not equal total due to rounding.									

4.2.1.2 Prime Farmland

According to the NRCS, prime farmland soils consist of soils classified as those best suited for production of food, feed, forage, fiber, and oilseed crops. These soils generate the highest yields with the least amount of expenditure. Prime farmland soils generally meet the following criteria: they have an adequate water supply, either from precipitation or irrigation; contain few or no rocks; are permeable to water and air; are not excessively erodible or saturated for long time periods; and either do not flood frequently or are protected from flooding.

The NRCS also recognizes unique farmlands and farmlands of statewide importance. Unique farmlands are defined as lands other than prime farmland that are used for production of specific high-value food and fiber crops (e.g., citrus, tree nuts, olives, fruits, and vegetables). Unique farmlands have the special combination of soil quality, location, growing season, and moisture supply needed to economically produce sustained high quality or high yields of specific crops when treated and managed according to acceptable farming methods. Farmland of statewide importance is similar to prime farmland but with minor shortcomings such as greater slopes or lesser ability to store soil moisture.

The NGT Project would cross approximately 3,789.3 acres (76 percent) of soils classified as prime farmland, or prime farmland if a limiting factor is mitigated. An additional 423.1 acres (8 percent) of the soils that would be crossed are classified as local or unique farmland. There are no soils classified as farmland of statewide importance along the proposed NGT Project route (see table 4.2.1-1). Permanent access roads, cathodic protection sites, and aboveground facilities would permanently impact 112.0 acres of soils classified as prime farmland and 2.4 acres of soils classified as local or unique farmland (see table 4.2.1-2).

The TEAL Project would cross approximately 43.4 acres (20 percent) of soils classified as prime farmland, or prime farmland if a limiting factor is mitigated. None of the soils that would be crossed are classified as local or unique farmland or farmland of statewide importance (see table 4.2.1-1). Permanent access roads, cathodic protection sites, and aboveground facilities would permanently impact 8.7 acres of soils classified as prime farmland (see table 4.2.1-2).

4.2.1.3 Hydric Soils

Hydric soils are soils that are formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part (NRCS, 1994). Also, soils in which the hydrology has been artificially modified are hydric if the soil, in an unaltered state, was hydric. Some soils designated as hydric have phases that are not hydric depending on water table, flooding, and ponding characteristics. A combination of hydric soil, hydrophytic vegetation, and hydrologic properties define wetlands as described in the *National Food Security Act Manual* (Soil Conservation Service, 1994).

The NGT Project would cross approximately 1,781.3 acres (36 percent) of soils that are considered hydric (see table 4.2.1-1). Permanent access roads, cathodic protection sites, and aboveground facilities would permanently impact 35.7 acres of hydric soils (see table 4.2.1-2).

The TEAL Project would not cross any soils that are considered hydric (see tables 4.2.1-1 and 4.2.1-2).

4.2.1.4 Compaction-prone Soils

Soil compaction is the compression of soil particles and the reduction of a soil's total pore space. Similarly, rutting is caused by the plastic deformation of soil when subject to an external load. The potential for soils to become compacted in the NGT and TEAL Projects area was evaluated based on SSURGO data using texture and drainage class data. Soils that are prone to compaction include sandy loams and finer soils that are classified as very poorly drained, poorly drained, and somewhat poorly drained. In general, compaction and rutting become more pronounced when soils are wet.

The NGT Project would cross approximately 2,338.4 acres (47 percent) of soils that are considered compaction prone (see table 4.2.1-1). Permanent access roads, cathodic protection sites, and aboveground facilities would permanently impact 26.6 acres of compaction prone soils (see table 4.2.1-2).

The TEAL Project would cross approximately 1.8 acres (1 percent) of soils that are considered compaction prone (see table 4.2.1-1). There would not be any permanent impacts on compaction-prone soils (see table 4.2.1-2).

4.2.1.5 Stony/Rocky Soils and Shallow Bedrock Soils

Soils considered stony/rocky include soils with a cobbly, stony, bouldery, shaly, channery, very gravelly, or extremely gravelly modifier to the textural class of the surface layer and/or those with a surface layer that contains greater than 5 percent by weight rock fragments larger than 3 inches. Shallow bedrock is considered prevalent where the depth to bedrock is less than 5 feet below the ground surface.

The NGT Project would cross approximately 107.1 acres (2 percent) of the soils that are classified as stony/rocky and approximately 329.5 acres (7 percent) of soils that have shallow depth to bedrock (see table 4.2.1-1). Permanent access roads, cathodic protection sites, and aboveground facilities would permanently impact 7.5 acres of stony/rocky soils and 19.5 acres of soils underlain by shallow bedrock (see table 4.2.1-2).

The TEAL Project would cross approximately 86.3 acres (41 percent) of soils that are classified as stony/rocky and approximately 200.8 acres (94 percent) of soils that have shallow depth to bedrock (see table 4.2.1-1). Permanent access roads, cathodic protection sites, and aboveground facilities would permanently impact 3.8 acres of stony/rocky soils and 15.5 acres of soils underlain by shallow bedrock (see table 4.2.1-2).

4.2.1.6 Poor Revegetation Potential

The vegetation potential of soils is based on several characteristics, including topsoil thickness, soil texture, available water capacity, wetness, susceptibility to flooding, soil temperature, and slope. Some soils have characteristics that cause a high seed mortality. Areas with soils that have poor revegetation potential may be difficult to revegetate and need additional management.

The NGT Project would cross approximately 368.3 acres (7 percent) of soils that are considered to have poor revegetation potential (see table 4.2.1-1). Permanent access roads, cathodic protection sites, and aboveground facilities would permanently impact 13.1 acres of soils with poor revegetation potential (see table 4.2.1-2).

The TEAL Project would cross approximately 103.0 acres (48 percent) of soils that are considered to have poor revegetation potential (see table 4.2.1-1). Permanent access roads, cathodic protection sites,

and aboveground facilities would permanently impact 4.9 acres of soils with poor revegetation potential (see table 4.2.1-2).

4.2.1.7 Topsoil

Topsoil is the uppermost layer of soil and typically has the highest concentration of organic materials, hence a higher fertility, and contains a generally greater biological productivity than subsurface soils. Microorganisms and other biological material found in topsoil, in addition to inorganic soil components, provide the bulk of the necessary nutrients to vegetation. Topsoil also has the highest concentration of plant roots and seeds. Topsoil preservation is important especially for restoration of natural vegetation and cropland as well as range or pasture lands, especially in areas where topsoil is limited in extent or depth. Topsoil is usually compared to lower, less fertile subsurface soils commonly referred to as subsoils, below which lay sub-stratum soils containing large amounts of sand, gravel, and rock.

The NGT Project would cross approximately 4,918.5 acres (98 percent) of soils that have topsoil depths greater than 12 inches, while only 52.7 acres (1 percent) of the soils crossed have topsoil depths less than 6 inches (see table 4.2.1-3).

The TEAL Project would cross approximately 195.5 acres (92 percent) of soils that have topsoil depths greater than 12 inches while only 12.3 acres (6 percent) of the soils have topsoil depths less than 6 inches (see table 4.2.1-3).

Project, State, Component	Total Acreage	0-6 inches	>6-12 inches	>12-18 inches	>18 inches
NGT PROJECT					
Ohio					
Mainline	3,518.3	39.2	25.5	691.2	2,762.3
TGP Interconnect	15.6	0.0	0.6	10.6	4.4
Staging Areas	208.2	0.2	2.6	24.0	181.4
Access Roads	59.7	0.7	0.4	11.2	47.3
Aboveground Facilities ^b	292.9	0.2	10.1	13.7	268.9
Ohio Total	4,094.7	40.2	39.4	750.8	3,264.3
Michigan					
Mainline	831.1	12.5	0.0	39.4	779.2
Staging Areas	74.5	0.0	0.0	0.3	74.2
Access Roads	9.2	0.0	0.0	0.3	8.9
Aboveground Facilities ^b	1.1	0.0	0.0	0.0	1.1
Michigan Total	915.9	12.5	0.0	40.0	863.4
NGT Project Total	5,010.6	52.7	39.4	790.8	4,127.7
TEAL PROJECT					
Pipeline Loop	80.3	12.3	0.0	7.5	60.5
Connecting Pipeline to NGT	14.2	0.0	0.0	7.2	6.9
Access Roads	4.9	0.5	0.0	1.1	3.3
Aboveground Facilities ^b	113.7	0.0	5.3	60.3	48.1
TEAL Project Total	213.0	12.8	5.3	76.1	118.8
NGT and TEAL Projects Total	5,223.6	65.5	44.6	866.9	4,246.5
^a Topsoil depths were calculated using the depth of the uppermost soil horizon of the dominant soil within each map unit as outlined in SSURGO databases. ^b Aboveground facilities include compressor stations and meter stations. Note: Sum of addends may not equal total due to rounding.					

4.2.2 General Impacts and Mitigation

Constructing pipelines and aboveground facilities could impact soil resources. Potential impacts include soil erosion, soil compaction, reduction of soil fertility, and changes to other soil characteristics. The majority of these impacts are temporary and related to construction activities; however, as previously noted in this document and by commenters, there would be permanent impacts at certain access roads, cathodic protection sites, and aboveground facilities. These permanent impacts comprise approximately 161.6 acres (3 percent) of the total footprint for the NGT and TEAL Projects.

Clearing and grading removes protective vegetation cover and exposes the soil to the effects of wind and rain, resulting in an increased potential for erosion within the workspace and deposition/ sedimentation into nearby sensitive areas such as wetlands and waterbodies. The clearing and grading of soils with poor revegetation potential could result in a lack of adequate vegetation following construction and restoration of the right-of-way, which could lead to increased erosion and sedimentation, a reduction in wildlife habitat, and adverse visual impacts. The movement of equipment on the right-of-way also can accelerate the erosion process. Additionally, the loss of topsoil due to erosion reduces soil fertility, potentially inhibiting revegetation of the right-of-way and reducing agricultural yields. Soils on moderate to steep slopes would be more prone to water-related erosion. Dry, coarse textured soils in open areas, including trench spoil stockpiles, would be more prone to wind erosion and the creation of dust.

Construction activities such as grading, trenching, and backfilling can also cause mixing of soil horizons. Mixing of topsoil with subsoil, particularly in agricultural lands, dilutes the chemical and physical properties of the topsoil, lowers soil fertility, and decreases the ability of disturbed soils to revegetate successfully. Soil fertility could also be affected by fuel or other hazardous material spills during construction or operations at aboveground facilities where hazardous materials are stored and used, or when constructing in areas of pre-existing soil contamination.

Rock fragments at the surface and in the surface layer may be encountered during grading, trenching, and backfilling. Trenching or blasting of stony or shallow-depth-to-bedrock soils can bring stones or rock fragments to the surface that could interfere with agricultural practices and further reduce soil fertility. Introducing stones and other rock fragments to surface soil layers may reduce soil moisture holding capacity, resulting in a reduction of soil productivity. Agricultural equipment could also be damaged by contact with large rocks and stones.

Construction activities such as grading, spoil storage, and heavy equipment traffic can compact soil, reducing porosity and percolation rates while increasing runoff potential. Operating heavy equipment under wet soil conditions could cause soil compaction of topsoil and subsoil as well as mixing of topsoils with subsoils. Hydric soils and soils that have been recently wet from precipitation would be more prone to compaction and rutting. Compaction can impede plant root establishment, thereby inhibiting revegetation of the right-of-way or reducing crop yields.

We received comments prior to the issuance of the draft EIS regarding potential soil impacts related to agricultural production. Commenters expressed concern that construction of the Projects could damage soil structure and lead to compression and compaction of soils, soil subsidence, mixing of subsoil with topsoil, and increased erosion potential, which could in turn lead to decreased agricultural production.

In general, the applicants would reduce impacts on soils by limiting the area of disturbance to the area needed for safe construction of the proposed facilities, co-locating the workspace with previously disturbed areas where possible, initiating restoration as soon as reasonably possible after final grading, and utilizing existing roads for temporary and permanent access to the extent possible. The applicants would further minimize impacts on soil resources by constructing and operating the NGT and TEAL Projects in

accordance with the applicants' *E&SCPs* discussed throughout this EIS. The measures applicable to soils include, but are not limited to:

- Stripping topsoil from either the full work area or from the trench and subsoil storage area in cultivated or rotated cropland and managed pastures, hayfields, residential areas, or other areas at the landowner's or land managing agency's request. At least 12 inches of topsoil would be stripped in areas of deep topsoil and every effort would be made to strip the entire topsoil layer in soils with less than 12 inches of topsoil. Topsoil piles would be segregated from subsoil throughout construction activities and would be stabilized with sediment barriers, mulch, temporary seeding, tackifiers, and functional equivalents, where necessary. Gaps within the topsoil and subsoil piles would be maintained such that temporary slope breakers can divert water off the construction right-of-way.
- Stripping the top 12 inches of topsoil from the area of the trench in wetlands, except where standing water is present or soils are saturated.
- In general, trenching deep enough (approximately 7 feet) to provide a minimum of 3 feet of cover over the pipelines and comply with the requirements of 49 CFR Part 192 of the DOT's regulations.
- Installing temporary erosion control devices within the trench and workspace immediately after initial disturbance of the soil and maintaining the devices throughout construction until replacement by permanent controls or completion of restoration. Temporary and permanent controls may include slope breakers, trench plugs, sediment barriers, and mulch.
- Controlling rock removed during blasting operations.
- Using excavated rock to backfill the trench only to the top of the existing bedrock profile. Excess rock would be considered construction debris unless approved for use on the right-of-way by the landowner or managing agency. Excess rock would also be removed from the top 12 inches of soil in all cultivated or rotated cropland, managed pastures, hayfields, residential areas, and other areas at landowner request. The size, density, and distribution of rock within the restored right-of-way would be similar to adjacent areas.
- Backfilling substratum, then subsoil, then topsoils in order (substratum defined as the soil horizons laying below or at the lowest level of soil generally regarded as subsoil).
- Testing topsoil and subsoil for compaction at regular intervals in agricultural and residential areas. Severely compacted soils in agricultural areas would be plowed with a paraplow or other deep tillage equipment; the subsoil would be plowed in areas where topsoil has been segregated prior to topsoil replacement. Appropriate soil compaction mitigation would also be conducted in severely compacted residential areas.
- Implementing a post-construction monitoring program to identify and correct instances of soil subsidence.
- Implementing a post-construction vegetation monitoring program to identify and correct revegetation issues.
- Conducting trench dewatering in a manner that does not cause erosion.

We received several comments from landowners and county commission offices during the draft EIS comment period suggesting that the depth of topsoil stripping should be 16 inches, not 12 inches. Commenters also were concerned that stripping soil in only two layers (topsoil and subsoil), as opposed to stripping from three layers (topsoil, subsoil and substratum), could mix good quality subsoil with poor quality substratum during backfilling and thereby decrease the depth of the rooting zone and reduce crop yields over the trench. Finally, commenters expressed concern that if NEXUS discovered it had excess soil during backfilling that needed to be removed offsite, substratum could be used at the expense of more valuable subsoil and topsoil. The concern is that if, for example, the substratum and subsoil have a high clay content and are displaced by the pipeline and that subsoil is placed back on top of the trench at the expense of topsoil, that rooting depth would be detrimentally impacted and crop productivity would decrease. Some of the commenters referred to the Ohio Department of Agriculture (ODA)'s *Ohio Pipeline Standard and Construction Specifications* as a way to address all these concerns. It has been our experience that, in general, stripping two layer (topsoil and subsoil) over the full width of right-of-way up to 12 inches deep, storing the topsoil in a reserved windrow maintained separate from the trench subsoil, and returning the topsoil to the surface of the subsoil during the backfill process results in minimal impacts to soil productivity. Further, it has been our experience that excess soil after backfilling is not a common occurrence. Notwithstanding, due to the generally deep topsoils found in the Project areas, and the possibility of excess excavated substratum or subsoil, **we recommend that:**

- **Prior to construction, NEXUS should file with the Secretary an *Agricultural Impact Mitigation Plan (AIMP)* detailing construction and restoration measures to be implemented on the NGT Project to address agricultural issues unique to Ohio and Michigan. Specifically, the *AIMP* should address plans for segregating topsoil in areas where the depth of topsoil is greater than 12 inches; triple stripping topsoil, subsoil, and substratum; and ensuring that excess spoil removed from the right-of-way during backfilling consists of substratum, and then, if needed, subsoil. For construction and restoration measures in Ohio, NEXUS should consult with the ODA on construction procedures to be used in agricultural land in Ohio and should file with the Secretary any measures that result from coordination with the ODA. Any comments received from ODA should also be filed with the Secretary.**
- **Prior to construction, NEXUS should file with the Secretary a 5-year post-construction monitoring program to evaluate crop productivity in areas impacted by the construction of the Project. NEXUS should include in the program a commitment to file with the Secretary quarterly reports for a period of 5 years following construction documenting any crop-related problems and describing any corrective action taken to remedy those problems. The program should stipulate that if any landowner agrees that revegetation and crop productivity are successful prior to the 5-year requirement, NEXUS should provide documentation in its quarterly reports indicating which landowners have agreed that monitoring is no longer necessary. This documentation should include the landowner name, tract number, and the date of agreement.**

Comments were received about potential impacts on and mitigation proposed for crossing agricultural land with subsurface drain tile systems present. We discuss these concerns and how we incorporated guidelines for restoring such lands in section 4.9.5.4.

We received comments expressing concern that freeze/thaw cycles could cause the ground to heave and expose the buried pipeline over time. Ground heaving is the uplifting of soil, typically based on the development and growth of ice lenses underneath the upper soil layer. Ground heaving or frost heaving is based on soil saturation, soil characteristics, and freezing temperatures. The maximum depth of frost

penetration within the area of the NGT and TEAL Projects does not exceed 5 feet and in most years it is approximately 4 feet or less (National Oceanic and Atmospheric Administration [NOAA], 1978). The pipeline would have a typical bottom depth of 7 feet and the likelihood of frost affecting soils completely surrounding the buried pipeline is low. Additionally, the ground surrounding the buried pipeline would be warmed by natural gas flow in the winter. Based on these circumstances, the risk of ground heaving and associated potential impacts on or from a pipeline due to freeze/thaw action is low.

Comments were received about the absence of discussion of impacts or mitigation proposed for crossing lands under conservation practices, such as CRP lands. We discuss these concerns and how we incorporated guidelines for restoring such lands according to the Ohio Department of Agriculture's recommendations in section 4.9.5.3.

We received comments expressing concern that construction and operation of the NGT and TEAL Projects would result in contamination of the soil and pollution of agricultural lands, including areas designated as organic farms. The applicants would limit the potential for contamination through implementation of their *Spill Prevention, Control, and Countermeasure Plans (SPCC Plan)*. In general, the applicants would manage fuel and other hazardous materials in accordance with applicable regulations designed to prevent inadvertent spills and by implementing specific measures to limit and cleanup any spills that occur as well as manage pre-existing soil contamination, if encountered. See the applicants' *SPCC Plans* for more detail.

We received several comments regarding possible impacts on certified organic farms. See section 4.9.5.1 for a discussion of certified organic farms, potential impacts, and mitigation methods.

Conclusions

Construction activities associated with the NGT and TEAL Projects could adversely affect soil resources by causing erosion, compaction, and introduction of excess rock or fill material to the surface, which could hinder restoration. However, the applicants would implement the mitigation measures contained in their respective *E&SCPs* to control erosion, enhance successful revegetation, and minimize any potential adverse impacts on soil resources.

Impacts to soils caused by the NGT and TEAL Projects during post-construction operations are expected to be minimal. Permanent impacts from the Projects would occur as a result of the conversion of non-industrial land use to industrial land use at aboveground facilities for operational purposes; however, as no additional ground would be excavated during operation of the aboveground facilities, no impacts are expected during operations.

In conclusion, construction and operation of the NGT and TEAL Projects would have some impacts on soil resources, most of which would be temporary. Soil impacts would be mitigated through measures such as topsoil segregation, temporary and permanent erosion controls, and post-construction restoration and revegetation of construction work areas. Additionally, the applicants would implement their *SPCC Plans* during construction and operation to prevent and contain, and if necessary clean up, accidental spills of any material that may contaminate soils. Based on the overall soil conditions present in the area of the NGT and TEAL Projects and the applicants' proposed construction and operation methods, we conclude that construction and operation of the Projects would not significantly alter the soils of the region.

4.3 WATER RESOURCES

4.3.1 Groundwater Resources

4.3.1.1 Existing Environment

Hydrogeologic Setting

NGT Project

Groundwater is an important resource in Ohio, where 42 percent of the population relies on groundwater for its water source (ODNR, 2016a), and in Michigan, where 50 percent of the population relies on groundwater (USGS, 1995b). The principal aquifers crossed by the NGT Project are comprised either of unconsolidated surficial sediments derived primarily from glacial, lacustrine, and alluvial deposits or consolidated and partially consolidated bedrock units confined by siltstone, shale, sandstone, limestone, and dolomite bedrock (Farrand and Bell, 1982; USGS, 1995a; USGS, 1995b).

The uppermost surficial aquifers along the NGT Project occur in glacial sediments deposited during the advance and retreat of continental ice sheets, or in lacustrine sediments. The glacial deposits are comprised of till, end moraine, and glacio-fluvial deposits and range in thickness from less than 100 to 600 feet in Ohio (USGS, 1995a) and 50 to 400 feet in Michigan (USGS, 1995b). Aquifers typically occur in sand and gravel deposited under glacio-fluvial conditions during periods of glacial retreat and melting. The lacustrine deposits consist of clay, silt, sand, and gravel derived from ancestral Lake Erie. Additionally, alluvial aquifers can occur in the valleys and floodplains of present-day rivers and streams. Although the surficial aquifers tend to be numerous and can locally serve as important aquifers, they tend to be limited in areal extent (ODNR, 2016b). The most productive sand and gravel aquifers typically occur in alluvial deposits within buried bedrock valleys. Sand and gravel aquifers can yield well discharges ranging from 500 to 1,000 gallons per minute (gpm) where deposits are thickest, but lower yielding sand gravel aquifers are typically more common (Ohio Environmental Protection Agency [OEPA], 2014a). As discussed in section 4.3.1.2, an important surficial aquifer is located in the Oak Openings beach ridge sand deposits (approximate MP 181.0 to 191.0) formed by ancestral Lake Erie.

Figure 4.3.1-1 illustrates the principal bedrock aquifers crossed by the NGT Project (USGS, 2013). The predominant aquifers of eastern Ohio are comprised of confined Mississippian and Pennsylvanian sandstone units containing numerous siltstone and sandstone beds that vary in thickness and are typically separated by layers of shale and minor amounts of limestone, clay, and coal. Although some of the thicker sandstone and conglomerate aquifers can yield up to 50 to 100 gpm, 25 gpm is more typical of the well yields in the higher yielding sandstone aquifers.

Carbonate bedrock units, typically Silurian and Devonian limestone and dolomite, comprise the dominant aquifer type in western Ohio. These units have a total thickness of 300 to 600 feet. Although these aquifers can yield from 100 to over 500 gpm, where crossed by the NGT Project, they yield between 0 to 100 gpm. Higher well yields are commonly associated with the development of karst features that have increased secondary porosity created by fractures and dissolution features as described in section 4.1.3.4. However, some karst aquifers are more susceptible to contamination from the ground surface and, consequently, can produce water that is of poor quality that is not used for drinking water.

Bedrock confining layers comprise the first bedrock beneath the majority of the NGT Project route in Michigan where they are relatively impermeable and are not considered significant aquifers. Between MP 225.0 and MP 245.0, the NGT Project traverses the Silurian-Devonian bedrock aquifer, consisting mostly of dolomite and limestone approximately 300 to 400 feet thick with yields typically less than 50 gpm. Portions

of the aquifer are unconfined and are overlain by surficial aquifers. At these locations the Silurian-Devonian aquifer tends to be more susceptible to contamination originating from the land surface than the portions that are overlain by confining units.

TEAL Project

The TEAL Project is underlain by Pennsylvanian sandstone bedrock aquifers that are typically confined and interbedded with siltstones and shales (OEPA, 2014a) (see figure 4.3.1-1). Wells in these aquifers typically yield 25 gpm but can range up to 50 to 100 gpm in areas where the aquifer is thicker. Well yields are typically less than 5 gpm where the aquifer contains thin bedded shales, limestones, sandstones, clays, and coal deposits.

Sole Source Aquifers

The EPA defines a sole source aquifer (SSA) or principal source aquifer area as one that supplies at least 50 percent of the drinking water consumed in the area overlying the aquifer, where contamination of the aquifer could create a significant hazard to public health, and where there are no alternative water sources that could reasonably be expected to replace the water supplied by the aquifer (EPA, 2015a). The NGT Project would not cross any designated SSAs (EPA, 2015b). On February 20, 2014, the Tuscarawas River Buried Valley Watershed Council petitioned the EPA to list the Tuscarawas River Buried Aquifer in Stark, Tuscarawas, and Wayne Counties as an SSA. The TEAL Project does not traverse any EPA-designated SSAs (EPA, 2015b).

Wellhead and Aquifer Protection Areas

Under the Safe Drinking Water Act (SDWA), each state is required to develop and implement a Wellhead Protection Program (WHPP) in order to identify the land and recharge areas contributing to public supply wells and prevent the contamination of drinking water supplies. The SDWA was updated in 1996 with an amendment requiring the development of a broader-based Source Water Assessment Program (SWAP), which includes the assessment of potential contamination to both groundwater and surface water through a watershed approach. A WHPA encompasses the area around a drinking water well where contaminants could enter and pollute the well.

In Ohio, the OEPA's Division of Drinking and Ground Water (DDAGW) mandates public groundwater and surface water supply systems to establish a Source Water Assessment and Protection Program (SWAPP), which includes defining the well recharge area, identifying and managing potential sources of pollution, conducting groundwater monitoring, and developing a contingency plan.

In Michigan, the MDEQ WHPP is a voluntary program in which communities may choose to develop an approved local WHPP according to the guidelines established by the state, including delineation of WHPAs (MDEQ, 2012).

WHPAs crossed by the NGT Project in Ohio were identified using GIS data from the OEPA (2016) and are summarized in table 4.3.1-1. The NGT Project mainline would cross 15 WHPAs at 25 locations in Ohio. Four (4) of the WHPAs crossed are for non-community wells, and the remaining 12 are for community wells. None of the proposed compressor stations would be within a designated WHPA. The NGT Project would cross one WHPA in Monroe and Washtenaw Counties in Michigan (MDEQ, 2016).

The TEAL Project would not traverse any WHPAs.

TABLE 4.3.1-1

Wellhead Protection Areas Crossed by the NGT Project Mainline

State/County	From MP	To MP	Crossing Length (feet)	Water Supply Type	Name
Summit, OH	37.2	37.4	1,076	Community	Country View South Apartments
Summit, OH	37.4	37.6	1,435	Community	Greentree Place 4900 PWS ^a
Wayne, OH	57.4	57.7	1,297	Community	Rittman City PWS ^a
Wayne, OH	57.6	57.7	606	Community	Rittman City PWS ^a
Medina, OH	57.7	59.1	7,337	Community	Rittman City PWS ^a
Medina, OH	57.7	59.1	7,381	Community	Rittman City PWS ^a
Medina, OH	68.7	69.2	2,922	Community	Medina Co/Southern Water District PWS ^a
Medina, OH	68.9	69.2	1,799	Community	Medina Co/Southern Water District PWS ^a
Erie, OH	116.7	117.3	2,972	Community	Riverview Manor Apartments
Erie, OH	125.5	131.5	31,831	Community	Bloomville Village PWS ^a
Erie, OH	125.5	131.5	31,831	Community	Flat Rock Care Center
Erie, OH	125.5	131.5	31,831	Community	Republic Village
Erie, OH	125.5	131.5	31,831	Noncommunity	Ebenezer United Methodist Church
Erie, OH	125.5	131.5	31,831	Noncommunity	Melmore United Methodist Church
Sandusky, OH	131.5	133.4	10,072	Community	Bloomville Village PWS ^a
Sandusky, OH	131.5	133.4	10,072	Community	Flat Rock Care Center
Sandusky, OH	131.5	133.4	10,072	Community	Republic Village
Sandusky, OH	131.5	133.4	10,072	Noncommunity	Ebenezer United Methodist Church
Sandusky, OH	131.5	133.4	10,072	Noncommunity	Melmore United Methodist Church
Sandusky, OH	153.4	155.2	9,649	Community	Lindsey Village Water
Sandusky, OH	154.6	160.2	29,568	Community	Gibsonburg Village PWS ^a
Sandusky, OH	160.2	163.5	17,161	Community	Woodville Village
Wood, OH	164.8	164.9	538	Noncommunity	Sycamore Grove Bar
Wood, OH	173.0	173.5	2,596	Noncommunity	Tanglewood Golf Club
Monroe and Washtenaw, MI	236.3	238.8	12,830	Unknown	Milan

a Public Water System

Sources: OEPA (2016); USGS and MDEQ (2002).

Water Supply Wells and Springs

GIS data from the OEPA (2016), ODNR (2016c), MDEQ (2016), and Michigan Department of Technology, Management, & Budget (2016), as well as preliminary field survey results from NEXUS and Texas Eastern, were used to identify public and private water supply wells and springs within 150 feet of construction workspaces (see appendix H-1). NEXUS and Texas Eastern would continue to identify nearby water supply sources through ongoing surveys and landowner communications.

NGT Project

As indicated in appendix H-1, 156 wells and 3 springs have been identified to date within 150 feet of the NGT Project mainline construction workspace in Ohio. The three springs are likely used for agricultural purposes. There are 43 wells within 150 feet of access roads and another 18 wells are within 150 feet of aboveground facilities, staging areas, or pipe/contractor yards.

In Michigan, 21 wells have been identified to date within 150 feet of the NGT Project mainline construction workspace. Additionally, as indicated in appendix H-1, one well is within 150 feet of the Willow Run M&R Station, three wells are within 150 feet of Ware Yard 4-1, and two wells are in the vicinity of access roads. No springs or seeps used for drinking water or agricultural purposes were identified near the NGT Project in Michigan.

TEAL Project

One private well and three springs have been identified within 150 feet of the TEAL Project construction workspace to date. The springs are likely being used by cattle.

Contaminated Groundwater

We accessed federal, state, and local government databases to identify facilities with potential and/or actual existing sources of contamination that may affect groundwater quality near the NGT and TEAL Projects. As discussed in section 4.9.9, numerous sites with known or suspected soil and groundwater contamination were identified within 0.25 mile of the NGT Project. Based on distance, regulatory status, and other information, the majority of these sites are unlikely to impact groundwater quality beneath the NGT Project. In section 4.9.9, we recommend that NEXUS further assess the potential for 11 of the sites to impact groundwater quality beneath the NGT Project and to provide site-specific contamination management plans for those sites determined to pose a risk to groundwater quality beneath the Project. One of these sites recommended for further review is a crude oil spill approximately 50 feet from the NGT Project at MP 37.4., which is in proximity to the WHPA for the Greentree Place 4900 Public Water System (MP 37.4 to 37.6). No known, contaminated sites with the potential to impact groundwater quality were identified within 0.25 mile of the TEAL Project.

Groundwater Use

Construction of the NGT and TEAL Projects would require approximately 70.1 million gallons of water for hydrostatic testing, HDD installations, and construction of aboveground facilities (see table 4.3.2-5). As discussed in section 4.3.2, approximately 67.0 million gallons (96 percent) of construction-related water would be obtained from surface water sources. The sources of the remaining 3.1 million gallons (4 percent) necessary for construction have not been identified to date, but could include groundwater resources. Operational groundwater requirements at existing or modified aboveground facilities would be minimal as none of the facility operations would require significant water use.

4.3.1.2 Impacts and Mitigation

Construction of the NGT and TEAL Projects would occur mostly above the water table; however, where the water table is within trench or grading depth, the elevation and flow characteristics of shallow groundwater resources could be affected by dewatering. Excavation could also increase turbidity within the resource. These impacts would be temporary, minor, and localized to the area near to construction, and would be further reduced by restoring surface contours to pre-construction conditions and implementing the applicants' *E&SCPs*, which include measures to avoid or minimize soil erosion in the trench and on the right-of-way, control the discharge of water in nearby uplands, and encourage revegetation after construction. After construction activities are complete, the applicants would restore the ground surface as closely as practicable to original contours and revegetate any previously vegetated, exposed soils to restore pre-construction overland flow patterns as well as groundwater recharge. Therefore, groundwater recharge is not expected to be impacted. Additionally, any impacts to groundwater flow resulting from the trench intersecting the water table would be minor and localized, and would not be expected to discernably impact the groundwater flow regime, or the quantity or quality of groundwater that is used for residential potable water supply. Since residential wells are screened at depths greater than the bottom of the pipeline trench, impacts to well yields are not anticipated even if the trench penetrates below the water table. In areas where backfill materials are more permeable than the substrate, trench breakers would be installed to eliminate preferential flow paths for shallow groundwater within the pipeline trench. As indicated in section 4.3.1.1, a crude oil release near a WHPA at MP 37.4 may have potential for contaminating groundwater near the NGT Project. Although not anticipated, if contaminated soil or groundwater is encountered during construction, the applicable agencies and FERC will be notified, and NEXUS would implement its *SPCC Plan* to manage and minimize the potential effects on groundwater from any existing contaminated sites and potential spills during construction. Additionally, if contaminated groundwater would occur within the backfilled trench, the trench breakers would mitigate its spread to uncontaminated portions of the surficial aquifer.

Construction of the NGT and TEAL Projects could increase turbidity and reduce capacity in nearby water supply wells and springs. The applicants have identified wells and springs within 150 feet of the construction workspaces and would verify locations through final civil surveys and landowner communication. Blasting would be conducted in accordance with the Projects' *Blasting Plans* (see appendices E-1 and E-2) and specific plans designed to avoid damage to nearby structures including wells. If requested by the landowner, wells and springs located within 150 feet of construction workspaces will be reviewed by an expert in the field to determine whether planned construction activities would be expected to impact these features. If impacts are anticipated to occur, the expert would further recommend construction alterations to be considered for avoiding impacts these features. Additionally, NEXUS would offer to conduct pre- and post-construction testing of water quality and yield in all wells and springs within 150 feet of the NGT Project construction workspace, and would repair or replace any wells that are damaged, or otherwise compensate the well owner. We note that NEXUS has not indicated that it would offer to repair, replace, or otherwise compensate owners for adversely impacted springs. Texas Eastern would offer the same monitoring and mitigation for only water wells, but not springs, within 150 feet of the construction workspace. The applicants would file a report with the Secretary within 30 days of placing the facilities in service, discussing whether any complaints were received concerning well yield or water quality and how each was resolved. We anticipate that any increased turbidity or capacity reduction in wells would be minor and temporary, and conclude that the applicants' well identification, testing, and mitigation procedures would avoid or adequately address any impacts on wells. Because springs which are presently used for agriculture or livestock watering also could be impacted by construction activities, but

were not offered the same level of protection as water wells by NEXUS or Texas Eastern, **we recommend that:**

- **NEXUS should repair or replace the water supply of any springs that are damaged by construction, or otherwise compensate the owner of the spring. NEXUS should file a report with the Secretary within 30 days of placing the facilities in service, discussing whether any complaints were received concerning spring yield or water quality and how each was resolved.**
- **Texas Eastern should offer to conduct pre- and post-construction testing of water quality and yield at all springs within 150 feet of the TEAL construction workspace, and repair or replace the water supply of any springs that are damaged, or otherwise compensate the owner of the spring. Texas Eastern should file a report with the Secretary within 30 days of placing the facilities in service, discussing whether any complaints were received concerning spring yield or water quality and how each was resolved.**

An inadvertent release of fuel, lubricants, and other substances could impact groundwater quality. The degree of impact would depend on the type, amount, and duration of material released; the type of soil or geologic material at the land surface; the depth to groundwater; and the characteristics of the underlying aquifer. The potential for a release to impact groundwater is greater in areas of shallow groundwater, such as where the NGT Project would cross the Oak Openings area of western Ohio. To minimize and mitigate impacts, the applicants provided Project-specific *SPCC Plans* that specify contractor training, the use of EIs, procedures for the safe storage and use of hazardous materials, and remedial actions that would be taken to address a spill. We have reviewed these plans and find that these plans along with our recommendations would sufficiently protect groundwater resources during construction of the NGT and TEAL Projects.

As indicated in table 2.3.2-1, NEXUS would use the HDD method to install its pipeline facilities at 18 locations; Texas Eastern would not utilize the HDD method. The HDD method is commonly used throughout the U.S. and involves the use of drilling mud to remove drill cuttings, lubricate the drill bit, and maintain the borehole. Drilling mud is comprised of water containing less than 2 percent high yield bentonite by volume. Bentonite is a naturally occurring, non-toxic, and non-hazardous clay mineral that is commonly used in the installation of potable water wells. Other additives may be incorporated into the drilling mud, including viscosifiers that are typically comprised of polymers.

Under normal conditions, drilling mud is recirculated and reused throughout the HDD process, with a small amount being retained in the immediate area of the borehole. If the drill bit encounters highly coarse materials, large fractures, or other large voids, drilling mud can be lost in the subsurface environment and potentially return to the land surface or wetlands and waterbodies along the drill path (referred to as inadvertent returns). The primary impact that lost drilling mud would have on groundwater quality would be increased turbidity. In general, the magnitude and duration of increased turbidity would depend on the volume of mud lost, and would diminish with distance and time from the point of loss. Water supply wells located downgradient from the point of loss could also experience increased turbidity and reduced capacity. NEXUS determined in its *HDD Design Report* (see appendix E-4) that the HDDs at the Sandusky, Portage, and Maumee Rivers would penetrate carbonate bedrock formations, where the potential for lost drilling mud would increase if large fractures or voids in the formation are encountered.

NEXUS has conducted geotechnical investigations at the proposed HDD crossing locations. Based on these geotechnical studies, site-specific HDD engineering plans were developed for each location and selected the drill path to minimize the potential for inadvertent returns, as presented in its *HDD Design*

Report. NEXUS also developed a Project-specific *HDD Plan*, which details the measures that NEXUS would implement to monitor drilling progress and minimize the potential for inadvertent returns to occur. These measures would include:

- sizing the hole frequently by advancing and retracting the drill string in order to keep the annulus clean and unobstructed;
- when drilling mud flow has been suspended, establishing circulation slowly before advancing;
- operating at low annular pressures by minimizing density and flow losses. Viscosity should be minimized, consistent with hole cleaning and stabilization requirements;
- minimizing gel strength;
- controlling penetration rates, travel speeds, and balling of material on bits, reaming tools, and pipe in order to prevent a plunger effect from occurring;
- sealing a zone of lost circulation using a high viscosity bentonite plug or lost circulation materials, such as wood fibers, cotton seed husks, ground walnut, or special polymers; and
- suspending drilling activities for a period of 6 to 8 hours.

We have reviewed the site-specific HDD designs in the *HDD Design Report* and the *HDD Plan* prepared by NEXUS based on the current geotechnical evaluations and find that implementation of these plans would adequately protect groundwater resources in the NGT Project area.

Comments were received concerning potential impacts that construction of the NGT Project could have on public water supply systems for the City of Wadsworth, Ohio; the Village of Chippewa Lake, Ohio; and Sandusky County, Ohio. The City of Wadsworth is concerned that possible blasting during installation of the NGT Project mainline could adversely impact nearby municipal wells. Based on well data obtained from the ODNR, the nearest Wadsworth municipal well would be approximately 2 miles (near MP 56.1) from the NGT Project mainline; therefore, blasting would not be expected to impact the Wadsworth municipal well system.

The proposed mainline of NGT Project would traverse the Medina County Southern Water District Public Water Supply WHPA (including the Inner Management Zone), which provides the water supply for Chippewa Lake, Ohio. For this and other reasons, we recommend in section 3.4.11 that the Chippewa Lake D Route Variation be used instead, which falls outside of that WHPA. However, the Chippewa Lake D Route Variation crosses 0.36 mile of the J and M Restaurant Corporation Public Water WHPA, but avoids its Inner Management Zone. Additionally, as noted previously, NEXUS would implement measures within its *E&SCP* and *SPCC Plan* to avoid or minimize impacts on groundwater resources. By following these mitigation measures and our recommendation for an alternative route, construction and operation of the NGT Project would not be expected to impact the Chippewa Lake water supply system.

Sandusky County raised concerns with the original routing of the NGT Project across the WHPA of two of its wells. In response to these concerns, NEXUS adopted a reroute that avoids the Sandusky County WHPAs, and states that the reroute is acceptable to Sandusky County. NEXUS would also implement measures in its *E&SCP* and *SPCC Plan* to avoid or minimize impacts on groundwater resources. Therefore, construction and operation of the NGT Project would not be expected to impact the Sandusky County water supply system.

Although implementation of NEXUS' *E&SCP* and *SPCC Plan* would be mitigating factors for protecting WHPAs and we would not expect impacts on WHPAs, the EPA suggested that NEXUS consult with water supplier in the WHPA to determine if any additional mitigation would be warranted. For this reason and because the NGT Project is in an area generally known to have shallow groundwater, we **recommend that:**

- **Prior to construction, NEXUS should consult with water suppliers in the WHPAs crossed by the Project and file with the Secretary for review and written approval by the Director of OEP any water supplier recommended mitigation that NEXUS would implement during construction. Where recommended mitigation would not be implemented, NEXUS should demonstrate that the mitigation would not be needed.**

Section 4.9.9 identifies three contaminated sites in the vicinity of the NGT Project with potential to encounter pre-existing contamination, including groundwater. In that section, we recommend that NEXUS prepare an updated *SPCC Plan* and *E&SCP* that details site-specific measures NEXUS would implement to avoid exacerbating existing contamination, if encountered. We further recommend that NEXUS file the updated *SPCC Plan* and *E&SCP* with the Secretary for review and approval of the Director of OEP.

Construction of the NGT and TEAL Projects could require the use of up to 3.1 million gallons of groundwater. This relatively small water withdrawal would be obtained from multiple sources throughout the Projects area and at various times during construction and, therefore, would not be expected to impact groundwater availability or the performance of existing wells in the area. In addition, water used during construction would be discharged in the area where it is used, further minimizing any effects on groundwater availability.

We received comments concerning the potential impact of a natural gas release from the proposed pipeline facilities on groundwater resources. The NGT and TEAL Projects would transport natural gas, not a liquid. Unlike a spill from a pipeline that conveys a liquid such as oil or gasoline, a leak of natural gas from a pipeline would dissipate quickly upwards to the atmosphere and not contaminate surrounding media.

Operational groundwater requirements at existing or modified aboveground facilities would be minimal because none of the facility operations involve process water. In addition, hazardous materials storage and use at aboveground facilities during construction and operation would be conducted in accordance with applicable regulations, which would include specifically designed containers and secondary containment structures, where necessary. Therefore, aboveground facilities operation is not expected to impact the availability of groundwater resources in the area nor pose a significant risk to groundwater quality.

4.3.1.3 Conclusions

In conclusion, construction and operation of the NGT and TEAL Projects could impact groundwater resources; however, as discussed previously, these impacts are expected to be minor, localized, and temporary, and would be avoided, minimized, or mitigated by implementation of the applicants' proposed construction and restoration plans and our additional recommendations, which are included in sections 4.3.1.2 and 5.2. Therefore, construction and operation of the Projects is not expected to result in any significant impacts on groundwater resources.

4.3.2 Surface Water Resources

4.3.2.1 Existing Surface Water Resources

Surface water resources were identified using USGS topographic maps and verified by field surveys. Surface water resources documented in the NGT and TEAL Projects area include major rivers, streams, ponds, and tributaries. This section describes the surface water resources in the vicinity of the Projects.

The United States is divided and subdivided into successively smaller watershed units that are identified by the USGS using the Hydrologic Unit Code (HUC). Each hydrologic unit is identified by a unique HUC number consisting of 2 to 12 digits based on these 6 levels of classification: 2-digit HUC first-level (region), 4-digit HUC second-level (subregion), 6-digit HUC third-level (accounting unit or basin), and 8-digit HUC fourth-level (cataloguing unit), which are used herein to define watersheds for the NGT and TEAL Projects (USGS, 2014).

We define a waterbody as any natural or artificial stream, river, or drainage with perceptible flow at the time of crossing, and other permanent waterbodies such as ponds and lakes. Waterbodies include streams with perennial, intermittent, or ephemeral flow. Perennial streams flow year-round. Typically, intermittent streams flow continuously during wet seasons, but may be dry for a portion of the year. Ephemeral streams flow only for a short period following major rainfall events. Intermittent and ephemeral streams may be dry at the time of construction, depending on the time of year and precipitation conditions. We also define waterbodies as major, intermediate, and minor based on the width of the water crossing at the time of construction. Major waterbodies are those that are greater than 100 feet wide, intermediate waterbodies are greater than 10 feet wide but less than or equal to 100 feet wide, and minor waterbodies are those that are less than or equal to 10 feet wide.

NGT Project

The NGT Project facilities are located within the Ohio River and Great Lakes regional drainage basins, and are further subdivided into HUC-8 watersheds as illustrated in figure 4.3.2-1 and presented in table 4.3.2-1, which provides the beginning and end MP for each watershed crossed by the pipeline facilities.

Approximately 90 percent of the NGT Project facilities were surveyed for the presence of waterbodies along the route during the 2014 and 2015 field seasons. Field surveys for the remaining 10 percent would be conducted pending survey access and weather conditions. NEXUS used publically available USGS topographic quadrangles, 2-foot contour LIDAR mapping data, and aerial photography to approximate waterbody boundaries where field surveys have not yet been conducted. The waterbodies crossed by the pipeline facilities are listed in appendix H-2, including approximate MP, waterbody widths, flow classifications, crossings methods, and other state and federal designations.

TABLE 4.3.2-1

Watersheds Crossed by the NGT and TEAL Projects

State, Project, Facility	From MP	To MP	Crossing Length (mi)	HUC 8 Identifier	Watershed (HUC 8) Name
OHIO					
NGT Project					
TGP Interconnect	0.0	0.9	0.9	05030100	Upper Ohio
Mainline	0.0	0.3	0.3	05030101	Upper Ohio
	0.3	7.0	6.7	05040001	Tuscarawas
	7.0	7.1	0.1	05030103	Mahoning
	7.1	7.6	0.5	05040001	Tuscarawas
	7.6	8.6	1.0	05030103	Mahoning
	8.6	8.7	0.1	05040001	Tuscarawas
	8.7	8.8	0.1	05030103	Mahoning
	8.8	14.3	5.4	05040001	Tuscarawas
	14.3	14.3	0.1	05030103	Mahoning
	14.3	14.3	0.0	05040001	Tuscarawas
	14.3	21.2	6.9	05030103	Mahoning
	21.2	72.7	51.4	05040001	Tuscarawas
	72.7	97.7	25.0	04110001	Black-Rocky
	97.7	119.8	22.1	04100012	Huron-Vermilion
	119.8	154.8	35.0	04100011	Sandusky
	154.8	176.6	21.8	04100010	Cedar-Portage
	176.6	203.5	26.9	04100009	Lower Maumee
	203.5	208.3	4.8	04100001	Ottawa-Stony
TEAL Project					
Proposed Pipeline Loop	0.0	0.4	0.4	05030201	Little Muskingum-Middle Island
Connecting Pipeline	N/A	N/A	0.3	05030100	Upper Ohio
MICHIGAN					
NGT Project					
Mainline	208.3	209.4	1.1	04100001	Ottawa-Stony
	209.4	237.9	28.4	04100002	Raisin
	237.9	249.2	11.3	04100001	Ottawa-Stony
	249.2	253.7	4.5	04090005	Huron
	253.7	255.0	1.3	04090004	Detroit
N/A = Not applicable					
Source: USGS, 2014					

The NGT pipeline would cross a total of 159 different waterbodies and/or their tributaries (at 370 locations) in Ohio and 59 different waterbodies and/or their tributaries (at 93 locations) in Michigan. Of the 463 waterbody crossings, 206 are perennial, 150 are intermittent, 93 are ephemeral, 11 are classified as ponds, and three as reservoirs. The NGT Project would cross a total of ten major waterbodies (at 11 locations): Nimisila Reservoir, Tributary to Mallet Creek (classified as a pond), Huron River in Ohio, Sandusky River, tributary to Sandusky (classified as a pond), Portage River, Maumee River, Huron River in Michigan, Willow Run (classified as a pond, and is crossed at two locations) and a Tributary to Willow Run (classified as a pond).

As indicated in appendix H-2, 15 waterbodies would be crossed by temporary access roads and none by permanent access roads. No waterbodies were identified within the compressor station sites, M&R stations, MLV sites, or pipe/contractor yards.

TEAL Project

The TEAL Project facilities are located within the Upper Ohio-Beaver and Upper Ohio-Little Kanawha drainage basins (see figure 4.3.2-1) and cross three watersheds (8-digit HUC) as indicated in table 4.3.2-1.

Appendix H-2 lists 4 waterbodies and/or their tributaries (at 15 locations) that would be crossed by the TEAL pipeline facilities which include 10 perennial and 5 intermittent waterbodies. Twelve (12) of the 15 waterbodies crossed by the TEAL pipelines are classified as minor waterbodies and 3 are intermediate; none are major waterbodies. None of the TEAL aboveground facilities or access roads would impact waterbodies.

4.3.2.2 Surface Water Supplies and Surface Water Protection Areas

NGT Project

Public surface water intakes located within 3 miles downstream of the NGT Project mainline are summarized in table 4.3.2-2. Four surface water intakes in Ohio and one in Michigan would be located within 3 miles downstream of the NGT Project crossings.

County	Nearest MP	Municipality	Waterbody Intake
Lorain County, OH	91.4	Oberlin Water Department	West Branch Black River
Lorain County, OH	92.9	Oberlin Water Department	West Branch Black River Reservoir
Fulton County, OH	197.2	Swanton Village	Swan Creek
Fulton County, OH	197.2	Swanton Village	Swanton Reservoir
Lenawee County, MI	215.6	Blissfield	River Raisin

Sources: Ohio: OEPA, 2016
Michigan: USGS and MDEQ, 2002

The NGT Project is located approximately 20.5 miles from the nearest Ohio River surface water intake (East Liverpool, Columbiana County, Ohio). Additionally, the NGT Project is located approximately 7 miles from the nearest Mahoning River surface water intake (Alliance, Stark County, Ohio).

Surface water protection areas crossed by the NGT Project are presented in appendix H-3. Surface public water systems are regulated by OEPA's DDAGW. The OEPA requires that a SWAPP be established for all public surface water supply systems. Public watershed areas in Ohio include municipal watersheds and associated reservoirs as well as state and locally designated surface water protection areas. Based on OEPA GIS data (OEPA, 2016), the NGT Project crosses surface water protection areas located within the greater Ohio River SWAPPs, Mahoning River SWAPPs, West Branch Black River SWAPP, and Swanton Reservoir SWAPP.

Surface water protection areas for intakes in Michigan, determined by identifying the watershed upstream from a surface water intake, are defined as a critical assessment zone (CAZ). A 3,000-foot radius is applied to a CAZ for river intakes and a 1,000- to 3,000-foot radius is applied to lake intakes (USGS and MDEQ, 2002).

TEAL Project

No public surface water intakes are located within 3 miles downstream of the TEAL Project waterbody crossing locations. As listed in appendix H-3, one surface water protection area would be crossed within the greater Ohio River SWAPP between MP 0.0 to 0.3. No aboveground facilities are located within surface water protection areas.

4.3.2.3 Water Classifications

Water quality classifications established by the states of Ohio and Michigan are also presented in appendix H-2 for the waterbodies crossed by the Projects. Water use designations for aquatic life habitat in Ohio include:

- Warmwater Habitat (WWH): waters that are capable of supporting and maintaining a balanced, integrated, adaptive community of warmwater aquatic organisms having a species composition, diversity, and functional organization comparable to the 25th percentile of the identified reference sites within each of the following ecoregions: the interior plateau ecoregion, the Erie/Ontario lake plains ecoregion, the western Allegheny plateau ecoregion, and the eastern corn belt plains ecoregion. For the Huron/Erie lake plains ecoregion, the comparable species composition, diversity, and functional organization are based upon the 90th percentile of all sites within the region.
- Modified Warmwater Habitat (MWH): applies to extensively modified habitats that are capable of supporting the semblance of a warmwater biological community, but fall short of attaining WWH because of functional and structural deficiencies due primarily to altered macrohabitats.

The water use quality designations for aquatic life habitat in the state of Michigan includes WWH, defined there as all surface waters of the state that are designated and protected for warm water fisheries. Although there are specific rivers and inland lakes that are designated and protected for cold water fisheries, none are crossed by the NGT Project in Michigan.

The states of Michigan and Ohio assume that all streams support agricultural and IWS uses. The only water supply designation types that are crossed by the NGT Project are:

- Agricultural Water Supply (AWS): waters suitable for irrigation and livestock watering without treatment.
- IWS: waters suitable for commercial and industrial uses, with or without treatment. Criteria for the support of the IWS use designation will vary with the type of industry involved.

Designations for state recreation classification in Ohio are only in effect during the recreation season, which is the period from May 1 to October 31. Primary Contact Classes A, B, and Secondary Contact recreational uses are crossed by the NGT Project. Primary Contact waters, during the recreation season, are suitable for one or more full-body contact recreation activities such as, but not limited to, wading, swimming, boating, water skiing, canoeing, kayaking, and scuba diving. Three classes of Primary Contact Recreation use are defined to reflect differences in the observed and potential frequency and

intensity of usage. State recreation classifications are identified in rules 3745-1-08 to 3745-1-30 of the Ohio Administrative Code (OAC) and defined as follows:

- **Primary Contact A:** These are waters that support, or potentially support, frequent primary contact recreation activities. These streams and rivers are popular paddling streams with public access points developed, maintained, and publicized by governmental entities.
- **Primary Contact B:** These are waters that support, or potentially support, occasional primary contact recreation activities. All surface waters of the state are designated as Class B Primary Contact Recreation (unless otherwise designated as bathing waters), Class A Primary Contact Recreation, Class C Primary Contact Recreation, or Secondary Contact Recreation.
- **Secondary Contact:** These are waters that result in minimal exposure potential to water-borne pathogens because the waters are rarely used for water-based recreation (e.g., wading); are situated in remote, sparsely populated areas; have restricted access points; and have insufficient depth to provide full body immersion, thereby greatly limiting the potential for water-based recreation activities.

At a minimum, all surface waters in Michigan are designated and protected by the MDEQ for the partial-body contact recreation and total-body contact recreation designations. Partial body contact recreation is designated throughout the year and total-body recreation is designated from May 1 through October 1. Most designations have two or more types of assessment that may be used to determine support. These types of assessment include biological, physical/chemical, toxicological, pathogen, other public health, and other aquatic health indicators. These designations are defined as follows:

- **Partial Body Contact:** These are waters that support, or potentially support, occasional partial body contact recreation activities. Partial body recreation activities include, but are not limited to, paddling, canoeing, and kayaking, and are protected in all surface waters year-round in Michigan.
- **Total Body Contact:** These are waters that support, or potentially support, occasional total-body contact recreation activities. Total body contact recreation activities include activities such as swimming, and all surface waters in Michigan are protected from May 1 through October 1 for such activities.

4.3.2.4 Sensitive Surface Waters

Sensitive surface waters include waterbodies that have been designated for intensive water quality management, waters containing federally or state-listed threatened or endangered species and/or critical habitats, any waters afforded national or state designated status, and Section 10 Navigable Waterways. Table 4.3.2-3 summarizes the sensitive surface waters crossed by the NGT and TEAL Projects by milepost and applicable designated categories. NEXUS and Texas Eastern have indicated that all of these waterbodies would be crossed by the HDD method except for the East Fork Vermillion River, which would be crossed using the dry cut method.

The FWS, ODNR, and Michigan Department of Natural Resources (MDNR) identified that the NGT and TEAL Projects are located within the range of federal- and state-listed species. Information regarding federal and state listed species that may be associated with waterbodies crossed by the NGT and TEAL Projects is presented in section 4.8.

TABLE 4.3.2-3

Sensitive Waters Crossed by the NGT Project Pipeline Facilities

State, Facility	County	Milepost	Waterbody ID	Waterbody Name	NRI ORV ^a	State Designation ^b	Crossing Method
OHIO							
Mainline	Lorain	86.7	A14-50-S1	East Branch Black River	S, R, H	N/A	HDD
	Lorain	92.4	C15-8-S4	West Branch Black River	S, G, W, H	N/A	HDD
	Lorain	99.3	C15-66-S1	East Fork Vermillion River	S, F, R	N/A	Dry Cut
	Huron	104.4	C15-56-S4	Vermillion River	S, F, R	OSW-E	HDD
	Erie	116.9	A14-186-S1 ^c	Huron River	N/A	N/A	HDD
	Sandusky	145.9	E15-41-S1 ^c	Sandusky River	R, H	N/A	HDD
	Wood/Lucas	181.5	E14-55-S1 ^c	Maumee River	N/A	OSW-R	HDD
MICHIGAN							
TGP Interconnecting Pipeline	Washtenaw	250.9	D15-21-S1	Huron River	R, F, H	N/A	HDD

a NRI ORV Definitions
Scenery (S): The landscape elements of landform, vegetation, water, color, and related factors result in notable or exemplary visual features and/or attractions. When analyzing scenic values, additional factors—such as seasonal variations in vegetation, scale of cultural modifications, and the length of time negative intrusions are viewed—may be considered. Scenery and visual attractions may be highly diverse over the majority of the river or river segment.
Recreation (R): Recreational opportunities are, or have the potential to be, popular enough to attract visitors from throughout or beyond the region of comparison or are unique or rare within the region. Visitors are willing to travel long distances to use the river resources for recreational purposes. River-related opportunities could include, but are not limited to, sightseeing, wildlife observation, camping, photography, hiking, fishing, and boating.
Geology (G): The river, or the area within the river corridor, contains one or more example of a geologic feature, process, or phenomenon that is unique or rare within the region of comparison. The feature(s) may be in an unusually active stage of development, represent a "textbook" example, and/or represent a unique or rare combination of geologic features (erosional, volcanic, glacial, or other geologic structures).
Fish (F): Fish values may be judged on the relative merits of either fish populations, habitat, or a combination of these river-related conditions.
Wildlife (W): Wildlife values may be judged on the relative merits of either terrestrial or aquatic wildlife populations, habitat, or a combination of these conditions.
History (H): The river or area within the river corridor contains a site(s) or feature(s) associated with a significant event, an important person, or a cultural activity of the past that was rare or one-of-a-kind in the region. Many such sites are listed on the National Register of Historic Places. A historic site(s) and/or features(s) is 50 years old or older in most cases.

b State Designations are based on the OEPA Antidegradation Rule definitions.
Ohio Special Waters (OSW)-E: Waters that have special significance for the state because of their exceptional ecological values.
OSW-R: Waters that have special significance for the state because of their exceptional recreational values.

c Waterbodies designated as Navigable under USACE Section 10 of the Rivers and Harbors Act.
 NRI = National Rivers Inventory
 ORV = Outstandingly remarkable value
 USACE = U.S. Army Corps of Engineers
 Sources: NPS, 2011; National Wild and Scenic Rivers System; 2014 (unless otherwise noted)

NGT Project

We reviewed, the National Rivers Inventory (NRI) (National Park Service [NPS], 2011), National Wild and Scenic River System (2014) maps, and available state regulations and mapping to identify federal and state exceptional quality waters crossed by the NGT Project. The NRI is an inventory of over 3,400 free-flowing river segments in the U.S. designated as having outstandingly remarkable values (ORV) due to the presence of cultural or natural resources considered to be more than local or regional in their significance. Federal agencies are required to avoid or mitigate actions that would adversely affect one or more NRI segments (NPS, 2011). Table 4.3.2-3 identifies the six NRI river segments that the NGT Project would cross, as well as their ORV characteristics.

A review of the National Wild and Scenic River list (National Wild and Scenic Rivers System, 2014) determined that there are no federally designated Wild and Scenic Rivers crossed by the NGT Project in Ohio.

The OEPA Antidegradation Rule 3745-1-05 of the OAC identifies stream segments that have exceptional water quality, special ecological significance, or recreational value. The NGT Project crosses two stream segments of exceptional value: the Vermillion and Maumee Rivers (see table 4.3.2-3).

We also reviewed MDNR's list of designated natural streams (MDNR, 2015) as well as National Wild and Scenic Rivers System (2014) listings, and determined that the NGT Project does not cross any waterbodies designated as such.

The NGT Project crosses three navigable waterbodies in Ohio as defined in Section 10 Rivers and Harbors Act of 1899: the Huron River (MP 116.9), Sandusky River (MP 145.9), and Maumee River (MP 181.6). There are no navigable waters crossed in Michigan.

TEAL Project

The TEAL Project does not cross any designated NRI outstandingly remarkable waterbodies; waters designated by the state of Ohio as having exceptional water quality, special ecological significance, or recreational value; National Wild and Scenic Rivers; or navigable waters.

4.3.2.5 Impaired Surface Waters

Waters that do not meet state water quality standards are considered impaired. Section 303(c) of the CWA requires states to develop and maintain lists of waters that are impaired and do not meet water quality requirements. Appendix H-4 lists the Ohio (OEPA, 2014b) and Michigan 2014 Section 303(d) lists of impaired streams that would be crossed by the NGT and TEAL Projects, including the cause of impairment for each. We identified a total of 317 impaired stream crossings in Ohio along the NGT Project mainline pipeline, 2 of which are attributable to the TGP Interconnect pipeline and some which may represent more than 1 crossing of the same stream. The NGT Project would cross 32 impaired waterbodies in Michigan. The TEAL Project would cross only one impaired stream in Ohio.

4.3.2.6 Federal Emergency Management Agency Flood Zones

Federal digital flood data was reviewed to identify where the Projects facilities would be located in areas subject to flooding, as defined by the FEMA according to varying levels of flood risk and type of flooding. These zones are depicted on the FEMA's Flood Insurance Rate Maps or Flood Hazard Boundary Maps as Special Flood Hazard Areas that have a 1-percent-annual chance of flooding (FEMA, 2016). Appendix H-5 identifies FEMA Flood Zones crossed by the NGT pipeline facilities, by MP range, and

includes 122 locations. All of the aboveground facilities would be sited outside of FEMA flood zones. No TEAL Project facilities would be located within a flood zone.

4.3.2.7 Impacts and Mitigation

Construction

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. Construction activities including clearing and grading of adjacent land, in-stream trenching, trench dewatering, and backfilling would temporarily increase sedimentation and turbidity rates, decrease dissolved oxygen concentrations, result in the loss and modification of aquatic habitat, and increase the potential for the introduction of fuels and oils from accidental spills. Indirect or secondary impacts could occur to fisheries and other aquatic organisms that utilize the water resources. However, proper construction techniques and timing can ensure that any such effects are both temporary and minor.

The applicants would use one of three general methods to install the proposed pipeline across waterbodies, including the open-cut wet method, dry crossing method (flumed and dam and pump), and boring methods, which could be either the conventional bore or the HDD method. The proposed crossing method for each waterbody crossed is identified in appendix H-2.

The wet open-cut method uses conventional construction techniques with no temporary diversion structures (e.g., flume pipes, cofferdams) during construction of the crossing. Wet open-cut would be used to cross waterbodies that are dry during the time of the crossing and that have no discernible or anticipated flow regardless of the crossing method listed in appendix H-2.

Dry open-cut waterbody crossings are conducted by installing a flume pipe(s) and/or a dam and pump prior to trenching to divert the stream flow to the downstream side of the crossing during construction, creating drier conditions by isolating the construction area from the stream flow, as detailed in the Projects' *E&SCPs*. The pipe string would be prefabricated into one continuous section on one bank and either pulled across the stream bottom to the opposite bank, floated across the isolated portion of the stream, or carried into place and lowered into the trench. Diversion devices would be left in place during pipeline installation until final cleanup of the streambed is complete.

Impacts of the open-cut construction method would generally be localized, short-term, and minor. The degree of impact would depend, in part, on the flow volume during construction and the waterbody substrate that would be affected by the crossing. If construction occurs during a dry period, most of the impacts on streams would be avoided.

Waterbodies would be crossed as quickly and safely as possible to minimize potential impacts on surface waters. With the exception of the initial clearing equipment, only equipment necessary for in-stream excavation and backfilling would be allowed in a stream channel. All other equipment would cross waterbodies on temporary equipment bridges that would be constructed in accordance with the applicants' construction plans. In addition, where access roads would be in close proximity to a waterbody, the applicants would install silt fence along the edge of the access road to avoid impacts on the waterbody and minimize sedimentation.

As indicated in appendix H-2, the conventional bore method is proposed for crossing 69 waterbodies of the NGT Project, but not proposed for any of the waterbodies crossed by the TEAL Project. The bore method employs specialized boring equipment to advance a borehole in which the pipe would be

installed and requires that bore pits be excavated on each side of the waterbody to allow installation of the pipeline beneath the waterbody.

Although the majority of the waterbodies along the NGT Project would be crossed with either dry or wet open-cut construction methods, 30 waterbodies would be crossed using the HDD method at 16 locations, as addressed in section 2.3.2.1 and summarized in table 4.3.2-4. The *HDD Design Report* (see appendix E-4) provides further details specific to each HDD crossing, including crossing diagrams.

State, Waterbody ID	Waterbody Name	HDD Name	Milepost
OHIO			
AS-SU-200	Nimisila Reservoir	Nimisila Reservoir	41.1
C15-28-S1	Tuscarawas River	Tuscarawas River	48.1
C15-44-S1	Unnamed	Wetland	71.1
A14-46-S2	Unnamed	Wetland	71.3
A14-46-S1	Unnamed	Wetland	71.4
A14-50-S1	East Branch Black River	East Branch Black River	86.7
C15-8-S2	Tributary to West Branch Black River	West Branch Black River	92.3
C15-8-S3	Tributary to West Branch Black River	West Branch Black River	92.3
C15-8-S4	West Branch Black River	West Branch Black River	92.4
C15-56-S1	Vermilion River	Vermilion River	104.2
C15-56-S4	Vermilion River	Vermilion River	104.4
C15-56-S4B	Vermilion River	Vermilion River	104.4
C15-56-S4A	Vermilion River	Vermilion River	104.5
B15-115-S1	Unnamed	Interstate 80	110.3
AS-ER-19	Huron River	Huron River	116.9
A14-186-S1	Huron River	Huron River	116.9
AS-ER-20A	Unnamed Tributary to Huron River	Huron River	117.0
AS-ER-20	Unnamed Tributary to Huron River	Huron River	117.1
AS-SA-699	Sandusky River	Sandusky River	145.9
AP-SA-700	Unnamed Tributary to Sandusky River	Sandusky River	146.0
D15-26-S1	Portage River	Portage River	162.5
E15-8-S1	Unnamed	Findlay Road	179.9
D15-101-S1	Unnamed	Findlay Road	180.0
D15-99-S1	Unnamed	Findlay Road	180.1
E14-55-S1	Maumee River	Maumee River	181.6
D15-48-S1	Maumee River	Maumee River	181.9
MICHIGAN			
E14-140-S1	River Raisin	River Raisin	215.2
E14-157-S1	Saline River	Saline River	237.3
D15-21-S1	Huron River	Hydro Park	250.9
AS-WA-401	Unnamed	Highway 12/RACER Property	254.3

Waterbody crossings completed using the HDD method generally avoid and significantly minimize surface water impacts resulting from erosion, sedimentation, and/or excess turbidity by limiting the surface disturbance in and immediately adjacent to the waterbody. Bentonite drilling mud is circulated in the borehole during drilling to lubricate the drill bit, stabilize the borehole, and remove the cuttings. There is potential for the HDD method to result in an inadvertent release of drilling mud to the ground surface or waterbody. Accidental releases of drilling mud can result in negative impacts on waterbodies. When drilling mud is released into a waterbody, it may settle out and disperse downstream by the current depending on the nature of the waterbody (e.g., stream size and flow rate). The effects of releasing drilling mud to a waterbody could range from localized turbidity and sedimentation, which could be quickly diluted

by the waterbody's flow, to significant turbidity and sedimentation, which could be carried farther downstream. Small or slow moving waterbodies may exhibit minimal dispersal of drilling mud, and thus increased sedimentation at the release point. Large-scale drilling mud releases could be capable of killing fish, smothering invertebrates or mussels, altering water chemistry, changing water temperature, and altering habitat.

To avoid or minimize impacts, NEXUS has developed a site-specific *HDD Design Report* (see appendix E-4) that outlines specific procedures and methods for each HDD crossing, including measures that NEXUS would implement to monitor drilling progress and minimize the potential for inadvertent returns to occur. These measures are further described in sections 2.3.2.1 and 4.3.1.2. NEXUS would obtain the necessary USACE and state permits, and would conduct drilling in accordance with permit conditions. Additionally, NEXUS would follow the monitoring and response action protocols of the *HDD Plan* (see appendix E-4) during all HDD drilling operations. According to the *HDD Design Report*, none of the sites have subsurface conditions that are expected to prevent installation by HDD, based on the subsurface data collected to date, though some HDDs have a higher risk of experiencing difficulty during installation. In the draft EIS, FERC staff recommended that NEXUS characterize the risk of four proposed HDD sites that were previously uncharacterized: the Nimisila Reservoir (MP 41.1), Tuscarawas River (MP 48.1), West Branch of the Black River (MP 92.4), and the U.S. Highway 12/RACER site (MP 254.3). During the Draft EIS comment period, NEXUS submitted geotechnical feasibility studies for the four locations, and on the basis of these analyses, concluded that HDD would be feasible at all four locations. The feasibility studies were based on available desktop data, existing geologic mapping, and/or field reconnaissance or geotechnical testing at or near the sites.

NEXUS would implement measures detailed in its Project-specific *HDD Plan* to avoid or minimize the inadvertent release of drilling mud. This includes general procedures for the containment and cleanup of drilling mud should a release occur at one or more of the HDD sites. We have reviewed this plan and find it acceptable. In the event that an HDD were to fail at a particular location, NEXUS would abandon the drill hole, relocate the HDD operation to an adjacent area within the approved workspace, and commence drilling a new hole. If that is unsuccessful, a different crossing method, such as wet trench construction, would be required.

NEXUS characterized three HDD sites as high risk of experiencing difficulty during construction, including the Sandusky River (MP 145.9), Maumee River (MP 181.6), and Huron River (MP 250.9). Each of these rivers is designated as sensitive for fish, recreation, and/or historic values. Because these waterbodies are sensitive and the sites are high risk, FERC recommended in the draft EIS that NEXUS provide an assessment of why HDD is the preferred crossing method at these locations. During the Draft EIS comment period, NEXUS responded by acknowledging that potential risks had been identified, but indicated that HDD is feasible and presents the least environmental damaging practicable method for crossing these three rivers. We requested additional information from NEXUS on the likelihood of HDD at these site to result in an inadvertent release of drilling fluid to the waterbodies or other nearby sensitive environmental features (e.g., NRHP-listed or eligible historic properties). We also requested information on any special measure NEXUS would implement to minimize the likelihood of an inadvertent release. In its response, NEXUS indicated that it had performed site-specific hydraulic fracturing evaluations for each of the crossings by calculating the confining capacity of the substrate based on a given design depth and then comparing it to estimated annular pressure necessary to conduct HDD operations. Where necessary, NEXUS increased the design depth until the factor of safety against the hydraulic fracture was determined to be low risk. A factor of safety of 1.5 for sands and 2.0 for all other soil types is considered sufficient to prevent adverse impacts. Because the factor of safety for the three crossings as currently designed was determined to be no less than 2.0, NEXUS concluded that the potential for an inadvertent release of drilling mud to be low risk at all three crossing locations.

NEXUS indicated in its *E&SCP* that it would prepare a contingency crossing plan for each HDD of a waterbody or wetland in the event HDD is unsuccessful. To date, NEXUS has not submitted any alternative contingency crossing plans to the FERC. Therefore, **we recommend that:**

- **In the event of an unsuccessful HDD, NEXUS should prepare an alternative construction plan for crossing the area that was to be drilled. This should be a site-specific plan that includes scaled drawings identifying all areas that would be disturbed by construction. If the alternative plan affects a wetland or waterbody, NEXUS should file the alternative plan with the Secretary concurrent with submission of its application to the USACE for a permit to construct using this alternative plan. The Director of OEP must review and approve any plan in writing before construction of the crossing.**

Geotechnical drilling would be conducted near the stream banks to identify the need for drilling or blasting. If the presence of rock indicates the need for blasting, the ditch crew would prepare the trench line. If in-water blasting is determined to be necessary, the applicants would follow mitigation measures provided in the Projects' *Blasting Plans* (appendices E-1 and E-2, respectively) to avoid or minimize impacts on surface waters.

Spills of gas, lubricants, and other materials during construction have the potential to impact surface water quality and aquatic organisms. As previously described, the applicants have prepared Project-specific *SPCC Plans* detailing procedures for fueling, storage, containment, and cleanup of hazardous materials to minimize the potential for a release into a waterbody. Measures prescribed in these *SPCC Plans* include storing any hazardous materials, chemicals, lubricating oils, solvents, or fuels used during construction in upland areas at least 100 feet from wetlands and waterbodies. Additionally, refueling or lubricating of vehicles or equipment would be prohibited within 100 feet of a waterbody except where absolutely necessary.

Sedimentation of waterbodies would be minimized by placing trench spoil excavated from streambeds and banks at least 10 feet from the top of the waterbody bank or within the ATWS located 50 feet from the water's edge, except where the adjacent upland consists of cultivated or rotated cropland or other disturbed land. Additionally, silt fences and other best management practices (BMP) would be implemented at the edges of the spoil piles to prevent sediment from entering the waterbody.

Following placement of the pipeline across the waterbody, the stockpiled spoil material would be placed back in the trench, and the stream banks and streambed would be restored as close to their pre-construction contours as feasible. Stream banks and riparian areas would be revegetated in compliance with the Projects' *E&SCPs*, as well as with any permit and agency requirements. If the open trench accumulates water from either precipitation or groundwater discharge, the trench would be dewatered periodically to allow for proper and safe construction. Any necessary trench dewatering would be monitored and the water would be discharged into appropriate receiving structures for filtration prior to release and directed into well vegetated areas and allowed to infiltrate. Additionally, as previously indicated, HDD would be used to cross major waterbodies and specially designated surface waters to avoid in-stream disturbance and to minimize tree clearing at the stream banks.

Adherence to the measures described previously, as well as the Projects' *E&SCPs* and permit and agency regulatory requirements, would adequately reduce potential impacts on waterbodies by minimizing streamside vegetation clearing, requiring installation and maintenance of temporary and permanent erosion controls, and minimizing the duration of in-stream construction. Disruption to water flow would be limited to only that necessary to construct the crossing and would reduce the suspension and deposition of sediments downstream of the crossing location. Adequate flow rates would be maintained in streams to

limit the potential impacts on aquatic life. Temporary equipment crossing bridges would be installed to allow equipment access across waterbodies.

Implementation of the NGT Project *E&SCP*, crossing methods, and distance between waterbody crossings and surface water intakes are mitigating factors for protecting water quality at public surface water intakes downstream of waterbody crossings. Using the *Michigan's Source-Water Assessment Program- Surface-Water Assessments Leading to Protection Initiatives 2002* report, it was determined that, although the Blissfield surface water intake along the River Raisin (MP 215.2) is located within 3 miles of the NGT Project pipeline facilities, its CAZ intake is located outside of the NGT Project area. In addition, NEXUS is proposing to use the HDD method for crossing of the River Raisin to avoid impacts on the river or the Blissfield surface water intake and water supply.

In Ohio, the Ohio SWAPP online mapping tool was used to identify surface water intakes at the West Branch Black River and Reservoir (MP 92.9), Swan Creek (MP 197.2), and Swanton Reservoir (MP 192.7). The HDD crossing method would be used to cross the West Branch Black River and conventional bore techniques would be used to cross Swan Creek, avoiding direct impacts on these public source water streams. The Swanton Reservoir and West Branch Black River Reservoir are within 3 miles of the crossing as the crow flies, but are more than 3 river miles downstream. Because two of the crossings avoid direct contact with the water source via crossing technique and the other two are greater than 3 river miles downstream, we conclude that surface water intakes would not be impacted.

Following installation and backfilling of the pipeline, suspended sediments and turbidity within waterbodies would decline to pre-construction levels. Waterbody banks would be stabilized within 24 hours of backfilling in accordance with the Projects' *E&SCPs*, weather and soil conditions permitting. Permanent erosion control structures would be installed in accordance with the applicants' construction plans. Stabilization, restoration, and revegetation of the pipeline rights-of-way and extra workspaces would also be completed in accordance with these measures and state stormwater discharge permits. During operation of the facilities, a 25-foot-wide riparian strip adjacent to waterbodies would be allowed to revegetate with native plant species within the construction right-of-way, and a 10-foot-wide corridor above the pipeline may be maintained to allow pipeline corrosion/leak surveys. No in-water work would be expected during maintenance and operation of the Projects' facilities.

Seasonal and flash flooding hazards are a potential concern where the pipeline would cross or be near major streams and small watersheds. As noted in section 4.3.2.6, the NGT Project traverses flood zones as defined by FEMA, which are listed in appendix H-5. Impacts and mitigation pertaining to flooding and flash floods are addressed in section 4.1.5.7.

ATWS would be required adjacent to waterbody crossings to facilitate pipeline construction techniques used for crossing these resource areas. Typically, ATWS is used for staging equipment, assembly and fabrication of the pipe section(s), or for spoil storage. The FERC Procedures require that ATWS be setback at least 50 feet from the edge of waterbodies; however, in some instances those setback distances may not be met due to site-specific conditions (e.g., topographic conditions, proximity to other features such as roadways). The applicants have requested approval for specific modifications to the requirements of our *Procedures* in regard to 53 specific instances for the NGT Project and 16 instances for the TEAL Project of placing ATWS within 50 feet of waterbodies where the adjacent upland does not consist of cultivated or rotated cropland or other disturbed land.

The Projects' *E&SCPs* specify that extra workspace should not be within 50 feet of waterbodies on previously undisturbed land except where an alternative measure has been requested by NEXUS or Texas Eastern and approved by the FERC. Areas where NEXUS or Texas Eastern have requested extra workspace and stated that a 50-foot setback from waterbodies is infeasible (including its justification) are identified in

appendix H-6. We have reviewed the justifications and deem them acceptable for the Projects due to site-specific conditions such as topographic conditions, proximity to other features such as roadways, foreign utility crossings, existing building structures, and other justifications provided in appendix H-6.

Operation

Operation of the Projects would likely result in minimal impacts on waterbodies as streambeds and banks would be restored to pre-construction conditions. Maintenance activities would largely be restricted to periodic clearing of vegetation within the permanent right-of-way up to 25 feet from waterbody crossings as described earlier in this section. These maintenance activities would be consistent with the FERC *Procedures*, which have been integrated into the *E&SCPs* for the Projects and have minimal impacts on surface waters.

4.3.2.8 Water Withdrawal

Constructing the Projects would require the use of water for hydrostatic testing, dust control, and the HDD construction method. The DOT requires hydrostatic testing to be completed on pipeline segments before they are placed in service under 49 CFR Part 192. Hydrostatic testing involves the use of water that is pressurized within pipeline segments to determine that the installed pipeline is free from leakage and possesses the strength to safely operate at the proposed maximum allowable operating pressure. Water withdrawal would also be required for dust control and for mixing the bentonite slurry used as drilling mud for the HDD construction method. Each state administers programs to regulate the withdrawal and discharge of water used for hydrostatic testing under the federal NPDES.

Surface waterbody withdrawals would be conducted by using pumps placed adjacent to the waterbody with hoses placed into the waterbody. Intake structures would be floated so they are not laying on the streambed, and would be screened to prevent the uptake of aquatic organisms and fish. Water withdrawals would be conducted in compliance with all necessary permits required for surface water extraction. In order to minimize impacts associated from water uses, low flow conditions would be avoided. Efforts would be made to reuse water between test segments to decrease water withdrawal volumes. After the testing is complete, the discharges would be directed to dewatering structures located in well-vegetated upland areas and within the same watershed as the source. No significant water quality impacts are anticipated as a result of discharge from hydrostatic testing. The new pipeline installed as part of the Projects would consist of new steel pipe that would be free of chemicals or lubricant and no additives would be used. Moreover, the applicants do not anticipate using chemicals for testing or for drying the pipelines following hydrostatic testing. Potential impacts resulting from the discharge of water to upland areas would generally be limited to erosion of soils, which would be minimized by adhering to the measures contained in the Projects' *E&SCPs*. Mitigation measures would include discharging test water to a well-vegetated and stabilized area, maintaining at least a 50-foot vegetated buffer from adjacent waterbody/wetland areas, using sediment barriers or similar erosion control measures, regulating discharge rate, and using energy dissipating device(s).

The source waters would be located in proximity to the construction areas and required test sections, and based on their ability to supply a sufficient volume of water for the testing process without compromising normal waterbody dynamics and ecology. Table 4.3.2-5 presents approximate MPs, estimated withdrawals, and water sources for the proposed hydrostatic test waters for pipeline segments, aboveground facilities, and HDD segments for the Projects. In total, the Projects would require approximately 67.5 million gallons of water for hydrostatic testing of the pipeline facilities, 0.8 million gallons for testing the aboveground facilities, and 1.8 million gallons for HDD crossings. Test sections are selected based on several factors, including pipe parameters, the elevation changes within the alignment, the target design pressure, and the class locations of the pipeline facilities.

TABLE 4.3.2-5

Potential Sources of HDD and Hydrostatic Test Water for NGT and TEAL Projects

State, Project, Facility	Approximate MP/Facility Name	Potential Source(s) ^{a, b}	Estimated Volume Uptake (gallons) ^c	
NGT PROJECT				
Ohio				
Mainline	MP 25.2	Unnamed Lake	13,841,520	
	MP 92.3	Tributary to West Branch Black River	10,846,130	
	MP 86.7	East Branch of Black River	Unknown	
	MP 116.9	Huron River	9,644,494	
	MP 123.4	Unnamed Lake	Unknown	
	MP 145.9	Sandusky River	8,421,233	
	MP 181.6	Maumee River	11,137,999	
	MP 162.5	Portage River	Unknown	
	Interconnect Pipeline to TGP Compressor Stations	MP N/A	Water Truck	232,848
		Hanoverton	Water Truck	154,211 ^d
M&R Stations	Wadsworth	Water Truck	85,545 ^d	
	Clyde	Water Truck	129,552 ^d	
	Waterville	Water Truck	104,407 ^d	
	MR01	Water Truck	27,056 ^e	
	MR02	Water Truck	31,497 ^e	
	MR03	Water Truck	32,257 ^e	
	MR04	Water Truck	44,669 ^e	
	MR05	Water Truck	27,056 ^e	
	HDDs	MP 7.7 Category III Wetland (MP 8.4)	Water Truck	149,341
		Nimisila Reservoir (MP 41.1)	Water Truck	77,875
RR and Tuscarawas River (MP 48.1)		Water Truck	166,753	
MP 70.4 Category III Wetland (MP 71.2)		Water Truck	82,266	
East Branch of Black River (MP 86.7)		East Branch of Black River	94,985	
West Branch of Black River (MP 92.4)		West Branch of Black River	84,840	
Vermillion River (MP 104.4)		Water Truck	153,580	
Interstate 80 (MP 110.3)		Water Truck	72,626	
Huron River (MP 116.9)		Huron River	122,995	
Sandusky River (MP 145.9)		Sandusky River	109,621	
Portage River (MP 162.5)		Portage River	91,149	
Findley Road/State Hwy 64 (MP 180.1)		Maumee River	77,219	
Maumee River (MP 181.6)		Maumee River	202,788	
		Ohio NGT Project Total	56,246,512	
Michigan				
Mainline	MP 237.5	Saline River	9,280,849	
	MP 251.1	Ford Lake	2,830,950	
	MP 215.2	River Raisin	Unknown	
HDDs	River Raisin (MP 215.2)	River Raisin	74,948	
	Saline River (MP 237.5)	Saline River	66,620	
	Hydro Park (MP 250.9)	Ford Lake	115,627	
	I-94 (MP 251.7)	Water Truck	72,475	
	U.S. Hwy 12 (MP 254.4)	Unknown	Unknown	
		Michigan NGT Project Total	12,441,469	
		NGT Project Total	68,687,981	
TEAL PROJECT				
Michigan				
Mainline	Entire Pipeline	Ohio River or municipal source	1,200,000	
Connecting Pipeline	Entire Pipeline	Ohio River or municipal source	80,000	

TABLE 4.3.2-5 (cont'd)

Potential Sources of HDD and Hydrostatic Test Water for NGT and TEAL Projects			
State, Project, Facility	Approximate MP/Facility Name	Potential Source(s) ^{a, b}	Estimated Volume Uptake (gallons) ^c
Compressor Stations	Colerain	Water Truck	45,000
	Salineville	Water Truck	90,000
TEAL Project Total			1,415,000
NGT and TEAL Projects Grand Total			70,102,981
a	The NGT Project may use additional waterbodies to those included in the above table depending on conditions encountered during construction. All waterbodies used as sources would be registered and permitted as required for withdrawal of hydrostatic test water. Known alternative water sources have been identified for Project use and are included in this table.		
b	Water would be trucked in from a municipal or other approved Project source.		
c	Volumes of potential water sources may vary from this table depending on Project use of alternative water sources and conditions encountered during construction.		
d	Assume 30 percent water re-use for NGT Project compressor stations.		
e	Volumes for Meter Stations do not include skid piping. This piping is tested during initial fabrication prior to arriving at the Project site. Testing as part of the Project installation is not anticipated.		

NGT Project

To the extent practicable, NEXUS would transfer hydrostatic test water from one test segment to the next, which would reduce the volume of test water required.

NEXUS' preliminary evaluations have identified municipal water sources and nine different waterbodies as potential hydrostatic test water sources for the NGT Project pipeline facilities. Hydrostatic test waters used for the proposed compressor and M&R stations likely would be obtained from municipal water sources. NEXUS is investigating the option of installing on-site water wells at the Wadsworth and Clyde Compressor Stations that would provide the source water for hydrostatic testing. For the NGT Project HDDs, water would be obtained from the waterbody being crossed or trucked in from an approved Project source. NEXUS would obtain the appropriate NPDES general permit from the OEPA and MDEQ for discharge of the hydrostatic test water following the hydrostatic testing.

TEAL Project

Texas Eastern would use the Ohio River or a municipal source as a potential source of water for hydrostatic testing and dust control for the TEAL Project facilities. Texas Eastern would obtain permits required through the state of Ohio for water appropriations. As indicated in table 4.3.2-5, hydrostatic test water would be required for the mainline and connecting pipeline and the two compressor stations. Additionally, Texas Eastern would obtain the appropriate NPDES general permit from the OEPA for discharge of the hydrostatic test water following the hydrostatic testing.

4.3.2.9 Conclusions

Minor long-term effects associated with pipeline operations and maintenance would largely be restricted to periodic clearing of vegetation within the permanent right-of-way up to 25 feet from waterbody crossings as described earlier in this section. These maintenance activities would be consistent with the FERC *Procedures*, which have been integrated into the *E&SCPs* for the Projects.

Surface water sources and surface water protection areas can be impacted by activities with potential to adversely affect water quality. As discussed previously, these impacts would be avoided or minimized by implementing the BMPs detailed in the Projects' *SPCC Plans*, *E&SCPs*, and *Blasting Plans*, if needed. To avoid and minimize direct impacts on surface waters and intakes downstream of the NGT

Project crossings, NEXUS would adhere to its *E&SCP* along the entire NGT Project and would use HDD and conventional bore crossing methods for several stream crossings, as indicated in appendix H-2. Because of this, as well as the significant distance from the NGT Project from the SWAPPs and associated intakes, the NGT Project is not expected to impact water supplies within the Ohio River SWAPPs. Additionally, NEXUS would use an HDD crossing at the West Branch Black River and a conventional bore crossing method for the Swan Creek crossing (intake for Swanton Reservoir) to avoid direct impacts on these public source water streams.

NEXUS is proposing to use the HDD crossing method for all of the NRI designated streams, streams designated by OEPA as outstanding and superior water quality, and navigable waters crossed by the NGT Project (waterbody crossing methods are summarized in appendix H-2). The *HDD Design Report* provides further details regarding each HDD crossing. NEXUS would implement monitoring and mitigation protocols specified in the *HDD Plan* as previously discussed. Successful implementation of HDD for these crossings would avoid impacts on these sensitive water resources. If an inadvertent return or loss of drilling mud circulation occurs during drilling, NEXUS would follow the protocols established in the *HDD Plan* to minimize environmental impacts on waterbodies.

Because the applicants have located all compressor station sites, M&R stations, MLV sites, and pipe/contractor yards to avoid impacts on surface waters, no direct or indirect impacts on waterbodies associated with the construction or operation of these facilities are anticipated.

By conducting all proposed waterbody crossings in compliance with the BMPs described above, potential impacts on impaired waterbodies from construction would be mitigated and the current status of the impaired waters crossed is not expected to be impacted.

The NGT Project pipeline facilities would be buried underground so they are not expected to have any permanent impact on the flood zones. Because the portions of the NGT Project pipe/contractor yards 2-1 and 3-2 would only be used as temporary workspace, there would be no permanent change to the flood storage capacity and mitigation would not be required. TEAL Project facilities lie outside of the 100-year flood zone; therefore, no mitigation would be required.

In summary, the applicants would implement a variety of measures to minimize impacts on aquatic habitats and water quality, including the use of dry-crossing methods to ensure that aquatic species are not directly affected by construction, HDD crossings to avoid disruption of habitat, restoration of disturbed habitat to preconstruction conditions to the extent practicable, minimization of vegetation clearing along waterbodies, setbacks from waterbodies for storage and use of potentially hazardous materials, and implementation of erosion and sediment control measures to avoid sedimentation. Further, as discussed previously, NEXUS would implement the measures in its *HDD Plan* to avoid or minimize the risk of drilling mud release, as well as procedures that would be followed if an inadvertent release does occur. Therefore, through implementation of these measures and compliance with all applicable water quality permits, we conclude that impacts on water resources, including aquatic and riparian habitats, and water quality would be acceptably mitigated and would not be significant.

4.4 WETLANDS

Wetlands are defined as areas inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and in normal conditions do support, a prevalence of vegetation adapted for life in saturated soil conditions (Environmental Laboratory, 1987). Wetlands serve a multitude of functions and values, including, but not limited to, groundwater recharge/discharge, flood flow alteration, sediment and toxicant retention, nutrient storage and removal, promoting floral biodiversity and interspersions, and serving as habitat for fish, shellfish, and wildlife (USACE, 1999).

Wetlands impacted by the NGT and TEAL Projects are federally and state-regulated. On the federal level, USACE regulates wetlands under Section 404 of the CWA and Section 10 of the Rivers and Harbor Act (RHA), and the EPA shares responsibility to administer and enforce the Section 404 program. For the NGT and TEAL Projects, the USACE, OEPA, and MDEQ are responsible for Section 404 permits in Ohio and Michigan, respectively. The EPA has the authority to review the decisions on Section 404 permits. Wetland activities under Section 401 of the CWA are delegated to the appropriate state agencies: the OEPA in Ohio and MDEQ in Michigan.

4.4.1 Existing Wetland Resources

The applicants conducted wetland surveys during the 2014 and 2015 growing seasons, as landowner permissions allowed, to identify and determine the extent of wetlands crossed along the pipeline routes, temporary access roads, permanent access roads, ATWS, aboveground facility sites (i.e., compressor stations, MLV sites, and M&R stations), and pipe/contractor yards. Surveyed areas consist generally of a 300-foot-wide corridor along the proposed pipeline route that includes the construction and permanent rights-of-way, temporary workspaces for aboveground facilities, and a 50-foot-wide corridor along proposed access roads. In areas where field survey was not possible due to lack of landowner permission, National Wetland Inventory data, USGS topographic maps, SSURGO data, project-specific LIDAR topographic mapping, and high resolution photography were used to approximate the locations and boundaries of wetlands within the NGT and TEAL Projects area.

Wetlands were delineated per the methods set forth in the USACE *1987 Wetland Delineation Manual* (Environmental Laboratory, 1987), applicable Regional Supplements: *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: North Central and Northeast Region (Version 2.0)* (USACE, 2012), and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Midwest (Version 2.0)* (USACE, 2010). Wetlands were classified according to *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin et al., 1979). Additionally, the functionality of wetlands in Ohio was assessed and quantified in accordance with OEPA's Ohio Rapid Assessment Method (ORAM) for Wetlands V.5.0 (Mack, 2011).

The NGT and TEAL Projects predominantly would cross five wetland types, as described by Cowardin et al. (1979). These include palustrine emergent (PEM), agricultural PEM (AG-PEM), palustrine unconsolidated bottom (PUB), palustrine scrub-shrub (PSS), and palustrine forested (PFO) wetlands, which are described in the following subsection.

4.4.1.1 Wetland Types

Five wetland types would be impacted by construction and operation of the NGT and TEAL Projects in Ohio and Michigan. PFO and PEM wetlands are respectively the most common types of wetlands that would be impacted by construction of the NGT and TEAL Projects. Many of the PEM wetlands that would be impacted occur in conjunction with other wetland types (PSS or PFO) and along open water or streams/rivers. In addition, many of these PEM wetlands occur within active agricultural fields and therefore have evidence of altered hydrology, soils, and/or stunted or stressed vegetation.

Palustrine Emergent Wetlands

PEM wetlands are generally dominated by erect, rooted, herbaceous, perennial hydrophytic vegetation and are located within the utility corridors throughout the NGT and TEAL Projects area. This wetland type has a variety of species that occupy it, and the following list of species are the most common species observed in PEM wetlands throughout Ohio and Michigan: jewel weed (*Impatiens capensis*), deer tongue grass (*Dichanthelium clandestinum*), tearthumb (*Polygonum* spp.), Joe pye weed (*Eupatorium*

purpureum), reed canary grass (*Phalaris arundinaceae*), rice cut grass (*Leersia oryzoides*), white cutgrass (*Leersia oryzoides*), common rush (*Juncus effusus*), fowl mannagrass (*Glyceria striata*), woolgrass (*Scirpus cyperinus*), Canada goldenrod, (*Solidago canadensis*), gray goldenrod (*S. nemoralis*), sensitive fern (*Onoclea sensibilis*), narrow-leaf cattail (*Typha angustifolia*), bluejoint grass (*Calamagrostis canadensis*), gray's sedge (*Carex grayii*), fox sedge (*Carex vulpinoidea*), poison ivy (*Toxicodendron radicans*), Frank's sedge (*Carex frankii*), green bulrush (*Scirpus atrovirens*), and common reed (*Phragmites australis*). The PEM wetlands delineated throughout the NGT and TEAL Projects area vary in terms of functionality, as they were identified in disturbed areas such as agricultural fields and roadside wetlands, but were also delineated in diverse wooded and grassland habitat areas.

AG-PEM wetlands are dominated by stunted and stressed row crops and various hydrophytic grass species that exist within active agricultural fields. The characteristics of an AG-PEM wetland tend to be of lower functionality and often consist of disturbed settings, including presence of soils that are disturbed on a regular basis due to plowing and field maintenance, evidence that the hydrology has been altered by tile drains or ditches, and evidence of stressed vegetation (e.g., stunted plants or failed row crops). Common species observed in AG-PEM wetlands throughout Ohio and Michigan include barnyard grass (*Echinochloa* spp.), yellow foxtail grass (*Setaria pumila*), fall panic grass (*Panicum dichotomiflorum*), cattails (*Typha* spp.), reed canary grass (*P. arundinacea*), as well as stressed corn (*Zea mays*) and soybean (*Glycine max*) row crops.

Palustrine Unconsolidated Bottom Wetlands

PUB wetlands are generally sparsely vegetated and may consist of species including submerged aquatic vegetation, algae, and submerged mosses. A small number of PUB wetlands were identified along the route and include small, shallow depressional areas that are seasonally to permanently flooded. PUB wetlands are generally anthropogenic in origin and are the result of mining activity, railroad or road construction excavations, and agricultural activities. PUB wetlands generally exhibit lower functionality due to hydrological modifications, point and non-point source pollutants (e.g., fertilizer, pesticides, manure leachate), and livestock disturbance.

PUB areas are dominated by mineral soils with a small percentage of the soil surface covered by vegetation. Generally the edges of the PUB components are vegetated with black willow (*Salix nigra*), ash-leaf maple (*Viburnum acerifolium*), American sycamore (*Platanus occidentalis*), honeysuckle (*Lonicera tatarica*), black cherry (*Prunus serotina*), black raspberry (*Rubus occidentalis*), reed canary grass, asters (*Aster* spp.), green bulrush, field horsetail (*Equisetum arvense*), grass species, narrow-leaf cattail, Fuller's teasel (*Dipsacus fullonum*), watercress (*Nasturtium officinale*), jewel weed, common boneset (*Eupatorium perfoliatum*), and fringed willowherb (*Epilobium ciliatum*).

Palustrine Scrub-shrub Wetlands

PSS wetlands are dominated by woody vegetation that is less than 20 feet tall, including tree shrubs, young trees, and trees or shrubs that are small due to environmental conditions, and are often found along riverine systems or adjacent to forested habitats (Cowardin et al., 1979). Vegetation communities for PSS wetlands in Ohio and Michigan typically consist of the following species: steeple bush (*Spiraea latifolia*), buttonbush (*Cephalanthus occidentalis*), redbud dogwood (*Cornus sericea*), gray dogwood (*Cornus racemosa*), silky dogwood (*Cornus amomum*), green ash (*Fraxinus pennsylvanica*), red maple (*Acer rubrum*), black raspberry (*Rubus occidentalis*), red raspberry (*Rubus idaeus*), multiflora rose (*Rosa multiflora*), and various species of willow (*Salix* spp.). PSS communities within the NGT and TEAL Projects area also vary in functional quality, as PSS wetlands were identified adjacent to roads and agricultural fields, but were also delineated in higher-quality areas such as woodland habitats.

Palustrine Forested Wetlands

PFO wetlands are dominated by woody vegetation that is equal to or greater than 20 feet tall, and are typically found along floodplains and poorly drained basins (depressions). Generally, these wetlands have seasonally flooded inorganic, poorly drained mineral soils. The trees often associated with PFO wetland communities in Ohio and Michigan are typically broad-leaved deciduous species, including red maple, slippery elm (*Ulmus rubra*), American elm (*Ulmus americana*), green ash, black willow, eastern cottonwood (*Populus deltoides*), pin oak (*Quercus palustris*), shagbark hickory (*Carya ovata*), silver maple (*Acer sacharinum*), and box elder (*Acer negundo*).

Shrub species observed in PFO wetlands can consist of spice bush (*Lindera benzoin*), multiflora rose, and redosier dogwood. Depending on canopy cover, hydrology, and soil characteristics, the following species can be observed as an herbaceous layer in PFO wetlands: skunk cabbage (*Symplocarpus foetidus*), fowl mannagrass (*Glyceria striata*), stout wood reed (*Cinna arundinacea*), garlic mustard (*Allaria petiolata*), white avens (*Geum canadense*), sensitive fern, poison ivy, yellow avens (*Geum aleppicum*), jewel weed, and various sedge species (*Carex* spp.).

Ohio Rapid Assessment Methodology

Wetlands in Ohio are categorized by using the ORAM as a quantitative tool to determine the quality of wetlands, and also outline the functionality of those wetlands. The quality and functionality of wetlands enact differing levels of protection and are utilized as part of the review process for compensatory mitigation where impacts to wetlands are unavoidable. There are three wetland categories (i.e., Category 1, Category 2, and Category 3) where quality directly correlates to minimal, good, and superior quality wetlands, respectively (Mack, 2001). Each category is explained in detail below.

Category 1 Wetlands

Category 1 wetlands are generally defined as limited quality waters, that support minimal hydrologic functions (e.g., water retention, flood flow alteration, flood storage), minimal wildlife habitat (e.g., no threatened or endangered species, or their habitat; no wildlife use), and minimal recreational purpose. Typically Category 1 wetlands are often hydrologically isolated, degraded habitats that foster low species diversity, non-native plant species, and limited potential for wetland functionality (Mack, 2001).

Category 2 Wetlands

Broadly defined as good quality wetland habitats, Category 2 wetlands could support moderate wildlife habitat, hydrological functions, and recreation. Category 2 wetlands are commonly dominated by native plant species, they may contain threatened or endangered species, or may serve as habitat for threatened, rare, or endangered wildlife. While there is likely to be some degradation in these wetland types, a moderate level of species diversity, hydrological connectivity, and flood flow alteration would be upheld (Mack, 2001).

Category 3 Wetlands

Category 3 wetlands are of superior habitat, hydrological, and recreational functions that support native species, threatened and endangered species, and their habitats. Examples of such wetlands would be forested wetlands, bogs, fens, and vernal pools, where species diversity is high, the flora and fauna are native species, and the hydrological, groundwater, wildlife, and recreational functions are of high value (Mack, 2001).

4.4.2 General Impacts and Mitigation

4.4.2.1 Avoidance and Minimization

Consistent with state and federal guidelines and regulations, the applicants routed their respective pipelines and sited their associated aboveground facilities to avoid wetlands to the extent practicable. Where wetlands could not be avoided, impacts would be minimized to the extent practicable.

After proposing several pipeline route alternatives, where wetland avoidance was a routing consideration, wetland impacts have been avoided to the extent practicable. Where wetland impacts could not be avoided, impacts would be minimized by implementing the applicants' *E&SCPs* and the *SPCC Plans*, which are generally consistent with our *Plan* and *Procedures*, as summarized below. These procedures include:

- generally using a reduced, 75-foot-wide, construction right-of-way through wetlands;
- utilizing HDD installation procedures to minimize impacts on Category 3 wetlands in Ohio;
- locating ATWS at least 50 feet away from the wetland edge where practicable;
- segregating the top 12 inches of topsoil excavated from the trench line in non-saturated wetlands and returning it to the appropriate horizon upon backfill of the trench;
- utilizing timber mats to support equipment in inundated or saturated wetlands;
- sealing the trench line at upland/wetland boundaries to maintain wetland hydrology;
- installing erosion and sediment control devices, as necessary (e.g., trench breakers, slope breakers, silt fences, and/or stacked hay bales);
- storing hazardous materials, including fuels, chemicals, and lubricating fluids, a minimum of 100 feet from any wetland boundary;
- prohibiting parking or refueling of vehicles within 100 feet of a wetland unless the on-site EI determines that there is no practicable alternative;
- implementing procedures to prevent the introduction and spread of invasive species;
- limiting construction equipment travel and operation within wetlands;
- restoring pre-construction contours to the extent practicable; and
- performing post-construction invasive species monitoring and control.

In addition to the routing and alternatives review, construction crossing methods were also considered for minimizing wetland impacts. Under appropriate circumstances, HDDs can be utilized to avoid impacts on sensitive wetland habitat. Furthermore, workspace boundaries surrounding aboveground facilities generally avoid placement within wetlands, thus avoiding and minimizing wetland impacts.

4.4.2.2 General Impacts and Mitigation Measures

Construction and operation of the NGT and TEAL Projects would temporarily and permanently impact wetlands. Construction activities would temporarily and permanently impact wetland vegetation and habitats, and could temporarily impact wetland soils characteristics, hydrology, and water quality. The effects on wetland vegetation would be greatest during and immediately following construction. In general, wetland vegetation would eventually transition back into a community with a function similar to that of the wetland before construction. PEM wetlands would recover to their pre-existing vegetative conditions in a relatively short period (typically within 1 to 2 years). PSS wetlands could take 2 to 4 years to reach functionality similar to pre-construction conditions depending on the age and complexity of the system. In PFO wetlands, the impact of construction would be long term due to the time needed to regenerate a forest community, although operation may not allow for PFO restoration in all areas. Given the species that dominate the PFO wetlands crossed by the NGT and TEAL Projects, regeneration to pre-construction conditions may take 30 years or longer for construction. PFO wetlands directly within the operation corridor would not restore to PFO, but would still function as PEM or PSS wetlands in order to maintain the vegetation along the right-of-way for operation. Impacts on the vegetative communities may also include changes in the density, type, and biodiversity of vegetation, including invasive species. Impacts on habitats may occur due to fragmentation, loss of riparian vegetation, and microclimate changes associated with gaps in canopy.

Wetland soils would be restored to their original profile to the extent possible. During construction, failure to segregate topsoil could result in the mixing of the topsoil with the subsoil. This disturbance could result in reduced biological productivity or modify chemical conditions in wetland soils that could affect the reestablishment and natural recruitment of native wetland vegetation. In addition, inadvertent compaction and rutting of soils during construction could result from the movement of heavy machinery and the transportation of pipe sections. The resulting alteration of the natural hydrologic patterns of the wetlands could inhibit seed germination and regeneration of vegetative species. The discharge of stormwater, trench water, or hydrostatic test water could also increase the potential for sediment-laden water to enter wetlands and cover native soils and vegetation. Finally, construction clearing activities and disturbance of wetland vegetation could also temporarily impact a wetland's capacity to buffer flood flows and control erosion. Wetland hydrology would be maintained by installation of trench breakers at the wetland/upland boundary, sealing the trench bottom where necessary, and by restoring wetlands to original contours without adding new drainage features that were not present prior to construction. Impacts on water quality may include changes in temperature, biochemistry, or water chemistry; sedimentation or release of hazardous materials (e.g., fuels, lubricants); addition of nutrients; and turbidity (see section 4.3.2).

Secondary and indirect effects are impacts on adjacent or other nearby environmental resources, such as sedimentation to water resources down-gradient of disturbed areas, habitat loss due to clearing of forested vegetation and fragmentation, and microclimate changes from removal of canopy cover and maintenance mowing immediately over the pipeline that affect vegetative species composition, density, interspersions, and biodiversity, including noxious weeds. The applicants propose measures in their construction and restoration plans to prevent secondary and indirect impacts on adjacent wetland areas. These include such measures as minimizing the length of open trench at any given time, using HDD installation methods in sensitive areas, installing trench breakers, employing erosion and sediment control measures to prevent discharge of sediment into adjacent wetlands and waterbodies, and limiting refueling and storage of hazardous materials. In addition, where secondary and indirect effects cannot be avoided or minimized, they would be mitigated as part of the applicable USACE and state wetland impact mitigation requirements described below.

Operation of the NGT and TEAL Projects would require periodic vegetation maintenance over the pipeline centerline to facilitate aerial inspections of the pipeline and prevent roots from compromising the

integrity of the pipeline. The applicants would conduct annual vegetative maintenance to maintain herbaceous vegetation within a 10-foot-wide strip centered over the pipeline. Existing herbaceous wetland vegetation would not need to be mowed or otherwise maintained, and therefore would not be permanently impacted. PSS wetlands would be allowed to regenerate but would be impacted by maintenance of the 10-foot-wide strip. In PFO wetlands, trees within 15 feet of the pipeline centerline that are greater than 15 feet tall would be selectively cut and removed once every 3 years. Therefore, by maintaining the right-of-way and limiting revegetation of a portion of PSS and PFO wetlands, some of the functions of these wetlands (primarily habitat) would be permanently altered by conversion to scrub-shrub and/or PEM wetlands. Vegetation communities outside of the 10- and 30-foot-wide corridors would be allowed to transition back to pre-construction conditions.

The USACE, MDEQ, and OEPA would determine mitigation requirements depending on the types of impacts associated with construction and operation of the NGT and TEAL Projects. Ongoing consultations with the OEPA and MDEQ have indicated that restoration ratios of 1:1 would be required for temporary wetland impacts. Additional wetland mitigation would be required for any wetland conversion from PFO to PEM or PSS wetlands, pursuant to USACE permitting processes. In Ohio, the applicants plan to utilize in-lieu fee programs to address wetland mitigation requirements. In Michigan, NEXUS would include the purchase of wetland mitigation credits from USACE-approved wetland mitigation banks, would utilize in-lieu fee programs, or would implement a combination of both. A summary of the specific wetland impacts and potential mitigation banks that may be used for the NGT and TEAL Projects' components is provided in the following subsections.

4.4.3 Alternative Measures

The applicants have requested approval for specific modifications to the requirements of our *Procedures*, most commonly in regard to placing ATWS within wetlands or within 50 feet of wetlands. The specific modifications, their supporting justifications, and our acceptance status are summarized in appendix H-6 for both the NGT and TEAL Projects.

The FERC *Procedures* specify that extra workspace should not be within 50 feet of wetlands except where an alternative measure has been requested by the applicants and approved by the FERC. Areas where NEXUS and Texas Eastern have requested extra workspace and stated that a 50-foot setback from wetlands is infeasible (including its justification) are identified in appendix H-6. We have reviewed these and deem them acceptable for the NGT and TEAL Projects, as discussed in section 2.2.1.1.

4.4.3.1 Project-specific Impacts and Mitigation

As presented in table 4.4.3-1, a total of 199.7 acres of wetlands would be impacted by construction of the NGT and TEAL Projects, including 179.6 acres in Ohio and 20.1 acres in Michigan. Operation of the NGT and TEAL Projects would impact 41.1 acres of wetlands, including up to 30.2 acres of wetland conversion impacts from PFO wetlands to PEM or PSS, as discussed in the following sections. Wetland impacts from operation would be limited to PFO wetland conversion impacts but would not result in any net loss of wetlands, although the associated vegetation communities may not be able to fully restore due to maintenance mowing. To a lesser degree, PSS wetlands would incur minimal wetland conversion impacts as well, where pipeline maintenance would affect a 10-foot-wide corridor centered on the pipe. No permanent impacts to PEM, AG-PEM, or PUB wetlands would be incurred as a result of operation because vegetation would be allowed to regenerate following construction.

TABLE 4.4.3-1

Summary of Wetland Impacts Associated with the NGT and TEAL Projects		
Wetland Type, State ^a	Construction (acres)	Operation (acres)
PEM WETLANDS		
Ohio	65.8	0.0
Michigan	4.0	0.0
Total PEM Wetland Impacts	69.8	0.0
AG-PEM WETLANDS		
Ohio	21.6	0.0
Michigan	1.4	0.0
Total AG-PEM Wetland Impacts	22.9	0.0
PUB WETLANDS		
Ohio	0.2	0.0
Michigan	0.0	0.0
Total PUB Wetland Impacts	0.2	0.0
PEM/PSS WETLANDS		
Ohio	1.1	0.4
Michigan	0.0	0.0
Total PEM/PSS Wetland Impacts	1.1	0.4
PSS WETLANDS		
Ohio	27.1	9.5
Michigan	3.0	1.0
Total PSS Wetland Impacts	30.1	10.5
PFO WETLANDS		
Ohio	63.8	26.5
Michigan	11.7	3.7
Total PFO Wetland Impacts	75.5	30.2
Total Ohio Impacts	179.6	36.4
Total Michigan Impacts	20.1	4.7
Projects Grand Total for Wetland Impacts	199.7	41.1
<p>a Wetland classification according to Cowardin et al., (1979): PEM = Palustrine Emergent Wetland; AG-PEM = Agricultural Palustrine Emergent Wetland; PSS = Palustrine Scrub-Shrub Wetland; PFO = Palustrine Forested Wetland.</p> <p>b Total operational impacts on PEM/PSS and PSS acreage may be less than reflected in the table due to maintenance limit to a 10-foot-wide corridor centered over the pipeline.</p> <p>Note: Sum of addends may not equal total due to rounding.</p>		

The tables in appendix I detail each individual wetland impacted by construction and operation of the NGT and TEAL Projects, respectively, including impacts associated with the pipeline facilities, ATWS, access roads, and aboveground facilities. A discussion of these construction and operation impacts for each Project is provided in the following subsections.

NGT Project

Construction of the NGT Project would temporarily impact 198.4 acres of wetlands, including 68.5 acres of PEM wetlands, 22.9 acres of AG-PEM wetlands, 0.2 acre of PUB wetlands, 1.1 acres of PEM/PSS wetlands, 30.0 acres of PSS wetlands, and 75.5 acres of PFO wetlands (see appendix I-1). Of these wetlands four are Category 3 wetlands: C15-56-W1, W2; C-15-44; and B-15-31. All Category 3 wetlands along the NGT Project will be crossed using HDD techniques to minimize impacts on vegetation, soil, and hydrology.

Following construction, wetlands would be allowed to return to pre-construction conditions, with the exception of PFO wetlands and some areas of PSS wetlands. Vegetative maintenance along the pipeline centerline during operations would result in a permanent conversion of 30.2 acres of PFO wetlands to

PEM/PSS wetlands as a result of vegetation maintenance. Total operational impacts on PSS and PEM/PSS wetlands may be less than 10.5 acres and 0.4 acre, respectively, due to limited maintenance clearing of a 10-foot-wide corridor centered over the pipeline.

Access roads associated with the NGT Project would temporarily impact less than 0.5 acre of wetlands, including PEM, AG-PEM, and PFO wetlands in Ohio, and PFO wetlands in Michigan. No permanent impacts due to access roads would occur.

The aboveground NGT Project facilities in Ohio and Michigan would not result in the permanent loss of any wetlands (i.e., conversion to upland). However, a total of 0.2 acre of PEM wetlands would be temporarily impacted by construction of MR04. No other wetland impacts are anticipated for construction or operation of any aboveground NGT Project facilities including compressor stations, MLV sites, M&R stations, and pipe/contractor yards in Ohio and Michigan.

During scoping, we received comments from the City of Green expressing concern about potential NGT Project impacts on Singer Lake Bog located in the City of Green in Summit County, Ohio. Singer Lake Bog is a 343.9-acre nature preserve owned by the Cleveland Museum of Natural History (CMNH) (CMNH, 2016) that is not directly crossed by the NGT Project route but is within 450 feet of the NGT Project area. Therefore, no direct impacts on Singer Lake Bog are anticipated as a result of construction of the NGT Project. The NGT Project route would cross several wetlands (AWB-SU-202, AWB-SU-221, AWB-SU-222, and AWB-SU-203) that may be associated with Singer Lake Bog. Implementation of special construction techniques described in NEXUS' *E&SCP*, such as installation of trench plugs, and restoration of wetland soils, vegetation, and contours following the completion of construction, would minimize impacts on wetlands that may be associated with Singer Lake Bog. Based on the construction and mitigation measures described previously, and our review of the issues raised by the City of Green, we do not anticipate that wetland hydrology and existing flows would be adversely impacted by construction of the NGT Project.

We received comments from Sandusky County Park District expressing concern about potential NGT Project impacts on PFO wetlands within Creek Bend Farm Park. The proposed NGT Project route would cross a PFO wetland (E14-43) and Muddy Creek (E14-43), a perennial stream, for a combined length of approximately 80 feet. Construction of the NGT Project would require clearing of trees within the construction right-of-way. As stated in section 4.4.2.2, NEXUS would maintain the permanent right-of-way in a vegetative state, clear of trees and large shrubs. In PFO wetlands, this would result in permanent vegetation conversion in PFO wetlands, but would not result in a net loss of wetlands because they would be converted to PEM and/or PSS wetlands. Additionally, NEXUS is developing a *Wetland Mitigation Plan* that outlines the mitigation measures that would be implemented to further minimize impacts on wetlands. Additionally, our determination of whether or not impacts are being minimized *to the extent practicable* is pending until the *Wetland Mitigation Plan* is filed.

We received comments expressing concern about the potential for impacts on fen habitat in the vicinity of Killinger Road, City of Green, Summit County, Ohio. The wetland crossing along Killinger Road (AWB-SU-13) is a PEM and PSS wetland complex; however, its classification (e.g., bog, fen, peatland, OEPA ORAM classifications) is undetermined at this point. The NGT Project would cross the wetland near MP 40.

Fens and peatlands are described as peat-forming wetlands that receive nutrients from sources other than precipitation, such as upslope drainage from surrounding mineral soils and groundwater movement, and are host to a diverse plant and animal community (EPA, 2015c). Peatlands are characterized by soils made up of partially decomposed plant remains that retain water (Andreas and Knoop, 1992). Research

conducted by Andreas and Knoop shows the greatest impacts on peatlands in Ohio are from agriculture, water level control (e.g., dams, impoundments), mining and development, and recreation, in that order.

Pursuant to 33 CFR 332.3(e)(3), impacts on difficult-to-replace resources (e.g., fens and peatlands) would need to be appropriately mitigated via in-kind methods. Additionally, NEXUS has developed a *Wetland Mitigation Plan* that outlines the mitigation measures that would be implemented to further minimize impacts on wetlands. Based on these measures, we anticipate this wetland would be restored within one to three growing seasons and would not experience long-term impact. Additionally, our determination of whether impacts are being minimized *to the extent practicable* is pending until the *Wetland Mitigation Plan* is filed.

NEXUS would create a project-specific *Wetland Mitigation Plan* in consultation with USACE, MDEQ, and OEPA. Mitigation would include the purchase of wetland mitigation credits from established wetland mitigation banks, the use of an in-lieu fee program, or a combination of the two. However, because this mitigation plan has not been finalized, **we recommend that:**

- **Prior to construction, NEXUS should file with the Secretary a copy of its final *Wetland Mitigation Plan*, including any comments and required approvals from the USACE, MDEQ, and OEPA, as applicable.**

TEAL Project

Based on a review of field data, construction of the TEAL Project would temporarily impact 1.3 acres of wetlands, including 1.2 acres of PEM wetlands, <0.1 acre of PSS wetlands, and <0.1 acre of PFO wetlands (see appendix I-2). No wetland impacts are anticipated as a result of the construction or operation of aboveground facilities, pipe/contractor yards, or access roads associated with the TEAL Project.

Following construction, wetlands would be returned to pre-construction conditions, hydrological conditions of wetlands would be restored, and no net loss of wetlands is anticipated. However, less than 0.1 acre of PFO wetlands would be permanently converted to either PEM or PSS wetlands within the permanent right-of-way due to vegetative maintenance for pipeline operations (see appendix I-2).

Texas Eastern would create a project-specific *Wetland Mitigation Plan* in consultation with USACE and OEPA. Mitigation would include the purchase of wetland mitigation credits from established wetland mitigation banks, the use of an in-lieu fee program, or a combination of the two. However, because this mitigation plan has not been finalized, **we recommend that:**

- **Prior to construction, Texas Eastern should file with the Secretary a copy of its final *Wetland Mitigation Plan*, including any comments and required approvals from the USACE and OEPA.**

4.4.4 Conclusion

Construction of the NGT Project would temporarily impact a total of about 198.4 acres of wetlands, and construction of the TEAL Project would temporarily impact a total of about 1.3 acres of wetlands. Emergent and scrub-shrub wetlands impacted by the Projects would be allowed to revegetate naturally, with limited operational impacts on PSS wetlands due to maintenance clearing of a 10-foot-wide corridor centered over the pipeline. The 30.2 acres of PFO wetlands within the permanent right-of-way would be converted to PEM or PSS wetlands, as no trees would be allowed to regrow. Additionally, while the remaining 45.2 acres of forested wetlands outside of the permanent right-of-way would be allowed to revegetate, it could take years to decades to revert to preconstruction conditions.

Operating the NGT and TEAL Projects would permanently impact only PFO, PSS, and PEM/PSS wetlands due to vegetative maintenance activities. As described in section 4.4.2.2, forested vegetation would be maintained within 15 feet of the pipeline centerline where trees taller than 15 feet may be selectively cut and removed. Additionally, the applicants would maintain a 10-foot-wide corridor centered over the pipeline as herbaceous vegetation, impacting PFO and PSS wetlands during operation. Wetland impacts specific to each Project are described in section 4.4.2.2.

Based on the types and amounts of wetlands that would be impacted and the applicants' measures to avoid, minimize, and mitigate wetlands impacts as described previously and in their construction and restoration plans, as well as our recommendations, we have determined that the NGT and TEAL Projects would not significantly impact wetlands. These impacts would be further minimized and mitigated by the applicants' compliance with USACE Section 404 and state permit requirements, including the purchase of wetland mitigation credits and use of in-lieu fee programs.

4.5 VEGETATION

4.5.1 Existing Environment

4.5.1.1 NGT Project

The NGT Project would be located in the Huron/Erie Lake Plains (53 percent of the Projects area), Erie/Ontario Drift and Lake Plains (37 percent of the Projects area), Eastern Corn Belt Plains (5 percent of the Projects area), Eastern Great Lakes Lowlands (5 percent of the Projects area), and the Western Allegheny Plateau (less than 1 percent of the Projects area). The Huron/Erie Lake Plains ecoregion has broad land uses, including farmland for crops such as corn, winter wheat, soybeans, hay, sugar beets, field and seed beans, canning crops, and fruit. The area was previously swampland but has largely been drain tiled for agricultural use. The Erie/Ontario Drift and Lake Plains ecoregion consists of rolling to level terrain with scattered woodlands. Lakes, wetlands, and swampy streams are often present in flat areas. Urban development, industrial development, and agricultural land uses are common. The Eastern Corn Belt Plains ecoregion consists primarily of agricultural land, with major crops being corn and soybeans. Other land uses include permanent pasture, small woodlots, and developed areas. The Eastern Great Lakes Lowlands ecoregion is a mix of forest, agricultural land, and developed areas. Major crops grown in the region include apples, cherries, pears, plums, corn, hay, wheat, oats, barley, soybeans, cabbage, and potatoes. The Western Allegheny Plateau ecoregion is primarily comprised of mixed temperate and oak forests on rugged hills with dairy, livestock, farming, and residential development concentrated in the valleys (Omernik, 2012).

The NGT Project has been categorized into six primary vegetative cover types: upland forest, forested wetlands, upland open land, agriculture, scrub-shrub wetlands, and emergent wetlands. While developed land (including commercial/industrial land and residential areas) is not a designated vegetation type, it is a land use category in which vegetation may be affected. Wetland cover types are further described in section 4.4.1.1. Descriptions of each vegetation cover type crossed by the NGT Project are provided in table 4.5.1-1.

Agricultural land is the most common vegetation type that would be affected by construction and operation of the pipeline facilities, followed by upland forest and upland open land (see section 4.5.1.1). Compressor stations and M&R stations would be located primarily in agricultural and upland open land. The Hanover Compressor Station (CS 1) and Willow Run M&R Station each contain small areas of wetland habitat. Access roads and yards would be primarily located in agricultural land and upland open land.

TABLE 4.5.1-1

Vegetation Cover Types Crossed by the NGT Project

Vegetation Cover Types	State	Cover Type and Common Vegetation Species
Upland Forest	Ohio	Midwestern Dry and Dry-mesic Oak Forests, dominated by northern red oak, white oak, and shagbark hickory. Midwestern Mesic Hardwood Forests, dominated by American beech and sugar maple, can include red maple, eastern cottonwood, shagbark hickory, black cherry, and American elm. Midwestern Mesic Oak and Oak-Maple Forests, dominated by red oak, sugar maple, and elm species. Appalachian Highlands Dry-mesic Oak Forests, dominated by red oak, sugar maple, and yellow poplar. Appalachian Highlands Mixed Mesophytic/Cove Forests, dominated by sugar maple, red maple, American beech, white ash, yellow poplar, black cherry, white oak, and northern red oak.
	Michigan	Mesic Southern Forests, dominated by American beech, and sugar maple, can include bitternut hickory, yellow poplar, white oak, and red oak. Dry-mesic Southern Forests, dominated by white oak, black oak, red oak, and hickory tree species.
Forested Wetland	Ohio	Midwestern Rich Hardwood Swamps, dominated by red maple, American elm, green ash, black willow, pin oak, shagbark hickory, silver maple, and other oak species (see section 4.4.1.1). Midwestern Riverfront Floodplain Forests, dominated by silver maple, eastern cottonwood, American sycamore, American elm, black willow, boxelder, river birch, hackberry, and green ash. Midwestern Bottomland Hardwood Forests, dominated by maple species, hickory, and pawpaw. Midwestern Wet Flatwoods, dominated by American beech, sugar maple, swamp white oak, and red maple (see section 4.4.1.1).
	Michigan	Southern Hardwood Swamps, dominated by red maple, eastern cottonwood, pin oak, American sycamore, and silver maple (see section 4.4.1.1).
Upland Open Land	Ohio and Michigan	Open upland includes fallow crop fields, utility rights-of-way, vegetated roadway medians, and railroad rights-of-way. Common herbaceous species include Canada goldenrod, poison ivy, common dandelion, common cinquefoil, Queen Anne's lace, tall fescue, garlic mustard, smooth brome, Kentucky bluegrass, Canada thistle, red fescue, and common plantain.
Emergent Wetland	Ohio	Midwestern Deep Emergent Marsh, emergent wetlands, and depression marshes, including species such as jewel weed, deer tongue grass, arrowleaf tearthumb, joe pye weed, reed canary grass, rice cutgrass, common rush, fowl mannagrass, woolgrass, sensitive fern, narrowleaf cattail, fowl bluegrass, Canada bluejoint, giant goldenrod, Canada goldenrod, gray's sedge, and green bullrush (see section 4.4.1.1).
	Michigan	Characterized by gray's sedge, Canada bluejoint, reed canary grass, and common reed (see section 4.4.1.1).
Scrub-shrub Wetland	Ohio	Midwestern Rich Shrub Swamps, dominated by steeple bush, redosier dogwood, gray dogwood, silky dogwood, red maple, buttonbush, black raspberry, multiflora rose, willow, and elderberry (see section 4.4.1.1).
	Michigan	Small components of larger wetland complexes, understory/edge of southern hardwood swamps (see section 4.4.1.1).
Agriculture Land	Ohio and Michigan	Agricultural land includes actively cultivated cropland and hay fields, orchards, and specialty crop farms.
Developed Land	Ohio and Michigan	Developed land include residential lands, industrial and commercial lands, utility stations, manufacturing or industrial plants, landfills, mines, quarries, and commercial or retail facilities.

Vegetation Communities of Special Concern or Value

Sensitive vegetation communities that could be affected by the NGT Project include the historical Oak Openings Region. No vegetation communities of special concern or value were identified in the vicinity of the NGT Project, although state-listed plant species were identified. Threatened and endangered plant species are analyzed in section 4.8.

The NGT Project would cross approximately 9.7 miles of the Oak Openings Region between MPs 186.6 and 196.3 in Henry and Fulton Counties. Roughly 99 percent of the ecosystem has been altered and fragmented by agricultural development, primarily through tree clearing and wetland draining. Several areas of remaining higher-quality Oak Openings Region ecosystem are protected, including the Oak

Opening Preserve Metropark (located approximately 2.5 miles east of the proposed Project), Kitty Todd State Nature Preserve (located approximately 7.7 miles northeast of the proposed Project), Irwin Prairie State Nature Preserve (located approximately 9.3 miles northeast of the proposed Project), and the Maumee State Forest/adjacent ODNR-owned parcels. Additional details about these recreation and special interest areas are provided in section 4.9.7.

The Oak Openings Region is characterized by sandy dunes and swales on top of a clay layer that assists in moisture retention. Oak savannahs and sand barrens were common where the sand layer is deep, and wet prairies were located in areas of shallow sand that kept the water tables at higher levels. Originally covering approximately 833,000 acres, the Oak Openings Region was made up of several unique ecological communities that contain numerous rare species endemic to this ecosystem (EPA, 2015d). Botanical surveys confirmed two of these unique communities would be crossed by the NGT Project: the Swamp White Oak-Pin Oak Flatwoods and the Black Oak-White Oak/Blueberry Forest Plant communities. Botanical surveys confirmed that the Twig-rush Wet Meadows, Mesic Sand Tallgrass Prairies, Midwest Sand Barrens, or Black Oak-Lupine Barrens Plant Communities would not be crossed by the NGT Project.

The Swamp White Oak-Pin Oak Flatwoods community is a forested wetland community typically dominated by swamp white oak, pin oak, red maple, American elm, and winterberry. In its original state, this community had a sparse understory and relatively open canopy. Fire suppression has resulted in more closed canopies and many of the communities have been cleared and drained for agricultural use (Michigan Natural Features Inventory [MNFI], 2010a).

Botanical surveys conducted in 2015 identified two areas where the NGT Project would cross components of Swamp White Oak-Pin Oak Flatwoods. The first is located near MP 189.0, where characteristic species such as pin oak, red maple, spicebush, and fowl mannagrass were identified; however, non-characteristic species such as silver maple and cottonwood were also present along with invasive species such as common buckthorn and multiflora rose. The second location was near MP 193.0, where the NGT Project crosses through approximately 2,400 feet of the Maumee State Forest. Component species such as pin oak, red maple, winterberry, spicebush, and common lake sedge were found. Neither of these areas contained all of the indicative species that would be present in high-quality Oak Flatwoods communities. The NGT Project would affect approximately 4.7 acres of the Maumee State Forest during construction, permanently converting approximately 2.8 acres of forested land to open land.

The Black Oak-White Oak/Blueberry Forest community typically has a closed canopy and low species diversity, dominated by black oak and white oak. The shrub layer is dominated by lowbush blueberry and hillside blueberry. Due to fire suppression, this community type has become more common than it was historically (Michigan Natural Features Inventory [MNFI], 2010b). Four Black Oak-White Oak/Blueberry Forest Plant communities were identified in the survey corridor. One of the four sites was avoided to reduce impacts to the plant community. The remaining three sites included some indicative species and showed evidence of prior disturbance, as well as the spread of invasive species.

Public comments identified concerns regarding impacts on threatened and endangered vegetation species associated within the Singer Lake Bog near MP 38.5. These species include the spotted pondweed, grass-leaved pondweed, and swaying bulrush, which are listed as endangered by the state of Ohio. Owned by the CMNH, the bog is a 344-acre nature preserve that features several threatened and endangered plant species. The Singer Lake Bog is located approximately 0.3 mile southwest of the NGT Project. Although the NGT Project would not cross the bog, the public comments identified concerns regarding impacts on forested wetlands that may be associated with the bog. Forested wetlands have been identified along the right-of-way and they would be affected by construction and operations. Impacts within the construction right-of-way would be long term, lasting until the wetlands revegetate. Impacts within the operations right-of-way would be permanent, as forested wetland areas would be maintained in an herbaceous state as

discussed in section 4.4.2.2. Botanical surveys did not identify any threatened/endangered or invasive plant species in the wetlands adjacent to the Singer Lake Bog.

4.5.1.2 TEAL Project

The TEAL Project would be located in the Western Allegheny Plateau ecoregion. As discussed previously, the Western Allegheny Plateau ecoregion is primarily comprised of mixed temperate and oak forests on rugged hills with dairy, livestock, farming, and residential development concentrated in the valleys (Omernik, 2012).

As with the NGT Project discussed previously, the TEAL Project area has been categorized into six primary vegetative cover types: upland forest, forested wetlands, upland open land, emergent wetlands, scrub-shrub wetlands, and agriculture land. Developed land (including commercial/industrial land and residential areas) is not a designated vegetation type, although it is a land use category in which vegetation may be affected. Wetland cover types are described in section 4.4.1.1. Descriptions of each vegetation cover type crossed by the TEAL Project are provided in table 4.5.1-2.

Vegetation Cover Types	Cover Type and Common Vegetation Species
Upland Forest	High Allegheny Rich Red Oak-Sugar Maple Forest, dominated by American beech, American elm, eastern cottonwood, northern red oak, red maple, shagbark hickory, white oak, and white pine.
Forested Wetland	Woody vegetation 20 feet or taller, including American elm, black willow, box elder, eastern cottonwood, green ash, pin oak, red maple, shagbark hickory, and silver maple (see section 4.4.1.1).
Upland Open Land	Fallow crop fields, utility rights-of-way, vegetated roadway medians, and railroad rights-of-way. Common herbaceous species include blackberries, brambles, multiflora rose, and viburnum species.
Emergent Wetland	Species such as sedges, common rush, dotted knotweed, jewelweed, woolyfruit sedge, aster species, creeping jenny, false mermaidweed, fowl bluegrass, reed canary grass, sensitive fern, and yellow avens (see section 4.4.1.1).
Scrub-Shrub Wetland	Species such as black raspberry, elderberry, green ash, multiflora rose, redosier dogwood, spicebush, and steeple bush (see section 4.4.1.1).
Agriculture Land	Cultivated cropland and hay fields, orchards, and specialty crop farms.
Developed Land	Developed land include residential lands, industrial and commercial lands, utility stations, manufacturing or industrial plants, landfills, mines, quarries, and commercial or retail facilities.

Of the land that would be required for construction and operation of the TEAL Project facilities, upland open land is the most common vegetation type that would be affected by the pipeline followed by forested land and agricultural land (see section 4.5.2.2). Compressor stations and M&R stations would be located primarily in agricultural and upland open land.

4.5.2 Impacts and Mitigation

4.5.2.1 NGT Project

Table 4.5.2-1 identifies the amount and types of vegetation that would be affected by construction and operation of the NGT Project. Cutting, clearing, and removing existing vegetation for construction would temporarily and permanently impact vegetation. Removing vegetation would increase the potential for soil erosion (see section 4.2), the introduction and establishment of noxious or invasive species (see section 4.5.4), and edge effects (see section 4.5.5), as well as reduce the amount of available wildlife habitat (see section 4.6). The degree of impact depends on the type and amount of vegetation affected, the rate at which vegetation regenerates after construction, and the frequency of vegetation maintenance conducted on the right-of-way during pipeline operation. Site-specific conditions such as grazing, rainfall amounts, elevation, weeds, and soil types would also influence the length of time required to achieve successful revegetation.

Construction of the NGT Project would affect the following vegetative types: upland forest, forested wetland, upland open land, emergent wetland, scrub-shrub wetland, agriculture, and other (including developed land and open water). During construction, the pipeline routes and infrastructure for the NGT Project would affect 3,952.6 acres of agricultural land, 461.8 acres of upland open land, 332.2 of forested land, 157.7 acres of developed land and open water, 43.1 acres of forested wetland, 42.6 acres of emergent wetland, and 19.5 acres of scrub-shrub wetland. Impacts on upland open land, emergent wetlands, and agricultural lands would be short term as these vegetation cover types would likely return to their pre-construction states within one to three growing seasons after restoration is complete. Impacts on these communities during operation of the pipeline facilities would be minimal because these areas would be allowed to recover following construction and would typically not require maintenance mowing. The construction or modification of aboveground facilities would result in the permanent loss of vegetation and would convert open land vegetation into industrial facility use.

Regeneration of shrub areas within upland open land and scrub-shrub wetland may take 2 to 4 years or longer. Permanent impacts on shrub vegetation would result primarily from right-of-way maintenance activities and the construction of aboveground facilities.

Impacts on upland forest and forested wetland would constitute the most pronounced change in vegetation strata, appearance, and habitat. Trees would be cleared along the construction right-of-way and replaced by herbaceous plants, shrubs, saplings, and other successional species until trees can again flourish, which can take several decades or longer to occur. As specified in the applicants' construction and restoration plans, vegetation maintenance activities may be conducted annually over a 10-foot-wide corridor centered over the pipeline, and vegetation clearing may occur every 3 years within the 50-foot-wide permanent right-of-way in non-riparian areas. The applicants would maintain a 30-foot-wide pipeline right-of-way in forested wetland areas. These clearing activities would prevent the establishment of larger woody species within the maintained pipeline right-of-way. The temporary and permanent removal of shrub and forested vegetation from construction and operation of the project facilities would result in habitat fragmentation, loss of wildlife habitat (see section 4.6.4), loss of natural noise barriers and buffers, and other impacts as described at the beginning of this section. The FWS has determined that, based on its definition, the NGT Project would not fragment any upland forests.

We received several comments expressing concern about the loss of mature trees and potential "old growth" forests. Old-growth forest is a subjective term describing forests that are relatively old and undisturbed by humans. Old-growth forests are characterized by the presence of large trees of late-successional (climax) species; living trees of multiple ages; decaying and large dead standing trees; and downed trees in various stages of decay (Shifley, 2016). Based on our review of recent and past aerial photographs, we observed isolated mature forested areas and older trees, but did not identify large contiguous old-growth forests; therefore, we have determined that constructing and operating the NGT Project would not impact old-growth forest.

NEXUS has discussed the expected impacts of the NGT Projects with the FWS. The FWS has used a Habitat Equivalency Analysis (HEA) to estimate the impact to forested habitat used by migratory birds and listed species. The FWS has provided recommendations to NEXUS regarding mitigation of those impacts through avoidance, minimization, and mitigation funding to replace or provide substitute resources for the impacted forested habitat. In several meetings with the FWS, NEXUS has committed to mitigate for loss of forested habitat, which is detailed further in section 4.6.

4.5.2.2 TEAL Project

The TEAL Project would be co-located with existing cleared right-of-way. A total of 29.8 acres of forested land would be cleared for construction, with 24.8 acres allowed to revegetate and return to forested land. As such, 5.0 acres of forested land would be converted to open land.

TABLE 4.5.2-1

Vegetation Communities Affected by Construction and Operation of the NGT and TEAL Projects (in acres)

Project, State, Facility	Upland Forest		Forested Wetland		Upland Open Land		Emergent Wetland		Scrub-Shrub Wetland ^a		Agriculture		Other ^b		Project Totals	
	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Ops	Con.	Ops.
NGT PROJECT																
Ohio																
Mainline Right-of-Way ^c	251.8	134.1	33.2	25.6	207.4	103.3	30.4	19.9	14.0	9.5	1849.0	947.1	59.1	30.4	2444.7	1269.9
Mainline Additional Workspaces	43.9	0	2	0	90.2	0	9.7	0	3.5	0	897.8	0	26.6	0	1073.8	0
TGP Interconnect Pipeline Right-of-Way	1.1	0.4	0	0	4	2.3	<0.1	<0.1	0	0	5.3	2.7	0.3	0.1	10.7	5.4
TGP Interconnect ATWS	0.8	0	0	0	1.9	0	0	0	0	0	2	0	0.2	0	4.9	0
Aboveground Facilities	0	0	0	0	23.8	3.7	0	0	0	0	262.6	127.8	6.1	0	292.7	131.5
Access Roads	0.8	0	<0.1	0	20.6	1.1	0.2	0	0	0	27.5	2.5	10.6	0.1	59.7	3.7
Pipe/Contractor Yards and Staging Areas	0	0	0	0	9.6	0	0	0	0	0	196.5	0	1.2	0	208	0
Ohio NGT Project Total	298.4	134.5	35.2	25.6	357.5	110.4	40.3	19.9	17.5	9.5	3240.7	1080.1	104.1	30.6	4093.7	1410.6
Michigan																
Mainline Right-of-Way ^c	22.5	11.8	5.4	3.8	46.6	23.7	2.0	1.7	1.3	1.0	454.5	232.2	19.5	10.1	551.8	284.3
Additional Workspaces	10.6	0.0	2.4	0.0	52.8	0.0	0.3	0.0	0.7	0.0	191.1	0.0	21.5	0.0	279.4	0.0
Aboveground Facilities	0.0	0.0	0.0	0.0	0.4	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.3	1.0	0.7
Access Roads	0.6	0.0	0.1	0.0	3.2	<0.1	0.0	0.0	0.0	0.0	3.7	0.0	1.5	0.3	9.2	0.3
Pipe/Contractor Yards and Staging Areas	0.1	0.0	0.0	0.0	1.3	0.0	0.0	0.0	0.0	0.0	62.6	0.0	10.5	0.0	74.7	0.0
Michigan NGT Project Total	33.8	11.8	7.9	3.8	104.3	24.0	2.3	1.7	2.0	1.0	711.9	232.2	53.6	10.7	915.8	285.2
NGT Project Total	332.2	146.3	43.1	29.4	461.8	134.4	42.6	21.6	19.5	10.5	3952.6	1312.3	157.7	41.3	5010.7	1696.0
TEAL PROJECT																
Ohio																
Pipeline Loop Right-of-Way ^c	17.0	4.8	0.1	0.1	29.5	18.1	0.8	0.5	0.0	0.0	5.3	2.8	0.6	0.3	53.3	26.7
Connecting Pipeline Right-of-Way	0.0	0.0	0.0	0.0	0.9	0.3	0.2	0.1	0.0	0.0	4.6	1.5	1.1	0.1	6.9	2.0
Additional Workspaces	11.3	0.0	0.0	0.0	8.7	0.0	0.0	0.0	0.0	0.0	13.5	0.0	0.7	0.0	34.2	0.0
Aboveground Facilities	0.0	0.0	0.0	0.0	62.1	4.7	0.0	0.0	0.0	0.0	39.8	11.4	11.9	0.1	113.8	16.2
Access Roads	1.4	0.1	0.0	0.0	2.3	0.0	0.0	0.0	0.0	0.0	0.5	0.5	0.7	0.3	4.9	1.0
Pipe/Contractor Yards and Staging Areas	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TEAL Project Total	29.7	4.9	0.1	0.1	103.4	23.1	1.0	0.6	0.0	0.0	63.7	16.2	15.0	0.8	213.0	45.9
Ohio Total	328.1	139.4	35.3	25.7	460.9	133.5	41.3	20.5	17.5	9.5	3304.4	1096.4	119.1	31.4	4306.6	1456.3
Michigan Total	33.8	11.8	7.9	3.8	104.3	24.0	2.3	1.7	2.0	1.0	711.9	232.2	53.6	10.7	915.8	285.2

TABLE 4.5.2-1 (cont'd)

Vegetation Communities Affected by Construction and Operation of the NGT and TEAL Projects (in acres)

Project, State, Facility	Upland Forest		Forested Wetland		Upland Open Land		Emergent Wetland		Scrub-Shrub Wetland ^a		Agriculture		Other ^b		Project Totals	
	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Ops	Con.	Ops.
NGT and TEAL Projects Grand Total	361.9	151.2	43.2	29.5	565.2	157.5	43.6	22.2	19.5	10.5	4016.3	1328.6	172.7	42.1	5223.8	1741.9
a	Impacts for mosaic wetlands (i.e., those consisting of a mix of emergent and scrub-shrub wetland components) have been combined with scrub-shrub wetland impact totals for comparison.															
b	The "Other" category includes developed land and open water. Although not typically considered vegetation components, these areas may include vegetation and have been included for comparison.															
c	Project-specific construction right-of-way widths are discussed in the previous project-specific sections. Note that impacts presented are based on a typical construction right-of-way width (i.e., 100 feet) for the entire length of the pipeline; however, the construction right-of-way would be reduced at certain locations (e.g., wetlands), some portions of the right-of-way would overlap with existing rights-of-way that have been previously disturbed, and/or the HDD method would be used to avoid direct impacts on vegetation.															

Similar to the impacts discussed previously for the NGT Project, impacts on upland open land (103.4 acres), emergent wetlands (1.0 acres), and agricultural lands (63.7 acres) would be short-term as these vegetation cover types would likely return to their pre-construction states within one to three growing seasons after construction is complete. These areas would be allowed to recover following construction and would typically not require maintenance mowing. The construction or modification of aboveground facilities would result in the permanent loss of vegetation and conversion of open land vegetation to industrial facility use.

Regeneration of shrub areas within upland open land may take 10 to 15 years or longer. Permanent impacts on shrub vegetation would result primarily from right-of-way maintenance activities and the construction of aboveground facilities.

Impacts on upland forest (29.7 acres) and forested wetland (0.1 acre) would constitute the most pronounced change in vegetation strata, appearance, and habitat. Trees would be cleared along the construction right-of-way and replaced by herbaceous plants, shrubs, saplings, and other successional species until trees can again flourish, which can take several decades or longer to occur. As specified in the applicants' construction and restoration plans, vegetation maintenance activities may be conducted annually over a 10-foot-wide corridor centered over the pipeline, and vegetation clearing may occur every 3 years within the 50-foot-wide permanent right-of-way in non-riparian areas. The applicants would maintain a 30-foot-wide pipeline right-of-way in forested wetland areas. These clearing activities would prevent the establishment of larger woody species within the maintained pipeline right-of-way.

Similar to the consultations described in section 4.5.2.1, Texas Eastern has discussed the expected impacts of the TEAL Project with the FWS and has committed to mitigate for loss of forested habitat, which is detailed further in section 4.6.

4.5.3 General Construction and Restoration Procedures

Vegetation clearing impacts can be minimized by using special construction techniques, proper restoration measures, and post-construction monitoring. The applicants' *E&SCPs* include specific measures for construction and restoration in upland and wetland areas, plans to control invasive species, and plans to prevent or mitigate spills of hazardous substances (see section 2.3). The applicants have proposed, at a minimum, to segregate topsoil in residential areas, agricultural areas, and wetlands (except where standing water or saturated soils are present) as discussed in section 4.2. The existing seedbank within the replaced topsoil should increase revegetation success; however, the results of this process can be less than favorable. Weedy species are among the largest component of grassland seed banks. The presence of noxious and invasive weed species identified during environmental field surveys indicate that weed colonization or at least initial recruitment in disturbed sites would likely occur. Noxious and invasive weed mitigation is discussed further in section 4.5.4.

Seeding would be the primary method of re-establishing vegetation on affected lands. Following construction, the applicants would revegetate disturbed areas according to their *E&SCP*. Disturbed areas would be seeded within 6 working days after final grading is complete, weather and soil conditions permitting. If construction is completed outside of the permanent seeding season, a mulch would be applied to stabilize the soils. Fertilizer and soil pH modifiers would be used in accordance with seeding recommendation for the northern zone.

Revegetation would be considered successful when the cover and density of non-noxious vegetation within the construction right-of-way is similar to the adjacent undisturbed land. According to each applicants' restoration plans and procedures, the applicants would monitor disturbed areas for the first and second growing seasons after construction. It should be noted that this monitoring timeframe is the minimum baseline requirement adopted from the FERC *Plan*; the applicants would be required to monitor the success of revegetation and restore all disturbed areas until restoration and revegetation is deemed successful, regardless of the length of time this may take. During the restoration phase of the Projects, landowners may identify areas where additional seeding or restoration actions may be required, including areas of weed infestation. The FERC and various land managing agencies, as appropriate, would also monitor restoration and revegetation success and would determine when restoration is successful. If revegetation efforts are not successful after the second growing season, the applicants may need to conduct additional soil compaction mitigation and/or apply soil additives and additional seeding.

4.5.4 Noxious Weeds and Pathogens

Invasive species are those that display rapid growth and spread, becoming established over large areas (USDA, 2006). Most commonly they are exotic species that have been introduced from another part of the United States, another region, or another continent, although some native species that exhibit rapid growth and spread are also considered invasive. Invasive plant species can change or degrade natural vegetation communities, which can reduce the quality of habitat for wildlife and native plant species. Similar to invasive species, noxious weeds are frequently introduced but occasionally are native. Noxious weeds are defined as those that are injurious to commercial crops, livestock, or natural habitats and typically grow aggressively in the absence of natural controls (USDA, 2016a).

Executive Order 13112 directs federal agencies to prevent the introduction of invasive species, provide for their control, and minimize the economic, ecological, and human health impacts that invasive species can cause. The Executive Order further specifies that federal agencies shall not authorize, fund, or carry out actions likely to cause or promote the introduction or spread of invasive species in the United States or elsewhere unless it has been determined that the benefits of such actions outweigh the potential harm caused by invasive species, and that all feasible and prudent measures to minimize the risk of harm would be taken in conjunction with the actions.

Per the administrative code, the State of Ohio has identified a list of Prohibited Noxious weeds (see table 4.5.4-1). These species present problems to agriculture or other human activity and are subject to federal, state, and local regulations. Additionally, although not mandated by state law, the ODNR has identified the top 10 most invasive species of concern: Japanese honeysuckle, Japanese knotweed, Autumn-olive, buckthorn, purple loosestrife, common reed/phragmites, reed canary grass, garlic mustard, multiflora rose, and bush honeysuckle.

The State of Michigan has laws regulating the sale and possession of certain plants. Per the Natural Resource and Environmental Protection Act (451 of 1994, as amended), prohibited plants cannot be grown or sold in the state, and may not be present in agricultural seed offered for sale (see table 4.5.4-1). Restricted species are limited to one seed per 2,000 in agricultural seed for sale.

TABLE 4.5.4-1

Regulated Noxious and Invasive Species in Ohio and Michigan	
Regulation Status	Species
OHIO	
Prohibited Noxious Weeds (OH Admin. Code 901:5-37-01)	Shatter cane (<i>Sorghum bicolor</i>), Russian thistle (<i>Salsola Kali</i> var. <i>tenuifolia</i>), Johnsongrass (<i>Sorghum halepense</i> L. (Pers.)), wild parsnip (<i>Pastinaca sativa</i>), wild carrot (Queen Annes lace) (<i>Daucus carota</i> L.), oxeye daisy (<i>Chrysanthemum leucanthemum</i> var. <i>pinnatifidum</i>), wild mustard (<i>Brassica kaber</i> var. <i>pinnatifida</i>), grapevines (<i>Vitis spp</i>) (when growing in groups of 100 or more and not pruned, sprayed, cultivated, or otherwise maintained for 2 consecutive years), Canada thistle (<i>Cirsium arvense</i> L. (Scop.)), poison hemlock (<i>Conium maculatum</i>), cressleaf groundsel (<i>Senecio glabellus</i>), musk thistle (<i>Carduus nutans</i>), purple loosestrife (<i>Lythrum salicaria</i>), mile-a-minute weed (<i>Polygonum perfoliatum</i>), giant hogweed (<i>Heracleum mantegazzianum</i>), apple of Peru (<i>Nicandra physalodes</i>), marestail (<i>Conyza canadensis</i>), kochia (<i>Bassia scoparia</i>), Palmer amaranth (<i>Amaranthus palmeri</i>), kudzu (<i>Pueraria montana</i> var. <i>lobata</i>), and Japanese knotweed (<i>Polygonum cuspidatum</i>).
MICHIGAN	
Prohibited Plant Species (MI Natural Resource and Environmental Protection Act; 451 of 1994, as amended)	Fanwort (<i>Cabomba caroliniana</i>), cylindro (<i>Cylindrospermopsis raciborskii</i>), Brazilian elodea (<i>Egeria densa</i>), Japanese knotweed (<i>Fallopia japonica</i>), giant hogweed (<i>Heracleum mantegazzianum</i>), hydrilla (<i>Hydrilla verticillata</i>), European frogbit (<i>Hydrocharis morsus-ranae</i>), African oxygen weed (<i>Lagarosiphon major</i>), parrot's feather (<i>Myriophyllum aquaticum</i>), starry stonewort (<i>Nitellopsis obtusa</i>), yellow floating heart (<i>Nymphoides peltata</i>), giant salvinia (<i>Salvinia molesta</i> , <i>auriculata</i> , <i>biloba</i> , or <i>herzogii</i>), and Water Chestnut (<i>Trapa natans</i>).
Restricted Plant Species (MI Natural Resource and Environmental Protection Act; 451 of 1994, as amended)	Flowering rush (<i>Butomus umbellatus</i>), purple loosestrife (<i>Lythrum salicaria</i>), Eurasian watermilfoil (<i>Myriophyllum spicatum</i>), phragmites/common reed (<i>Phragmites australis</i>), and curly leaf pondweed (<i>Potamogeton crispus</i>).
Noxious Weeds (MI Natural Resource and Environmental Protection Act; 451 of 1994, as amended)	Quackgrass (<i>Agropyron repens</i> , <i>Elytrigia repens</i>), whitetop/hoary cress/perennial peppergrass (<i>Cardaria draba</i>), plumeless thistle (<i>Carduus acanthoides</i>), musk thistle (<i>Carduus nutans</i>), spotted knapweed (<i>Centaurea maculosa</i>), Russian knapweed (<i>Centaurea picris</i>), Canada thistle (<i>Cirsium arvense</i>), bull thistle (<i>Cirsium vulgare</i>), field bindweed (<i>Convolvulus arvensis</i>), hedge bindweed (<i>Convolvulus sepium</i>), dodder (<i>Cuscuta spp</i>), yellow nutsedge/chufa (<i>Cyperus esculentus</i>), leafy spurge (<i>Euphorbia esula</i>), morning glory (<i>Ipomea species</i>), serrated tussock (<i>Nasella trachoma</i>), horsenettle (<i>Solanum carolinense</i>), perennial sowthistle (<i>Sonchus arvensis</i>), johnsongrass (<i>Sorghum halapense</i>), and puncturevine (<i>Tribulus terrestris</i>).
Restricted Noxious Weeds (MI Natural Resource and Environmental Protection Act; 451 of 1994, as amended)	Velvetleaf (<i>Abutilon theophrasti</i>), wild onion (<i>Allium canadense</i>), wild garlic (<i>Allium vineale</i>), wild oat (<i>Avena fatua</i>), yellow rocket (<i>Barbarea vulgaris</i>), hoary alyssum (<i>Berteroa incana</i>), Indian mustard (<i>Brassica juncea</i>), black mustard (<i>Brassica nigra</i>), jimsonweed (<i>Datura stramonium</i>), wild carrot (<i>Daucus carota</i>), buckhorn plantain (<i>Plantago lanceolata</i>), wild radish (<i>Raphanus raphanistrum</i>), curled dock (<i>Rumex crispus</i>), giant foxtail (<i>Setaria faberii</i>), charlock (<i>Sinapis arvensis</i>), bitter nightshade (<i>Solanum dulcamara</i>), silver leaf nightshade (<i>Solanum eleagnifolium</i>), black nightshade (<i>Solanum nigrum</i>), Eastern black nightshade (<i>Solanum ptycanthum</i>), hairy nightshade (<i>Solanum sarrachoides</i>), and cocklebur (<i>Xanthium strumarium</i>).
Source: Ohio Administrative Code; Michigan Department of Agriculture & Rural Development	

4.5.4.1 NGT Project

Vegetation communities are more susceptible to infestations of invasive or noxious weed species following soil disturbances. Vegetation removal and soil disturbance during construction of the NGT Project could create optimal conditions for the establishment or spread of undesirable species. Invasive or noxious plants could negatively affect habitat by competing for resources such as water and light, changing the community composition, eliminating or reducing native plants, or changing the vegetation structure. The changes in community composition or vegetation structure could reduce native plant populations and can also negatively affect wildlife habitat. Equipment movement along the construction right-of-way and access roads also could provide opportunities for seed transport into un-infested areas. Due to the connectivity of lands by access roads and equipment transport, the potential to spread invasive or noxious weeds would not be limited to the NGT Project's area of disturbance.

Through field surveys and evaluation of habitats crossed by the NGT Project, the applicants have identified several areas where noxious weeds or invasive species are present or are located near the construction right-of-way.

NEXUS has developed an *Invasive Species Management Plan (ISMP)* to minimize and control the spread of the noxious and invasive species. Some of the management and control measures that would be implemented are discussed below.

- NEXUS would inform and train construction personnel regarding noxious weed and invasive species identification and the protocols to prevent or control the spread of invasive species. EIs would be employed during construction to monitor and provide oversight and implementation of the *ISMP*.
- Vehicles and equipment would be inspected for remnant soils, vegetation, and debris, and would be cleaned of these materials before they are brought to the NGT Project area.
- Equipment cleaning stations would be set up in yards/staging areas and would be monitored by the EIs.
- NEXUS would ensure that straw or hay bales used for sediment barrier installations or mulch distribution, where appropriate, are certified weed-free and obtained from state-cleared sources.
- Post-construction monitoring of invasive plant species populations and colonization of the right-of-way would be conducted during the second full growing season. Monitoring reports detailing the success of right-of-way restoration and revegetation measures would identify invasive plant species' colonization locations and densities as well as the management measures that would be implemented to control the identified populations.
- NEXUS would utilize mechanical treatment or herbicide application to control the spread of invasive species during and after construction. Herbicides would be applied according to the manufacturer's printed recommendations and in accordance with applicable agency regulations governing herbicide application.

With the implementation of the procedures identified above and NEXUS' *ISMP*, we conclude the spread of noxious and invasive species should be adequately prevented and controlled.

4.5.4.2 TEAL Project

The TEAL Project is located along existing pipeline right-of-way. Field surveys found existing invasive species, primarily multiflora rose and reed canary grass, in and adjacent to the Project area. Texas Eastern has developed an *ISMP* to minimize and control the spread of the noxious and invasive species. Some of the management and control measures that would be implemented by Texas Eastern are identical to the NEXUS mitigation and control measures discussed above. With the implementation of the procedures identified above and Texas Eastern's *ISMP*, we conclude that the spread of noxious and invasive species should be adequately prevented and controlled.

4.5.5 Fragmentation and Edge Effect

The breaking up of contiguous vegetation cover types into smaller patches results in vegetation fragmentation and forest edges. Forest edges play a crucial role in ecosystem interactions and landscape

function, including the distribution of plants and animals, fire spread, vegetation structure, and wildlife habitat. Creation of new forest edge along dense canopy forests could impact microclimate factors such as wind, humidity, and light, and could lead to a change in vegetation species composition within the adjacent forest or increase the spread of invasive species. Vegetation along forest edges receives more direct solar radiation during the day, loses more long-wave radiation at night, receives less short-wave radiation than areas in the forest interior, and has lower humidity. Increased solar radiation and wind could desiccate vegetation by increasing evapotranspiration, affecting species that survive along the edge (typically favoring shade intolerant species) and impacting soil characteristics. Fragmentation and a loss of habitat connectivity could also impact wildlife.

4.5.5.1 NGT Project

The landscape that would be crossed by the NGT Project has already experienced fragmentation in the form of existing roads, other utility rights-of-way, residential and commercial development, and timber clear cuts. Construction and operation of the NGT Project pipeline facilities would create a new, cleared corridor and new forest edge in areas where the pipelines would not be co-located with existing linear infrastructure or corridors. Temporary construction workspace would also contribute to fragmentation by creating larger open patches within contiguous forested habitats.

In areas where the pipeline facilities would be co-located with existing cleared corridors, the NGT Project generally would not increase the amount of forest edges, but would incrementally widen existing corridors typically by 25 to 50 feet for operation.

To minimize fragmentation effects, NEXUS has co-located approximately 45 percent of the pipeline facilities adjacent to existing pipeline and transmission line rights-of-way. An additional 42 percent of the route would cross agricultural land. NEXUS would restore shrub and forested habitat within the temporary construction workspace. On May 11, 2016, NEXUS filed meeting notes with the FWS (Docket No. CP16-22-000), indicating that mitigation associated with forest fragmentation would not apply for this project since NEXUS has been successful in avoiding forest fragmentation in their routing plans. Therefore, we conclude that fragmentation effects would be minimized to the greatest extent practicable and would not be significant. The FWS has determined that, based upon its definition, the NGT Project would not fragment any upland forests.

4.5.5.2 TEAL Project

The TEAL Project has been sited along existing pipeline right-of-way, with existing edge habitat established. Construction and operation of the TEAL Project pipeline facilities would not result in the creation of new forest edge, but would widen the gap between existing forested areas. Temporary construction workspace would also contribute to fragmentation by creating larger open patches.

Because pipeline facilities would be entirely co-located with existing cleared corridors, the TEAL Project would not increase the amount of edge, but would incrementally widen existing corridors typically by 25 to 50 feet for operation. Texas Eastern would restore shrub and forested habitat within the temporary construction workspace. Therefore, we conclude that fragmentation effects would be minimized to the greatest extent practicable and would not be significant. The FWS has determined that, based on its definition, the TEAL Project would not fragment any upland forests.

4.5.6 Pollinator Habitat

On June 20, 2014, President Barack Obama signed the Presidential Memorandum *Creating a Federal Strategy to Promote the Health of Honey Bees and Other Pollinators* (The White House – Office

of the Press Secretary, 2014). According to the memorandum, “there has been a significant loss of pollinators, including honey bees, native bees, birds, bats, and butterflies, from the environment.” The memorandum also states that “given the breadth, severity, and persistence of pollinator losses, it is critical to expand Federal efforts and take new steps to reverse pollinator losses and help restore populations to healthy levels.” In response to the Presidential Memorandum, the federal Pollinator Health Task Force published a National Strategy to Promote the Health of Honey Bees and Other Pollinators in May 2015. This strategy established a process to increase and improve pollinator habitat.

Pollinator habitat in and adjacent to the Projects area can be found in a variety of vegetation types, including upland open land, forested land, forested wetland, emergent wetland, and scrub-shrub wetland.

4.5.6.1 NGT Project

Constructing the NGT Project would temporarily impact about 899.2 acres of pollinator habitat, including upland forest, forested wetland, upland open land, emergent wetland, and scrub-shrub wetland. The temporary loss of this habitat would increase the rates of stress, injury, and mortality experienced by honey bees and other pollinators. NEXUS would revegetate both the temporary workspace and permanent rights-of-way immediately after the pipeline facilities are installed with herbaceous and riparian seed mixes in consultation with the NRCS. Once revegetated, the restored workspace and permanent rights-of-way would provide pollinator habitat after the first or second growing season, and may naturally improve pollinator habitat along the Project area. The FWS, a cooperating agency on this EIS, commented that revegetation of disturbed areas should include nectar-producing plants and milkweed endemic to the area in order to assist butterflies, bees, and other pollinators. To ensure the impacts on pollinator habitat are sufficiently minimized, and consistent with the FWS recommendation and Presidential Memorandum and subsequent strategy regarding pollinators, **we recommend that:**

- **Prior to construction, NEXUS should provide a plan describing the feasibility of incorporating plant seeds that support pollinators into the seed mixes used for restoration of construction workspaces. This plan should also describe NEXUS’ consultations with the relevant federal and/or state regulatory agencies.**

4.5.6.2 TEAL Project

The TEAL Project would temporarily impact about 134.2 acres of pollinator habitat, including upland forest, forested wetland, upland open land, emergent wetland, and scrub-shrub wetland. The temporary loss of this habitat would increase the rates of stress, injury, and mortality experienced by honey bees and other pollinators. Similar to NEXUS, Texas Eastern would revegetate both the temporary workspace and permanent rights-of-way immediately after the pipeline facilities are installed with herbaceous and riparian seed mixes in consultation with the NRCS. As discussed above, the FWS, a cooperating agency on this EIS, commented that revegetation of disturbed areas should include nectar-producing plants and milkweed endemic to the area in order to assist butterflies, bees, and other pollinators. To ensure the impacts on pollinator habitat are sufficiently minimized, and consistent with the FWS recommendation and Presidential Memorandum and subsequent strategy regarding pollinators, **we recommend that:**

- **Prior to construction, Texas Eastern should provide a plan describing the feasibility of incorporating plant seeds that support pollinators into the seed mixes used for restoration of construction workspaces. This plan should also describe Texas Eastern’s consultations with the relevant federal and/or state regulatory agencies.**

4.5.7 Conclusion

Based on our review of the potential impacts on vegetation as described above, we conclude that the primary impact from construction and operation would be on forested lands. However, due to the prevalence of forested habitats within the NGT and TEAL Projects area, the ability to co-locate the proposed facilities adjacent to existing rights-of-way, and the eventual regrowth of forested areas outside of the permanent right-of-way, we conclude that the permanent conversion of forested lands would not result in a significant impact on the vegetative resources within the NGT and TEAL Projects area. In addition, impacts on forested and non-forested vegetation types would be further mitigated through implementation of the applicants' *E&SCPs* and our recommendations.

4.6 WILDLIFE

4.6.1 Existing Environment

The NGT and TEAL Projects area contains a diversity of wildlife, including large and small mammals, reptiles and amphibians, and birds (e.g., raptors, waterfowl, and songbirds). Wildlife is dependent on available habitat that is generally associated with existing vegetation cover types. The vegetation characteristics of each cover type are the most important factors for determining the presence or absence of a species at a particular site.

As described in sections 4.4 and 4.5, as well as in the following sections, the Projects would cross several distinct upland and wetland vegetation cover types. These include upland forest, open upland, forested wetlands, scrub-shrub wetlands, emergent wetlands, agricultural and developed land. Tables 4.6.1-1 and 4.6.1-2 identify the terrestrial wildlife species commonly occurring in these vegetation cover types. Open water areas also provide wildlife habitat for several species of waterfowl and wading birds.

TABLE 4.6.1-1 Wildlife Species Potentially Occurring within the NGT Project Area	
Vegetation Cover Types Affected by the NGT Project	Wildlife Species
Upland Forest	White-tailed deer, Virginia opossum, common raccoon, gray squirrel, red-bellied woodpecker, wild turkey, great crested flycatcher, wood thrush
Upland Open Land	White-tailed deer, coyote, eastern cottontail, gray fox, red fox, eastern box turtle, wild turkey, blue-winged warbler, field sparrow, prairie warbler, eastern towhee, American kestrel, red-tailed hawk, and sharp-shinned hawk
Forested Wetland	Wood frog, red-spotted newt, garter snake, little brown bat, raccoon, white-tailed deer, wild turkey, wood duck
Scrub-shrub Wetland	Pickerel frog, spring peeper, red-winged blackbird
Emergent Wetland	Common grackle, killdeer, red-winged blackbird, American mink, muskrat, raccoon, star-nosed mole, white-tailed deer, American bullfrog, common snapping turtle, painted turtle, pickerel frog
Agricultural Land	White-tailed deer, eastern cottontail, eastern mole, ground dove, mourning dove, mockingbird, tree swallow, kestrel, black vulture, eastern bluebird, common crow
Developed Land	Raccoon, striped skunk, squirrels and rat species, white-tailed deer, raccoon, European starling, house sparrow, rock pigeon, mourning dove, northern mockingbird

TABLE 4.6.1-2

Wildlife Species Potentially Occurring within the TEAL Project Area	
Vegetation Cover Types Affected by the TEAL Project	Wildlife Species
Upland Forest	White-tailed deer, gray squirrel, opossum, raccoon, blue jay, red-bellied woodpecker, wild turkey, great crested flycatcher, wood thrush
Upland Open Land	Eastern cottontail, eastern meadowlark, song sparrow, yellow-breasted chat, coyote, gray fox, red fox, wild turkey, field sparrow, American kestrel, red-tailed hawk, sharp-shinned hawk
Forested Wetland	Beaver, great blue heron, kingbird, raccoon, white-tailed deer, wood duck
Scrub-shrub Wetland	Brown thrasher, common yellowthroat, red-winged blackbird
Emergent Wetland	Common grackle, red-winged blackbird, mink, muskrat, raccoon, star-nosed mole, white-tailed deer, bullfrog, snapping turtle, northern spring peeper
Agricultural Land	White-tailed deer, eastern cottontail, eastern mole, ground dove, mourning dove, mockingbird, tree swallow, kestrel, black vulture, eastern bluebird, common crow
Developed Land	Raccoon, striped skunk, squirrels and rat species, white-tailed deer, raccoon, European starling, house sparrow, rock pigeon, mourning dove, northern mockingbird

4.6.1.1 Upland Forest

The upland forests in the NGT and TEAL Projects area provide moderate quality habitat for a variety of mammals, birds, amphibians, reptiles, and invertebrates. The predominance of oak is an important habitat component in the Projects area. Some mammals rely directly on oak mast as a food source, while amphibians and invertebrates rely on the soil chemistry of an oak forest. Predatory species, such as raptors and red fox, are also attracted to oak-dominated forests and their edges due to the abundance and diversity of prey species. Tree and shrub layers provide food and cover for birds and larger mammals, such as white-tailed deer. Detritus provides food and cover for invertebrates, amphibians, reptiles, and smaller mammals.

The NGT Project crosses the Oak Opening Region of northwestern Ohio. The Oak Openings Region is known to support a diversity of wildlife, including rare species. Historically, this region supported a variety of habitats, including oak savanna, oak woodland, wet prairie, oak barrens, and floodplain forest that supported abundant wildlife. However, much of the region has been converted to agricultural land uses and developed for urban use, resulting in habitat conversion and fragmentation. While portions of the region continue to support wildlife diversity and rare species, these areas are generally limited to conservation lands such as preserves and state forests.

4.6.1.2 Upland Open Land

This habitat type includes all non-forested vegetation; grasslands, pasture, agricultural land; shrublands; and maintained utility rights-of-way. Although row crops generally provide poor to moderate habitat, they often provide forage for a number of species. On landscapes where intensive row crop agriculture is the dominant land use, these strip habitats are extremely important for grassland birds and other wildlife. Hayfields, small grains, fallow and old fields, pastures, idled croplands, and grasslands provide nesting and foraging habitats for grassland birds (USDA, 1999). Utility rights-of-way maintained in early successional communities also provide valuable nesting and foraging habitats for grassland bird species (USDA, 1999). Grasslands and old fields can be utilized as foraging and denning habitat by mammals and also provide nesting and breeding habitat to upland game birds such as pheasants. Shrublands provide sources of food and nesting sites for various birds, as well as cover for invertebrates, reptiles, and amphibians. Open fields and shrublands provide habitat for small mammal species such as mice, rabbits, and voles, which make them prime hunting grounds for predator species such as foxes, coyotes, and raptors.

Wetlands

Forested wetlands provide a diverse assemblage of vegetation and an abundance of food and water sources for wildlife. Mammals such as mink, muskrat, raccoon, and white-tailed deer use these areas for foraging. Many waterfowl and wading birds use forested wetlands adjacent to scrub-shrub and emergent wetlands for nesting and foraging. Forested wetland communities are also important habitats for reptiles and amphibians including the American bullfrog and various salamander species.

Scrub-shrub wetlands provide nesting and roosting habitat for a variety of bird species, as well as aquatic habitat and cover for frog species and other amphibians.

Emergent wetlands provide important habitat for waterfowl, muskrats, herons, frogs, and salamanders. Bird species such as red-winged blackbird and grey catbird also utilize emergent wetland habitat.

Open water areas crossed by the Projects include creeks, streams, and rivers. In addition to the aquatic resources discussed in section 4.7, the open water cover type provides important foraging and breeding habitat for various terrestrial species, including waterfowl, reptiles, amphibians, and some mammals.

Developed Land

Developed lands consist of industrial/commercial areas, residential areas, and road crossings provide minimal habitat for wildlife species. Wildlife diversity is often limited to species that are adapted to human disturbance, such as paved and landscaped areas.

4.6.2 Impacts and Mitigation

4.6.2.1 NGT and TEAL Projects

General Impacts

The impact of the Projects on wildlife is dependent on a species' ability to leave project work areas and successfully utilize adjacent habitats during project construction and restoration. Much of the wildlife that would be displaced by construction would relocate to similar adjacent habitats; however, lower survival rates may result if there were a lack of adequate territorial space, inter- and intra-specific competition, or lower reproductive success. Where similar adjacent habitat is present, displacement impacts would generally be short term for species that utilize herbaceous habitats and long term for species that utilize scrub or forested habitats, as restoration of wooded areas would require a greater amount of time. Upon successful restoration, wildlife would be expected to return and colonize habitats that were temporarily affected by construction.

Constructing the Projects may result in mortality of less mobile animals, such as small rodents, reptiles, amphibians, and invertebrates that may be unable to escape the immediate construction area, and disruption of bird courting, breeding, or nesting behaviors within and adjacent to construction work areas. These impacts would primarily occur during construction but may also occur during restoration.

Constructing the Projects would disturb approximately 5,223.8 acres of potential habitat. The temporary loss of habitat would reduce (protective) cover and foraging habitat in the immediate Projects area. Changes to wildlife habitat, whether by vegetation removal, conversion of one type to another, or degradation, also impact wildlife populations. The degree of impact would depend on the type and quantity

of habitat affected and the rate at which vegetation regenerates after construction. Habitat that is converted to an aboveground facility would be permanently affected where it is maintained along the 50-foot-wide permanent pipeline right-of-way or is permanently altered by the construction of access roads.

Based on our restoration monitoring efforts along previous pipeline rights-of-way, we have found that wetland and upland herbaceous open land cover types typically restore to a pre-construction structural condition in a relatively short time (i.e., one to three growing seasons). Impacts on species that utilize agricultural land would be minor and temporary as these areas are regularly disturbed and would be replanted during the next growing season. The effect on forest-dwelling wildlife species would be greater because forest habitat would take a comparatively longer time to regenerate and would be prevented from reestablishing along maintained portions of the pipeline rights-of-way. Restoring the temporary construction areas to forest habitats could take 30 years or longer, depending on site-specific conditions such as rainfall, elevation, grazing, and weed introduction. The impacts on shrub-dwelling species would be comparable to impacts on forest-dwelling species due to the lengthy regeneration timeframes of these habitats. The fragmentation and edge effects of maintaining the pipeline rights-of-way are further discussed in the following section.

Noise

Noise could impact wildlife during all phases of the Projects. Certain species rely on hearing for courtship and mating, prey location, predator detection, and/or homing. These life functions could be affected by project construction and operational noise.

Research has demonstrated various wildlife reactions to noise from traffic, airplanes, sonic booms, helicopters, military activities, and blasting; however, specific noise studies from pipeline construction have not been conducted. Studies show that some species avoid roadways due to noise from a few meters to over 3 kilometers in distance. These species appear to be most sensitive during the breeding season. Conversely, the abundance of small mammals and birds (e.g., starlings, house sparrows, song sparrows, red-winged blackbirds) increases closer to the roadway, possibly due to increased availability of prey species such as insects. Construction-related sounds may have an adverse impact on raptors and bird species during nesting and breeding. These impacts occur when noise levels substantially exceed ambient conditions that existed prior to a project (i.e., by 20 to 25 dB, as experienced by the animal) and/or when the total sound level exceeds 90 dB. Such impacts could result in nest abandonment, egg failure, reduced juvenile growth and survival, or malnutrition or starvation of the young. During construction, these impacts are generally related to areas immediately adjacent to the construction right-of-way, but can extend to greater distances for activities such as blasting.

Noise generated from construction of the Projects would result from heavy equipment and machinery use. Most construction activities would be limited to daytime hours, with the exception of a limited number of 24-hour activities, such as water pump operation, road bores, and HDD installations. Construction is anticipated to occur throughout the year and would generally last 6 to 12 weeks at any given location. Noise levels along the construction right-of-way are expected to vary depending on the phase of work, number of locations of operating equipment, distance from noise receptors, and intervening topography. The worst-case noise level for the construction is estimated at 85 dB at 50 feet from NGT and TEAL Projects work area (see section 4.12.2.4).

The proposed compressor stations would generate noise on a continuous basis once in operation. The noise impacts associated with the compressor stations would be limited to the general vicinity of the facilities; however, certain operations, such as blow-downs, would generate infrequent, but high noise levels that would extend for a greater distance from the compressor stations. Noise emissions associated with compressor stations are described in section 4.12.2.4. While compressor station noise could affect

birds in the area, we expect that in subsequent years, birds and other wildlife would either be habituated to the noise source, or would move into similar available habitat farther from the noise source. This, in turn, could lead to increased competition for preferred habitats, depending on the amount of habitat available.

During pipeline operation, noise emissions also would be generated during monitoring and maintenance activities, such as vegetation clearing on the permanent right-of-way, or during ground or air surveillance of the pipeline, as required by regulations.

In conclusion, construction and operation of the Projects would result in short- and long-term impacts on wildlife and wildlife habitat. These impacts are expected to be minor given the mobile nature of most wildlife in the area, the availability of similar habitat adjacent to and near the NGT and TEAL Projects area, and the compatible nature of the restored right-of-way with species occurring in the area. In order to minimize permanent impacts on forested and other habitats, the majority of the Projects would be routed along existing corridors and agricultural lands. They would be constructed in accordance with the *E&SCPs*, and vegetative maintenance in the permanent right-of-way would take place no more than once every 3 years. Impacts on ground-nesting birds in upland areas would be minimized by conducting maintenance activities outside the nesting season (i.e., March 31 to August 1).

Noxious and Invasive Species

Short- or long-term impacts on wildlife habitat could occur if pipeline construction spreads noxious weeds and other invasive species (see section 4.5.4 for a discussion regarding noxious weed impacts on vegetation). Noxious weeds can out-compete native vegetation and displace native species by spreading rapidly and co-opting resources (i.e., nutrients, water, and sunlight) that can eventually lead to a weed-dominated monoculture. Such transformed habitat can be unsuitable to former wildlife inhabitants. Often, as habitat quality degenerates, wildlife diversity declines. Invasive plant species can form dense monocultures that inhibit native vegetation from flourishing, cause a decrease in species diversity, limit water flow and wildlife access to water, and in some instances make waterfowl nesting areas unsuitable.

The applicants have developed *ISMPS* to prevent the introduction or spread of noxious or invasive species. We have reviewed these plans and find them acceptable. Therefore, we conclude that wildlife impacts due to invasive species would not be significant.

4.6.3 Sensitive or Managed Wildlife Habitats

Sensitive or managed wildlife habitats, such as national wildlife refuges, state parks and forests, wildlife management areas, and reserve program lands, are generally established to protect lands and waters that have a high potential for wildlife production, public hunting, trapping, fishing, and other compatible recreational uses. The NGT Project would cross the Missionary Island State Wildlife Preserve, an island within the Maumee River that is managed by ODNR. The Maumee River, and consequently, the Missionary Island State Wildlife Preserve, would be crossed utilizing HDD construction methods; therefore, no impacts on the preserve or any wooded buffers along the Maumee River would occur.

Approximately 1 percent of natural communities remain intact within the Oak Openings Region, while the remaining 99 percent of its plant communities have been converted to agricultural, commercial, and industrial land use. The NGT Project has been sited to minimize protected lands within the Oak Openings Region, and NEXUS has developed a crossing plan specific to this region. The 0.5 mile of forest conversion in the Maumee State Forest would not increase edge effect or fragmentation as the NGT Project route is sited at the edge of the woodland. See section 4.9 for more information on sensitive or managed lands.

4.6.4 Habitat Fragmentation and Edge Effect

4.6.4.1 NGT Project

Fragmenting contiguous wildlife habitats into smaller units could alter wildlife habitat. Many wildlife species require large, undisturbed habitats. When these habitats are affected, wildlife may be subject to increased predation, parasitism, or inter-specific competition; reduced pairing, nesting, and reproductive success; inhibited migration, dispersal, and foraging; and expansion of non-native vegetation.

Fragmentation generally affects birds by creating dispersal barriers, resulting in smaller suitable microhabitats, smaller population sizes, and edge effects (Degraaf and Healy, 1990). Edge effects can cause interactions between birds that nest in the interior of forests and species that inhabit surrounding landscapes, typically lowering the reproductive success of the interior species. Other evidence suggests that certain mammals, amphibians, reptiles, and plants are also adversely affected by forest fragmentation. Species that require large tracts of unbroken forest land may be forced to seek suitable habitat elsewhere. Less mobile species, such as reptiles and amphibians, could experience greater impacts from habitat fragmentation, as they are less mobile and less likely to relocate to more suitable habitat. The loss of forest habitat, expansion of existing corridors, and the creation of open, early successional and induced edge habitats could decrease the quality of habitat for forest interior wildlife species in a corridor much wider than the actual cleared right-of-way. The distance an edge effect extends into a woodland is variable, but most studies point to at least 300 feet (Rodewald, 2001; Jones, et al., 2000; Ontario Ministry of Natural Resources, 2000; Robbins, 1988; Rosenberg, et al., 1999). Edge effects within this distance could include a change in available habitat for some species due to an increase in light and temperature levels on the forest floor and the subsequent reduction in soil moisture, thereby resulting in habitat that would no longer be suitable for species that require these specific habitat conditions, such as salamanders and amphibians. An alteration of habitat could affect the fitness of some species and increase competition both within and between species, possibly resulting in an overall change to the structure of the forest community.

Potential positive impacts from creating or widening utility rights-of-way would include increased diversity and density of bird species, increased access to a variety of food resources, and increased ground cover, which would favor ground-nesting species (Rosenberg and Raphael, 1986). The close proximity of cover and forage areas at forest edges provides ideal habitat for many bird and game species. For example, bird species diversity in power line corridors through forested vegetation was found to be higher in the corridor than within the adjacent forest (Kroodsma, 1984). Higher levels of flower and fruit production, pollinator, and frugivore densities are often found along the edge.

For the NGT Project, habitat fragmentation would generally occur where the pipeline facilities are not co-located with existing rights-of-way and forested and scrub habitats would be affected. As outlined in section 2.0, the NGT Project pipeline would be co-located with existing, maintained rights-of-way and corridors for 44 percent of their total length, which would reduce fragmentation effects. When co-located with existing corridors, it is unlikely that the relatively small widening of existing permanently cleared right-of-way would impede the movement of most wildlife species. Where the facilities would create a new corridor through shrub and forested habitats, wildlife composition would shift from those species favoring shrub and forest habitat to those favoring edge habitat or open areas.

As discussed in section 4.5.5, to adequately minimize fragmentation impacts and restore the construction right-of-way, NEXUS would restore the construction right-of-way according to its *E&SCP*, which includes reseeding measures using site-specific seed mixtures recommended by local seeding authorities, augmented by recommendations from the FWS, land-managing agency, and/or landowner to enhance wildlife habitat. Additionally, NEXUS would monitor the pipeline rights-of-way for at least 2 years following initial seeding or until required by FERC and other permit restoration criteria is achieved.

With NEXUS' ability to co-locate the proposed facilities and the commitment to implement and adhere to the measures outlined in the construction and restoration plans and other permit requirements, we conclude that habitat fragmentation and edge effect impacts that could result from construction and operation of the NGT Project would be adequately minimized.

4.6.4.2 TEAL Project

Construction of the TEAL Project would fragment habitat where the pipeline facilities are not co-located with existing right-of-way; forested and scrub habitats would be affected. As outlined in section 2.0, the TEAL Project is a looping project, and as such is co-located throughout its 4.4-mile length, which would reduce fragmentation effects. When co-located with existing corridors, it is unlikely that the relatively small widening of existing permanently cleared right-of-way would impede the movement of most wildlife species. Where the facilities would create a new corridor through shrub and forested habitats, wildlife composition would shift from those species favoring shrub and forest habitat to those favoring edge habitat or open areas.

4.6.5 Game Species and Game Harvesting

Certain wildlife species, as well as other wildlife furbearers and migratory birds, are important game animals in the NGT and TEAL Projects area. They include the white-tailed deer, bobcat, gray squirrel, raccoon, cottontail rabbit, opossum, wild turkey, bobwhite, mourning dove, and various waterfowl (e.g., ducks and geese).

The potential impacts on game species would be similar to those discussed previously for general wildlife species. Game species would be subject to temporary displacement and habitat loss until restoration is complete and native vegetation is reestablished. However, if adjacent habitats are at or near carrying capacity, displacement or stress on game species could cause reduction in wildlife populations. Permanent habitat impacts would occur where the pipeline rights-of-way are maintained, aboveground facilities are constructed, and where fragmentation occurs. In most instances, suitable adjacent habitat would be available for wildlife species until grasses and woody vegetation are reestablished. Forage vegetation would be expected to recolonize quickly. Following construction, game species would utilize the newly established right-of-way for foraging and travel. Restored pipeline rights-of-way generally provide an opportunity for developing high-quality feeding areas for game species, especially if noxious weeds are controlled and native forage is seeded.

Construction activities that coincide with hunting seasons, which vary in the NGT and TEAL Projects area depending on species and location, may impact the hunters' experience and success by temporarily restricting access to hunting areas and temporarily affecting the spatial distribution of game species. Construction-related disturbance likely would displace game species from adjacent habitats. In general, game species would be expected to return to habitats they vacated after construction and restoration efforts are completed, and success rates would likely be similar to pre-construction success rates.

The new pipeline right-of-way could increase access to remote or previously inaccessible hunting areas, which could result in increased hunting success. In addition, game species that use a cleared right-of-way could be more likely harvested. Increased public recreation along cleared rights-of-way in the hunting season, especially near crossings of existing access points, has been documented elsewhere (Crabtree, 1984). Increased public access along the new pipeline rights-of-way could increase poaching of game and non-game wildlife. This impact would be greater on smaller game species because they typically have smaller home ranges and movement areas than larger species and could experience greater population impacts from habitat loss and fragmentation.

4.6.6 Migratory Birds

4.6.6.1 Existing Environment

NGT Project

Migratory birds are protected under the MBTA (16 USC 703-711). The MBTA, as amended, prohibits the taking, killing, possession, transportation, and importation of migratory birds, their eggs, parts, or nests unless authorized under a FWS permit. Bald and golden eagles are additionally protected under the BGEPA (16 USC 668-668d). Executive Order 13186 (66 Federal Register 3853) directs federal agencies to identify where unintentional take is likely to have a measurable negative effect on migratory bird populations and to avoid or minimize adverse impacts on migratory birds through enhanced collaboration with the FWS and to restore and enhance their habitat. The Executive Order states that emphasis should be placed on species of concern, priority habitats, and key risk factors, and that particular focus should be given to addressing population-level impacts.

On March 30, 2011, the FWS and the Commission entered into a Memorandum of Understanding (MOU) that focuses on avoiding, minimizing, or mitigating adverse impacts on migratory birds and strengthening migratory bird conservation through enhanced collaboration between the two agencies. This voluntary agreement does not waive legal requirements under the MBTA, BGEPA, ESA, Federal Power Act, NGA, or any other statutes and does not authorize the take of migratory birds.

The 1988 amendment to the Fish and Wildlife Conservation Act mandates that the FWS “identify species, subspecies, and populations of all migratory nongame birds that, without additional conservation actions, are likely to become candidates for listing under the Endangered Species Act of 1973.” As a result of this mandate, the FWS created the Birds of Conservation Concern (BCC) list (FWS, 2008a). The goal of the BCC list is to prevent or remove the need for additional ESA bird listings by implementing proactive management and conservation actions and coordinating consultations in accordance with Executive Order 13186. As outlined in table 4.6.6-1, a total of ten BCC species within FWS Region 3 are known to breed in Michigan and Ohio and may occur within the NGT Project area.

A variety of migratory birds, including forest-interior birds, BCCs, and waterfowl use or could use the wildlife habitats affected by the NGT Project. These birds use these habitats for resting (stopover), sheltering, foraging, breeding, and nesting.

Bird Species	Confirmed Breeding in State		Preferred Habitat
	Michigan ^b	Ohio ^c	
Bald Eagle	Yes	Yes	Breeds in forested areas near large bodies of water. Breeds/nests from October 1 to May 15.
Black-capped Chickadee	Yes	Yes	Any habitat that has trees or woody shrubs, from forests and woodlots to residential neighborhoods and parks. Breeds/nests from May to September.
Blue-winged Warbler	Yes	Yes	Breeds at forest and field edges, often shaded by large trees. Breeds/nests from April to July.
Cerulean Warbler	Yes	Yes	Breeds in forests with tall deciduous trees and open understory, such as we bottomlands and dry slopes. Breeds/nests from May to August.
Field Sparrow	Yes	Yes	“Old-field” specialists – tall grass and brush, particularly thorny shrubs. Breeds/nests from May to September.
Louisiana Waterthrush	Yes	Yes	Breeds along gravel-bottomed streams flowing through deciduous forest. Breeds/nests from May to August.

TABLE 4.6.6-1 (cont'd)

Birds of Conservation Concern Potentially Occurring within the NGT Project Area ^a			
Bird Species	Confirmed Breeding in State		Preferred Habitat
Peregrine Falcon	Yes	Yes	Habitat generalist, but requires artificial structures or cliffs for nesting. Breeds/nests from April to August.
Northern Flicker	Yes	Yes	Open habitats near trees, including woodlands, edges, yards, and parks. Breeds/nests May to August.
Red-headed Woodpecker	Yes	Yes	Old trees in open areas. Breeds/nests from February to September.
Wood Thrush	Yes	Yes	Heavy deciduous or mixed forested areas, including riparian or wetlands. Breeds/nests from April to August.
a	Based on the FWS Region 3 (Midwest Region) BCC 2008 List (FWS, 2008a)		
b	Based on Michigan Breeding Bird Atlas II (Chartier et al., 2011)		
c	Based on the Ohio Bird Records Committee Checklist (Whan and Harlan, 2004)		

NEXUS conducted aerial bald eagle nest surveys along the NGT Project route in spring 2015, and pre-construction aerial surveys in April 2016. No bald eagle nests were identified within 660 feet of the NGT Project area; however, eight nests were identified greater than 660 feet from the area. One nest observed in Lorain County, Ohio is at a distance of approximately 780 feet from the edge of the construction corridor. Therefore, at this time, impacts on bald eagles are not anticipated from the NGT Project.

Forest clearing activities along the NGT were proposed to begin in February of 2017 and be completed by March 31, 2017, prior to the eagle nesting season. As such, the 2016 aerial surveys would serve as pre-construction surveys for bald eagle nests.

TEAL Project

As outlined in table 4.6.6-2, a total of 12 BCC species within FWS Region 3 are known to breed within the TEAL Project vicinity.

TABLE 4.6.6-2

Birds of Conservation Concern Potentially Occurring within the TEAL Project Area ^a		
Bird Species	Breeding Potential in Ohio ^b	Preferred Habitat
Bald Eagle	Yes – ODNR and FWS confirmed no bald eagle nests in the project vicinity	Breeds in forested areas near large bodies of water. Breeds/nests from October 1 to May 15.
Black-capped Chickadee	Yes	Any habitat that has trees or woody shrubs, from forests and woodlots to residential neighborhoods and parks. Breeds/nests from May to September.
Canada Warbler	Yes	Moist thickets including riparian thickets, brushy ravines, and forest bogs. Breeds/nests from June to July.
Cerulean Warbler	Yes	Breeds in forests with tall deciduous trees and open understory, such as wet bottomlands and dry slopes. Breeds/nests from May to August.
Kentucky Warbler	Yes	Ground nest in moist, deciduous woodlands. Breeds/nests from May to July.
Louisiana Waterthrush	Yes	Breeds along gravel-bottomed streams flowing through deciduous forest. Breeds/nests from May to August.
Olive-sided Flycatcher	Yes ^c	Open woodlands, particularly burned forests. Breeds/nests from March to July.
Red Crossbill	Yes ^d	Mature coniferous forests. Breeds/nests from January to August.
Red-headed Woodpecker	Yes	Old trees in open areas. Breeds/nests from February to September.
Whip-poor-whill	Yes	Deciduous and mixed-pine forests, often in areas with sandy soil and open understories. Breeds/nests from May to July.

TABLE 4.6.6-2 (cont'd)

Birds of Conservation Concern Potentially Occurring within the TEAL Project Area ^a		
Bird Species	Breeding Potential in Ohio ^b	Preferred Habitat
Wood Thrush	Yes	Heavy deciduous or mixed forested areas, including riparian or wetlands. Breeds/nests from April to August.
Worm-eating Warbler	Yes	Breeds in mature deciduous or mixed deciduous-coniferous forest with patches of dense understory, usually on a steep hillside. Breeds/nests from May to July.
a	Based on the FWS Region 3 (Midwest Region) BCC 2008 List (FWS, 2008a)	
b	Based on the Ohio Bird Records Committee Checklist (Whan and Harlan, 2004)	
c	One confirmed breeding record in the state (Ashtabula County, 1932)	
d	One confirmed breeding record in the state (Ross County, 1973)	

A variety of migratory birds, including forest-interior birds and BCC-listed birds use or could use the wildlife habitats affected by the TEAL Project. These birds use these habitats for resting (stopover), sheltering, foraging, breeding, and nesting.

Texas Eastern conducted a bald eagle desktop habitat assessment and determined that habitat for the bald eagle is unlikely to be affected by the TEAL Project; therefore, a bald eagle nest survey was deemed unnecessary by the FWS Columbus Field Office. Effects on bald eagles are not anticipated along the TEAL Project.

4.6.6.2 Impacts and Mitigation

The NGT and TEAL Projects construction schedules would overlap with the migratory bird nesting season (generally between February and August). Construction of the NGT Project would result in the loss of approximately 332.2 acres of upland forest and 43.1 acres of forested wetlands, and construction of the TEAL Project would result in the loss of approximately 29.7 acres of upland forest and 0.1 acre of forested wetlands. The impacts of forested habitat loss are considered long-term due to the amount of time required for the forested habitat to return to its previous state, often taking decades. The impacts associated with pipeline and aboveground facility construction would have long-term effects on migratory birds that depend on forest habitats. Vegetation clearing and other construction activities could affect egg and young survival. Bird displacement could impact bird migration, nesting, foraging, and mating behaviors. Behavior changes could increase the amount of stress, injury, and mortality experienced by migratory birds. Construction would also reduce the amount of habitat available for foraging and predator protection and would temporarily displace birds into adjacent habitats, which could increase the competition for food and other resources. This in turn could increase stress and susceptibility to predation, as well as negatively impact reproductive success.

Additionally, increased human presence and noise from construction activities could disturb actively nesting birds. Impacts would not be significant for non-nesting birds, as these individuals would temporarily relocate to avoid construction activities. However, construction activity near active nests during incubation or brood rearing could result in nest abandonment; overheating, chilling, or desiccation of unattended eggs or young, causing nestling mortality; premature fledging; and/or ejection of eggs or young from the nest.

Migratory birds, including BCC-listed birds, could also be affected during project operations. The NGT Project would permanently convert 146.3 acres of upland forest and 29.4 acres of forested wetland, while the TEAL Project would convert 4.9 acres of upland forest. These areas would be maintained in an

herbaceous state. The reduction in forest habitat could result in increased competition, parasitic bird species, edge effects (as previously discussed in sections 4.5.5 and 4.6.4). 185.9 acres of upland forest and 13.7 acres of forested wetland would be allowed to regenerate along the NGT Project route, and 24.8 acres of upland forest and 0.1 acres of forested wetlands would be allowed to regenerate along the TEAL Project route. The FWS has determined that, using their definitions, there will be no fragmentation of upland forest habitat.

To address FWS concerns about migratory birds, the applicants have prepared a *Migratory Bird Conservation Plan (MBCP)* for the Project (see appendix J-3). The *MBCP* was developed as a contingency to be used in the event that clearing cannot be completed within the September 1 to March 31 window for migratory birds. To construct the *MBCP*, NEXUS concentrated on BCC-listed birds, as well as federal- and state-listed species. Using the Ohio and Michigan breeding bird atlases and the National Audubon Society's Important Bird Area Program, NEXUS identified potentially suitable habitat along the NGT Project route. Species and nesting periods that might be associated with these areas were identified, and target clearing windows were determined to avoid impacts to nesting birds of concern. FWS region 3 and field office staff concurred with the methodology used to develop the *MBCP* for the Michigan and Ohio portions of the Projects. The applicants have committed to implementing the following measures to protect migratory bird species:

- Routing Project facilities to avoid sensitive resources where possible;
- Routing Project facilities to avoid forest fragmentation;
- Maximizing the use of active agricultural lands or existing pipeline and utility rights-of-way;
- Limiting the construction and operational right-of-way widths to the minimum necessary;
- Implementing mitigation for impacts to sensitive resources (e.g., wetlands) through agency permit conditions;
- Adhering to measures outlined in the applicants' *E&SCPs* and the FERC Plan and Procedures;
- Avoiding routine maintenance of the permanent easement during the migratory bird nesting season between April 15 and August 1; and
- Entering into a MOU whereby NEXUS agrees to mitigate for loss of forested habitat, including avoidance and minimization of impacts, and providing mitigation funding for loss of forested migratory bird habitat. The MOU between NEXUS and the FWS was signed on June 23, 2016.

If clearing cannot be completed within the FWS-recommended timeframe (i.e., September 1 to March 31), NEXUS would implement the clearing windows as described in the final *MBCP* and prioritize the location and timing of clearing to the identified habitat areas to the maximum extent practicable. If clearing inside these windows cannot be met, NEXUS would discuss these areas on a case-by-case basis with the FWS. Impacts on non-special status bird species that do not have significantly reduced populations would not result in long-term or significant population-level effect, given the stability of local populations, the abundance of available habitat outside the proposed rights-of-way, and the linear nature of the Projects over a large geographic range. While the Projects would not likely result in population-level impacts on migratory bird species, it is acknowledged that pipeline construction during the migratory bird breeding

season could impact individual birds and/or nests. Habitat loss could have a greater impact on BCC species due to their limited populations in the area and more restrictive habitat needs. However, with the implementation of the measures outlined previously, including minimization measures identified in the final MBCP and mitigation funding for loss of migratory bird habitat, we conclude that constructing and operating the Projects would likely not result in population-level impacts or significant measurable negative impacts on BCC-listed or migratory birds.

4.6.7 Conclusion

Overall, constructing and operating the Projects is not expected to significantly impact wildlife as a significant amount of similar adjacent habitat is available for use. The applicants would minimize wildlife and habitat impacts by implementing their *E&SCPs*, routing the pipeline to minimize impacts on sensitive areas, co-locating the pipeline with other rights-of-way where feasible, reducing the construction right-of-way through wetlands, and providing mitigation funding for loss of migratory bird upland forest habitat.

4.7 FISHERIES AND AQUATIC RESOURCES

4.7.1 Existing environment

Fisheries and aquatic habitats are typically characterized by water temperature (warmwater or coldwater), salinity (freshwater, marine, or estuarine), types of fishing uses (commercial or recreational), and utilization by open water marine fishes that require freshwater upstream areas to spawn (anadromous species) or freshwater species that migrate to marine waters for reproduction (catadromous species).

4.7.1.1 NGT Project

As described in section 4.3, construction and operation the NGT Project would require 385 waterbody crossings, many of which support fisheries and aquatic habitat. All of the waterbodies crossed by the NGT Project are classified as warmwater fisheries, which generally support fish able to tolerate water temperatures above 80 degrees Fahrenheit (°F). Fish species commonly found in the waterbodies crossed by the project are listed in table 4.7.1-1.

The National Marine Fisheries Service (NMFS) does not manage any waterbodies that would be crossed by the NGT Project, nor do the crossed waterbodies support essential fish habitat as defined under the Magnuson-Stevens Fishery Conservation and Management Act (Public Law 94-265, as amended through January 12, 2007). In addition, no commercial, saltwater marine, or estuarine fisheries would be affected by the NGT Project. Threatened and endangered fish species are discussed in section 4.8.

TABLE 4.7.1-1

Typical Fish Species within the NGT and TEAL Projects Area	
State	Species ^a
Ohio	Black bullhead (<i>Ameiurus melas</i>), black crappie (<i>Poxomis nigromaculatus</i>), bluntnose minnow (<i>Pimephales notatus</i>) , central stoneroller (<i>Campostoma anomalum</i>) , common carp (<i>Cyprinus carpio</i>), creek chub (<i>Semotilus atromaculatus</i>) , gizzard shad (<i>Dorosoma cepedianum</i>), green sunfish (<i>Lepomis cyanellus</i>), Johnny darter (<i>Etheostoma nigrum</i>) , largemouth bass (<i>Micropterus salmoides salmoides</i>), logperch darter (<i>Percina caprodes</i>), mottled sculpin (<i>Cottus bairdii</i>), northern hogsucker (<i>Hypentelium nigricans</i>), pumpkinseed sunfish (<i>Lepomis gibbosus</i>), rock bass (<i>Ambloplites rupestris</i>), smallmouth bass (<i>Micropterus dolomieu</i>), spotfin shiner (<i>Cyprinella spiloptera</i>), stonecat madtom (<i>Noturus flavus</i>), striped shiner (<i>Luxilus chrysocephalus</i>), sunfish bluegill (<i>Lepomis macrochirus</i>), white crappie (<i>Poxomis annularis</i>), white sucker (<i>Catostomus commersonii</i>) , yellow bullhead (<i>Ameiurus natalis</i>), and yellow perch (<i>Perca flavescens</i>).
Michigan	Black crappie (<i>Poxomis nigromaculatus</i>), bluntnose minnow (<i>Pimephales notatus</i>), blacknose dace (<i>Rhinichthys atratulus</i>), blacknose shiner (<i>Notropis heterolepis</i>), common shiner (<i>Luxilus comutus</i>), creek chub (<i>Semotilus atromaculatus</i>), emerald shiner (<i>Notropis atherinoides</i>), grass pickerel (<i>Esox americanus vermiculatus</i>), honeyhead chub (<i>Nocomis biguttatus</i>), largemouth bass (<i>Micropterus salmoides salmoides</i>), rock bass (<i>Ambloplites rupestris</i>), smallmouth bass (<i>Micropterus dolomieu</i>), spotfin shiner (<i>Cyprinella spiloptera</i>), stonecat madtom (<i>Noturus flavus</i>), sunfish bluegill (<i>Lepomis macrochirus</i>), white crappie (<i>Poxomis annularis</i>), white sucker (<i>Catostomus commersonii</i>), and yellow perch (<i>Perca flavescens</i>).
a	Bolded species may be present in the vicinity of the smaller streams and waterbodies crossed by the TEAL Project.

4.7.1.2 TEAL Project

Constructing and operating the TEAL Project would require 14 waterbody crossings. Of these, five are intermittent waterbodies and the remaining nine are classified as warmwater fisheries. Fish species that would occur in these waterbodies typically prefer small streams with gravel or cobble substrates. Species that may be present in waterbodies crossed by the TEAL Project are listed in table 4.7.1-1.

4.7.2 Impacts and Mitigation

4.7.2.1 NGT Project

Construction and operation the NGT Project could result in temporary and permanent impacts on fisheries and aquatic resources. Sedimentation and turbidity, alteration or removal of instream and stream bank cover, stream bank erosion, introduction of water pollutants, water depletions, and entrainment of small fishes during water withdrawals resulting from project activities would increase stress, injury, and mortality of stream biota. The degree of impact on fisheries from construction activities would depend on the waterbody crossing method, the existing conditions at each crossing location, the restoration procedures and mitigation measures employed, and the timing of construction. The discussions in the following sections further describe construction impacts on fisheries and aquatic resources and the measures that would be implemented to minimize impacts.

Sedimentation and Turbidity

Increased sedimentation and turbidity from in-stream and adjacent construction activities would impact fisheries resources. Sedimentation could smother fish eggs and other benthic biota, as well as alter stream bottom characteristics, such as converting sand, gravel, or rock substrate to silt or mud substrate. These habitat alterations could reduce juvenile fish survival, spawning habitat, and benthic community diversity and health. Fish and other stream biota would be displaced to similar habitat upstream or downstream of the pipeline crossing, which could lead to increased competition for habitat and food sources, affecting fish survival and health.

Increased turbidity could temporarily reduce dissolved oxygen levels in the water column and reduce respiratory functions in stream biota, which could temporarily displace fish to unaffected stream

segments, reduce fish health, or increase fish mortality. Turbid conditions could also reduce the ability for biota to find food sources or avoid prey. The extent of impacts from sedimentation and turbidity would depend on sediment loads, stream flows, stream bank and stream bed composition, sediment particle size, and the duration of the disturbances. Waterbody crossing methods are discussed in detail in section 2.3.2.1.

The wet open-cut crossing method would generate the highest amount of sediment and turbidity, but the elevated levels would be short-term and occur over a short distances downstream of the crossing. Furthermore, the warmwater species found in these streams are typically resilient to turbid conditions. According to construction plans, NEXUS would complete all in-stream work in less than 24 hours for minor streams (less than 10 feet across) and less than 48 hours for intermediate streams (between 10 and 100 feet across). Trench spoil would be stored above the banks of waterbodies and would be protected with erosion control devices that prevent, or significantly reduce, sediment runoff from entering the waterbody.

The dry open-cut crossing methods (e.g., fluming, dam and pump) would further reduce sedimentation and turbidity impacts on fisheries by temporarily rerouting water flow and conducting construction activities in a dry waterbody environment.

The HDD method would involve drilling under a waterbody, avoiding work (and impacts) within the feature. The HDD method would avoid direct sedimentation and turbidity impacts on fisheries but could release drilling fluid, a naturally occurring clayey material called bentonite, into a waterbody. In the event of an inadvertent release, NEXUS would implement the *HDD Plan* (see appendix E-4) to prevent, minimize, or mitigate inadvertent losses of drilling fluid. All waterbodies identified as fisheries of concern (potentially containing federal or state-listed species) would be crossed using dry crossing methods or HDDs. The *HDD Plan* indicates that if inadvertent returns occur within a waterway, NEXUS would notify appropriate parties and evaluate the potential impact of the returns in order to determine an appropriate course of action. In general, NEXUS does not believe that it is environmentally beneficial to try to contain and collect drilling fluid returns in a waterway, as HDD drilling fluids are nontoxic and discharge of the amounts normally associated with inadvertent returns, in most cases, do not pose a threat to the environment or public health and safety. NEXUS also contends that placement of containment structures and attempts to collect drilling fluid within a waterway often result in greater environmental impact than simply allowing the drilling fluid returns to dissipate naturally.

Overall, the impact of construction on fish and stream biota is expected to be localized and short term because in-stream conditions and suspended sediment concentrations would return to background condition levels soon after in-stream construction has been completed.

Loss of Stream Bank Cover

Stream bank vegetation and structure such as logs, rocks, and undercut banks provide important habitat for fish and stream biota. Open-cut construction through waterbodies would temporarily remove this habitat, which could displace fish and other stream biota to similar habitat upstream or downstream of the pipeline crossing. Displacement would result in increased competition for habitat and food sources, which could affect fish health and survival. Clearing of stream bank cover may also result in locally elevated water temperatures. Approximately 70.5 acres of riparian habitat (within 100 feet of waterbody banks) would be affected by the NGT Project.

Once construction is complete, streambeds and banks would be restored to pre-construction conditions to the fullest extent possible. Substrate such as rock and gravel would be returned to the stream. Stream bank vegetation is expected to recover over several months to a few years, although a 10-foot-wide area centered over the pipeline would be maintained in an herbaceous state in order to conduct periodic pipeline corrosion and leak surveys.

Fuel and Chemical Spills

An inadvertent release of fuel or equipment related fluids could impact water quality. The chemicals released during spills could have acute fish impacts, such as altered behavior, changes in physiological processes, or changes in food sources. Fish could also experience greater mortality if a large volume of hazardous liquid is spilled into a waterbody. Furthermore, ingestion of large numbers of contaminated fish could impact fish predators in the food chain.

NEXUS has developed and would implement a *SPCC Plan* that includes preventive measures such as personnel training, equipment inspection, and refueling procedures to reduce the likelihood of spills, as well as mitigation measures such as containment and cleanup to minimize potential impacts should a spill occur. Adherence to the *SPCC Plan* would prevent a large spill from occurring near surface waters because construction equipment fueling would be prohibited within 100 feet of the waterbody banks (except for water pumps, which would be placed in secondary containment structures), and hazardous material storage would be prohibited within 100 feet of waterbodies. If a small spill were to occur, adherence to measures in the *SPCC Plan* would decrease the response time for control and cleanup, thus avoiding or minimizing the effects of a spill on aquatic resources. Additionally, the *SPCC Plan* requires adequate supplies be available on all construction spreads of suitable absorbent material and any other supplies and equipment necessary for the immediate containment and cleanup of inadvertent spills. Training and lines of communication to facilitate the prevention, response, containment, and cleanup of spills during construction activities also are described in the *SPCC Plan*.

Hydrostatic Testing and Water Withdrawals

NEXUS would utilize surface waters for dust control and/or hydrostatic testing of the pipeline (see section 4.3). Surface water withdrawals could reduce stream flows and water levels and could entrain or impinge stream biota. Hydrostatic test water discharges to surface waters could change water temperature and dissolved oxygen levels, increase turbidity and stream flows, and contribute to stream bank and substrate scour. Additionally, the discharge of hydrostatic test water to different watershed basins could contribute to the spread of nuisance exotic and invasive organisms. These impacts could reduce fish and biota health or result in injury or mortality.

Impacts from surface water withdrawals and hydrostatic test water discharges would be minimized by:

- adhering to the measures in NEXUS' construction and restoration plans, which prevent water withdrawals from and discharges to exceptional value waters or waters that provide habitat for federally listed threatened and endangered species, unless approved by applicable resource and permitting agencies;
- screening and positioning water intakes at the water surface to prevent the entrapment of fish and other biota;
- maintaining adequate flow rates to protect aquatic species;
- placing water pumps in secondary containment devices to minimize the potential for fuel spills or leaks;
- regulating discharge rates; and
- using energy dissipating devices and sediment barriers to prevent erosion, streambed scour, and sedimentation.

NEXUS also would be required to obtain and comply with state water withdrawal and discharge permits.

Aboveground Facilities and Access Roads

Construction of aboveground facilities would not cause noticeable fisheries impacts. NEXUS would implement its *E&SCP* to prevent sediment from entering adjacent waterbodies. Access road use and the placement of temporary or permanent bridges could temporarily impact waterbodies by increasing sedimentation and turbidity, reducing available stream habitat, and limiting fish passage. These impacts would displace fish and other stream biota to similar habitat upstream or downstream of the bridges, which could lead to increased competition for habitat and food sources, affecting fish survival and health.

Blasting

If blasting would be required adjacent to waterbodies, stream flow would be maintained and care would be taken to avoid damage to springs and other surface water resources. The contractor would comply with waterbody crossing timing windows and would conduct operations in accordance with the NGT Project *E&SCP*. Blasting procedures are discussed further in sections 2.3.1.3 and 4.3.1.2.

4.7.2.2 TEAL Project

The TEAL Project would cross 14 waterbodies, 5 of which are small, intermittent waterbodies, none of which are part of commercial fisheries or essential fish habitat. While the TEAL Project is within range of the channel darter, a state-listed species, the Project would not cross any waterbodies with channel darter habitat. The wet (open-cut) crossing method would be used on dry and/or minor waterbodies. In-stream work must be completed within 24 hours. The three larger waterbodies would be crossed using dry cuts methods. The flume or dam-and-pump dry crossing methods would minimize impacts on fish species by reducing sedimentation effects. Although fish passage would be restricted during crossing operations, dry cut crossings would be completed within 48 hours. Impacts on fish passage are expected to be minor and temporary. Texas Eastern does not anticipate that blasting would be necessary for any waterbody crossings. Hydrostatic test water would be taken from municipal sources or the Ohio River, and no streams in the TEAL Project area would be used for withdrawal. Implementation of Texas Eastern's *SPCC Plan* would further prevent impacts to fisheries and aquatic resources.

4.7.3 Conclusion

Based on our review of the potential impacts discussed previously, we conclude that construction and operation of the Projects would not significantly impact fisheries or aquatic resources. As described previously, the applicants have proposed several measures to avoid or minimize impacts on fisheries, and would be required to implement construction, mitigation, and restoration measures required by the USACE or state permitting agencies that would further minimize impacts. Based on our review, we also conclude that the measures the applicants would implement would not significantly impact fisheries of special concern, which are more sensitive to construction impacts or are held to a higher level of value or protection by state agencies.

4.8 SPECIAL STATUS SPECIES

Special status species are afforded protection by law, regulation, or policy by state and federal agencies. Special status species generally include federally listed species that are protected under the ESA, proposed or petitioned for listing under the ESA, considered as candidates for such listing by the FWS or NMFS, or state-listed as threatened, endangered, or other designations.

To assist in compliance with Section 7 of the ESA, the applicants, acting as the FERC's non-federal representative, initiated informal consultation with the FWS regarding federally listed species and designated critical habitat. The applicants also consulted with state agencies to identify state-listed and sensitive species that are known to occur in the general vicinity of the Projects. Prior to commencing field studies, the applicants consulted with the FWS Columbus Field Office and East Lansing Field Office, ODNR, MNFI, and MDNR to request known federal or state species records within a 1-mile-wide corridor of the proposed pipeline route. ODNR provided Natural Heritage Inventory information on November 13, 2014 and June 26, 2015, while MNFI provided data on October 9, 2014. Based on the information received from the agencies, the applicants evaluated the potential occurrence of protected species and their locations relative to the proposed pipeline route and facilities. Based on information from the agencies, 11 federally listed species (including proposed, petitioned, or candidate species) and 77 species protected at the state level could occur in the NGT and TEAL Projects area.

The applicants surveyed the NGT and TEAL Projects area to determine whether special status species habitat would be affected, using a generally 300-foot-wide survey corridor. Based on special status species habitat preferences and the results of the habitat surveys, the applicants, FWS, and state agencies determined which special status species have the greatest potential to be affected by the NGT and TEAL Projects. The narrowed list of special status species was then used to develop survey requirements and protocols. The survey plans identified which special status species required species-specific surveys, where the surveys should be conducted, and what time of year the surveys should be completed.

The applicants completed habitat and species surveys in 2015 and filed survey reports that outlined the survey methodologies, locations where surveys were conducted, and survey results. Surveys for protected species were continued and completed in 2016. The applicants would file the results of any remaining surveys as they are available.

4.8.1 Federally Listed Threatened and Endangered Species

Federal agencies, in consultation with the FWS and/or NMFS, are required by ESA Section 7(a)(2) to ensure that any action authorized, funded, or carried out by the agency would not jeopardize the continued existence of a federally listed threatened or endangered species or species proposed for listing, or result in the destruction or adverse modification of designated critical habitat. As the lead federal agency, the FERC is responsible for consulting with the FWS and/or NMFS to determine whether any federally listed endangered or threatened species or any of their designated critical habitats are near the proposed action, and to determine the proposed action's potential effects on those species or critical habitats. As stated in section 4.7.1.1, none of the waters in the NGT Project area are managed by the NMFS; therefore, consultation with NMFS is not required under the ESA.

For actions involving major construction activities that may affect listed species or critical habitats, a Biological Assessment (BA) must be prepared for those species that may be affected and, if it is determined the action may adversely affect a federally listed species, the lead agency must submit a request for formal consultation to comply with Section 7 of the ESA. FERC staff submitted a BA to the FWS for the NGT Project on October 20, 2016 (see appendix J-2). In response to our BA, the FWS would issue a Biological Opinion as to whether or not the federal action would likely adversely affect or jeopardize the continued existence of a listed species, or result in the destruction or adverse modification of designated critical habitat. We have determined the Projects may affect federally listed species and their designated critical habitats, which are further discussed in sections 4.8.1.1 and 4.8.1.2 for their respective projects.

Although proposed, petitioned, and candidate species and proposed critical habitat do not receive federal protection through the ESA, we considered the potential effects on these species and habitats so that Section 7 consultation could be facilitated in the event one or more of these species become listed before

or during construction of the Projects. Should a federally listed, proposed, petitioned, or candidate species be identified during construction that has not been previously identified during field surveys or assessed through consultation and project activities could adversely affect the species, the applicants are required to suspend the construction activity and notify the Commission and the FWS of the potential effects. The construction activity would not resume until the Commission completes its consultation with the FWS.

One proposed species, the eastern massasauga rattlesnake, has been identified as potentially occurring in the Projects area. In order to facilitate Section 7 requirements for the proposed eastern massasauga rattlesnake in the event the species becomes listed or the critical habitat becomes designated before or during project activity, potential effects on the species have been evaluated and mitigation measures are proposed as part of this EIS.

4.8.1.1 NGT Project

NEXUS, as the non-federal representative to the FERC, initiated informal consultation with the FWS. In a January 6, 2016 letter to the FERC, the FWS identified 10 federally listed species and 1 proposed species that are within the NGT Project area (FWS, 2016). These species are summarized in table 4.8.1-1.

Species	FWS Status ^a	State Status ^b	State Occurrence	Habitat	Determination of Effects
Indiana bat (<i>Myotis sodalis</i>)	E	OH – E MI – E	Ohio and Michigan	Inhabits caves and abandoned mines that provide cool and stable temperature during winter and then inhabit under loose bark of exfoliating trees or in tree hollows during the summer.	May Affect, Likely to Adversely Affect
Northern long-eared bat (<i>Myotis septentrionalis</i>)	T	OH – T MI – T	Ohio and Michigan	Hibernation sites used during the winter (caves, mines) and roosting sites for reproduction (tree cavities) during the summer.	May Affect, Likely to Adversely Affect
Kirtland's warbler (<i>Setophaga kirtlandii</i>)	E	OH - E	Ohio	Kirtland's warblers are known to migrate along the Lake Erie shoreline through Ohio in late April-May and late August-early October.	No Effect
Rayed bean mussel (<i>Villosa fabalis</i>)	E	OH – E MI – E	Ohio and Michigan	Small headwater creeks, but they are sometimes found in large rivers.	May affect, Not Likely to Adversely Affect
Northern riffleshell mussel (<i>Epioblasma torulosa rangiana</i>)	E	MI – E	Michigan	Large streams and small rivers in firm sand of riffle areas; also occurs in Lake Erie.	No Effect
Snuffbox mussel (<i>Epioblasma triquetra</i>)	E	OH – E MI – E	Michigan	Small- to medium-sized creeks in areas with a swift current and some larger rivers.	No Effect
Mitchell's satyr butterfly (<i>Neonympha mitchellii mitchellii</i>)	E	MI – E	Michigan	Fens; wetlands characterized by calcareous soils that are fed by carbonate-rich water from seeps and springs.	No Effect
Powesheik skipperling (<i>Oarisma poweshiek</i>)	E	MI – T	Michigan	Wet prairie fens.	No Effect
Karner blue butterfly (<i>Lycaeides melissa samuelis</i>)	E	OH – E MI – T	Michigan	Pine barrens and oak savannas on sandy soils and containing wild lupines (<i>Lupinus perennis</i>).	No Effect
Eastern prairie fringed orchid (<i>Platanthera leucophaea</i>)	T	OH – T MI – E	Ohio and Michigan	Wet prairies, sedge meadows, and moist roadside ditches. Typically restricted to sandy or peaty lakeshores or bogs.	No Effect
Eastern massasauga rattlesnake (<i>Sistrurus catenatus</i>)	P	OH – E MI – SC	Ohio and Michigan	Wet prairies, sedge meadows, and early successional fields, preferred wetland habitats are marshes and fens.	No Effect

TABLE 4.8.1-1 (cont'd)

Summary of Effects on Federally Listed Species for the NGT Project						
Species	FWS Status ^a	State Status ^b	State Occurrence	Habitat	Determination of Effects	
a Federal Status: E = Endangered, T = Threatened, P = Proposed. b State Status: E = Endangered, T = Threatened, SC = Special Concern. Source: FWS, 2016						

Indiana Bat

The Indiana bat is a federally listed endangered species and is state-listed endangered in both Ohio and Michigan. The Indiana bat occurs in forests and caves from the east coast to Midwestern United States, primarily inhabiting regions in the Midwest (FWS, 2006). During the fall, from August through October, Indiana bats congregate at hibernation sites (i.e., hibernaculum) including caves and abandoned mine shafts, where bats engage in mating activities. During this time, bats also forage the surrounding areas to build fat reserves needed for hibernation (FWS, 2006). From October through April, Indiana bats hibernate in these areas, preferring cool, humid caves with stable temperatures under 50 °F. There are hibernacula located within Ohio and Michigan, and potential for this species to be located within each of the counties crossed by the NGT Project (FWS, 2006). Indiana bats emerge from hibernacula between mid-April and late May and again forage in areas typically within 10 miles of hibernaculum sites. Small maternity colonies are then formed under exfoliating bark for the duration of the summer months (FWS, 2006). Roosting colonies are commonly found in bottomland or riparian areas, but may also include some upland forests and pastures.

Roost trees commonly include mixed mesophytic hardwoods and mixed hardwood-pine stands (FWS, 2006). According to the FWS, potential roosting habitats are those with at least 16 suitable trees per acre. Suitable trees include live shagbark hickory over 9 inches in diameter at breast height (dbh); dead, dying, or damaged trees of any species over 9 inches dbh with at least 10 percent exfoliating bark; den trees, broken trees, or stumps over 9 inches in dbh and over 9 feet in height; or live trees of any species over 26 inches dbh (FWS, 2006).

Indiana bats often forage in both riparian and upland forests, as well as cropland borders and wooded fencerows. Preferred habitat include streams and associated floodplain forests, and impounded bodies of water, including ponds and reservoirs. Indiana bats search for flying insects at or near the canopy at night and similar to other bat species, utilize openings in the forest, such as stream corridors and rights-of-way to feed (FWS, 2006). Construction could temporarily cause stream sedimentation that could affect insects that are part of the bat's diet, and noise from the operation of a compressor station could interfere with bat navigation, making it difficult to locate insects. However, these indirect impacts are likely to be inconsequential and will not adversely impact Indiana bat populations in the NGT Project area. Construction and operation of the project could impact Indiana bat through direct mortality if clearing affected occupied roost trees, or indirectly through habitat loss and disruption.

NEXUS conducted mist-net surveys in 2015 and 2016 in areas along the NGT Project route. Surveys were not required in areas where the Indiana bat had previously been confirmed. Surveys were conducted outside of previous capture areas in Wayne, Medina, Lorain, Erie, Sandusky, Wood, Lucas, and Fulton Counties, Ohio, and in all Michigan counties associated with the NGT Project route. NEXUS drafted a survey plan following FWS and ODNR guidance and MDNR deferred to FWS regarding the mist net survey protocols. Survey reports were submitted to FWS on December 14, 2015. This report was amended to include the 2016 survey results. No Indiana bats were detected during the 2015 or 2016 summer presence/absence surveys, demonstrating probable absence of Indiana bats in these portions bat of the NGT Project area. NEXUS also conducted habitat assessment surveys within areas where there are known

Indiana bat records. Additionally, portal searches in 2015 and 2016 determined that no caves or abandoned mines would be affected by the NGT Project.

Construction and operation of the Project could impact Indiana bat through direct mortality if clearing affected occupied roost trees, or indirectly through habitat loss and disruption. NEXUS would conduct tree clearing within the winter clearing timeframe (i.e., October 1 through March 31) to the maximum extent possible. Tree clearing would be prioritized to clear known Indiana bat habitat first. In the event that tree clearing cannot be completed during the winter clearing window, NEXUS would prioritize clearing based on their *Clearing Contingency Plans* as described in section 3.8.1 of the BA. NEXUS has committed to not clear trees in known Indiana bat occupied suitable habitat when pups are non-volant between June 1 and July 31 in order to minimize potential direct impacts on bats.

Additionally, NEXUS has avoided impacting greenfield forested areas to the extent practicable, which is evidenced by 92 percent of the NGT Project route being either co-located with existing utility corridors or located in active agricultural areas. Where possible, the NGT Project has been designed to avoid isolated woodlots in areas with heavy agricultural use. In several locations, the NGT Project has been routed away from existing utility corridors and into agricultural fields to avoid unnecessary impacts on forested areas and to avoid long-term indirect impacts on habitat. The route ensures that any effects on Indiana bats are insignificant or discountable in areas where seasonal tree clearing can be completed during the winter clearing window in confirmed occupied habitat. However, summer clearing of suitable roosting habitat within known occupied areas may cause take of individual bats. Therefore, we conclude the NGT Project *may affect, and is likely to adversely affect* the Indiana bat.

Northern Long-eared Bat

The northern long-eared bat is a federally-listed threatened species and is state-listed threatened in Ohio and Michigan. In Ohio, the northern long-eared bat is assumed present wherever suitable habitat occurs unless a presence/absence survey has been performed to document absence. Suitable summer habitat for northern long-eared bats consists of a wide variety of forested/wooded habitats that are used for roosting, foraging, and travel. This includes forests and woodlots containing potential roosts (i.e., live trees and/or snags greater than 3 feet dbh that have any exfoliating bark, cracks, crevices, hollows and/or cavities), as well as linear features such as fencerows, riparian forests, and other wooded corridors. These wooded areas may be dense or loose aggregates of trees with variable amounts of canopy closure. Individual trees may be considered suitable habitat when they exhibit the characteristics of a potential roost tree and are located within 1,000 feet (305 meters) of other forested/wooded habitat. Suitable habitat may also include some adjacent and interspersed non-forested habitats such as emergent wetland, agricultural fields, old fields, and pasture. Northern long-eared bats have also been observed roosting in human-made structures, such as buildings, barns, bridges, and bat houses; therefore, these structures should also be considered potential summer habitat. In the winter, northern long-eared bats hibernate in caves and abandoned mines.

Construction and operation of the project could impact northern long-eared bat through direct mortality if clearing affected occupied roost trees, or indirectly through habitat loss and disruption. Construction could temporarily cause stream sedimentation that could affect insects that are part of the bat's diet, and noise from the operation of a compressor station could interfere with bat navigation, making it difficult to locate insects. However, these indirect impacts are likely to be inconsequential and will not adversely impact northern long-eared bat populations in the NGT Project area.

The NGT Project is near several confirmed northern long-eared bat records in Sandusky, Erie, Wayne, Summit, Stark, Columbiana, and Carroll Counties, Ohio. The FWS Columbus Field Office provided detailed information on where the NGT Project intersects known northern long-eared bat habitat

and for these areas has recommended not clearing, to the maximum extent possible, upland and lowland woodlots and tree-lined corridors that provide forage sites to avoid adverse effects on the bat and its habitat.

NEXUS conducted desktop and field surveys for portals (e.g., hibernacula) within the NGT Project area. No portals were identified during the surveys; therefore, no potential hibernacula would be affected by the NGT Project. NEXUS also conducted summer presence/absence surveys in 2015 and 2016 within the NGT Project area that fall outside the northern long-eared bat record buffers. NEXUS drafted a survey plan following FWS and ODNR guidance. Eight northern long-eared bats were captured in Ohio during the survey; seven were successfully radio-tracked, resulting in the identification of multiple roost trees. No northern long-eared bats were captured in Michigan. There are, however, recent records within the range of the NGT Project in the MNFI database. Three northern long-eared bat roost trees were identified within 150 feet of the NGT Project workspace.

The northern long-eared bat was federally listed as a threatened species in May, 2015 with an interim 4(d) rule; effective February 16, 2016, the FWS finalized the 4(d) rule. The FWS has developed a map identifying counties containing hibernacula where bats have been found to exhibit White Nose Syndrome (WNS) and/or have tested positive for the fungus that causes WNS. These counties have been buffered by approximately 150 miles; within this area, the northern long-eared bat is considered to be at greater risk of population decline. For areas within the WNS zone, incidental take is prohibited under the circumstances described below. The FWS identified activities within the conditions below as “take prohibitions” that require incidental take permits and additional formal consultation:

- If take occurs within a hibernacula, regardless of season;
- If take results from tree-removal activities and the activity occurs within 0.25 mile of a known, occupied hibernacula; or,
- The activity cuts or destroys a known, occupied maternity roost tree or other trees within a 150-foot radius from the maternity roost tree during the pup season from June 1 through July 31.

NEXUS has verified with the FWS Columbus and East Lansing Field Offices there are no known hibernacula within 0.25 mile. Surveys for protected bat species identified three roost trees within 150 feet of the NGT Project workspace. Construction and operation of the Project could impact northern long-eared bat through direct mortality if clearing affected occupied roost trees, or indirectly through habitat loss and disruption. NEXUS would clear trees for the NGT Project between October 1 and March 31 to the maximum extent practicable. However, where clearing is required outside the winter clearing window in areas that fall outside the 150 foot roost tree buffer, no additional clearing restrictions would apply. Where clearing is required outside the winter clearing window in areas that fall within the 150 foot roost tree buffer, no clearing would be conducted when pups are non-volant between June 1 and July 31 in order to minimize potential direct impacts on bats.

Summer clearing of suitable roosting habitat within known occupied areas may cause take of individual bats. Therefore, we conclude the NGT Project *may affect, and is likely to adversely affect* the northern long-eared bat.

Kirtland’s Warbler

The Kirtland’s warbler is a federally listed endangered species and is state-listed endangered in Ohio. This small blue-gray songbird has a bright yellow-colored breast and is found in low scrub, thickets, and deciduous woodland (Mayfield, 1992). This warbler migrates through Ohio in the spring and fall,

traveling between breeding grounds in north-central North America and wintering grounds in the Bahamas. While migration occurs in a broad front across the entire state, approximately half of all observations in Ohio are within 3 miles of Lake Erie. During migration, individual birds usually forage in scrub-shrub or forested habitats and only stay in the area for a few days.

The current location of the NGT Project is more than 3 miles from Lake Erie, and suitable habitat within the NGT Project corridor would be avoided. Therefore, we conclude the NGT Project would have *no effect* on the Kirtland's warbler.

Rayed Bean

The rayed bean is a federally listed endangered species and is state-listed endangered in both Ohio and Michigan. The rayed bean is a small freshwater mussel about 1.5 inches long as an adult. The shell can be brown, green, or yellow-greenish in coloration with wavy, dark-green lines. Sand or gravel and margins of water willow beds of headwater creeks and larger rivers make up the typical habitat of this species. In Ohio, the rayed bean is known to occur in the Lake Erie basin including recent records in Swan Creek, which flows through Fulton and Lucas Counties, Ohio. In Michigan, the rayed bean mussel is known to occur in the Huron River and River Raisin.

NEXUS conducted mussel surveys in Swan Creek, the Huron River, and the Sandusky River in Ohio between August and September 2015; no live rayed bean mussels were identified in these areas. Surveys conducted in the Vermillion River identified rayed bean shell fragments within the waterbody. In Michigan, live individuals were present in the River Raisin during mussel surveys. The Vermillion River and River Raisin would all be crossed using HDD methods, which would avoid any direct impacts on this species. Potential impacts from inadvertent releases of drilling mud during the HDD activities would be minimized by the implementation of NEXUS' *HDD Plan*. This plan states that in the event of an inadvertent drilling fluid return within a waterway, NEXUS would immediately contact applicable agencies by telephone and/or e-mail detailing the location and nature of the inadvertent return, corrective actions being taken, and whether the inadvertent return poses any threat to the environment or public health and safety.

The applicant has performed a risk identification and assessment for each waterbody being crossed utilizing HDD methods. The River Raisin crossing is considered to have a "low" level of risk of an inadvertent return. The Vermilion River crossing is determined to have an "average" level of risk. The Vermilion River is proposed to be crossed using the HDD crossing method. A letter from the Department of the Interior dated August 22, 2016 states that the rayed bean is currently considered extirpated from the Vermillion River. As such, no impacts are expected on the rayed bean in this waterbody. Therefore we conclude that the NGT Project *may affect, but is not likely to adversely affect* the rayed bean mussel. The FWS concurred with this determination on October 21, 2016.

Northern Riffleshell

The northern riffleshell is a federally listed endangered species and is state-listed endangered in Michigan. The northern riffleshell is considered a moderately sized mussel reaching 2 inches. The shell of the northern riffleshell is ovate to quadrate in shape and becomes thicker toward the anterior. The color of the shell can range from light greenish-yellow to an olive green, with narrow, dark, closed-spaces rays. The northern riffleshell is typically observed in well-oxygenated large streams or rivers with sand and coarse gravel. The species historically occurred in Macon Creek, a tributary of River Raisin, as well as the Huron River in Michigan.

NEXUS completed mussel surveys in Macon Creek and the Huron River in September 2015. No northern riffleshells were observed during the surveys. Additionally, the Huron River would be crossed by the HDD method. Therefore, we conclude that the NGT Project would have *no effect* on the northern riffleshell mussel.

Snuffbox

The snuffbox mussel is a federally listed endangered species and is state-listed endangered in both Ohio and Michigan. The snuffbox is a thick-shelled and triangular shaped species that is about 2 inches in length, with males typically larger than females. Coloration is light yellowish with numerous dark-green rays that are broken intermediately. This mussel inhabits small- to medium-sized rivers but can be found in larger waterbodies. During project coordination, the FWS indicated this species could occur in the Huron River near the NGT Project area in Michigan. Surveys were completed in 2015 and no snuffbox or its habitat were identified. Furthermore, the Huron River would be crossed by the HDD method. Therefore, we conclude that the NGT Project would have *no effect* on the snuffbox mussel.

Mitchell's Satyr Butterfly

The Mitchell's satyr butterfly is a federally listed endangered species and is state-listed endangered in Michigan. Mitchell's satyr is a medium-sized, brown butterfly with black circular eyespots outlines in distinctive orange rings. This butterfly inhabits prairie fens, geologically and biologically unique wetland communities. Hydrological processes are critical in maintaining the vegetative structure and ultimately the habitat for the Mitchell's satyr. Even minor alterations of the hydrology in these areas can significantly alter and even eliminate suitable fen habitat and increase woody plant species incompatible with the butterfly's life cycles.

The FWS identified a historic occurrence element for the species in Washtenaw County, Michigan, and indicated the Mitchell's satyr could occur near the NGT Project. NEXUS completed botanical surveys and confirmed that no prairie fens or large undisturbed grasslands would be affected by the NGT Project. Due to lack of suitable habitat, we conclude that the NGT Project would have *no effect* on the Mitchell's satyr.

Poweshiek Skipperling

The Poweshiek skipperling is a federally listed endangered species and is state-listed threatened in Michigan. The Poweshiek skipperling is a small butterfly with dark brown and orange wings with a lighter brown and prominent white veins on the underside of the wing. This butterfly lives in high-quality prairie habitats and is typically found in select upland or wet tallgrass prairies. In Michigan, the skipperling has been found mainly in prairie fen habitats. The FWS noted occurrence records for Washtenaw County, Michigan. The majority of the NGT Project route in Michigan is within active agriculture, commercial, or industrial land uses. NEXUS completed botanical surveys and confirmed that no prairie fens or large undisturbed grasslands would be affected by the NGT Project. Therefore, we conclude that the NGT Project would have *no effect* on the Poweshiek skipperling.

Karner Blue Butterfly

The Karner blue butterfly is a federally listed endangered species, is state-listed endangered in Ohio, and is state-listed threatened in Michigan. The Karner blue butterfly has four stages in its lifecycle: the egg, larva, pupa, and adult. There are two generations per year, with the first adults appearing in late May to mid-June. The second brood of adults, emerging in mid-July to early August, lay their eggs singly in dried lupine seed pods or near the ground on the lupine stems. Eggs of the second brood hatch the

following May. Additionally, although the Karner blue adults are nectar-feeders, the larvae are highly specialized and feed exclusively on the wild lupine (*Lupinus perennis*) leaves. Without lupine, the butterfly populations would not survive (FWS, 2008b).

According to the FWS, no impacts on this species are anticipated in Ohio (FWS, 2014). In Michigan, the species distribution is limited to pine and scrub oak habitats scattered among open grassy areas, commonly within wild lupine habitat (FWS, 2008b). The FWS identified this species as potentially occurring near the NGT Project in Michigan. NEXUS conducted botanical surveys and confirmed that neither oak savanna nor wild lupine is located within the NGT Project area. Therefore, we conclude that the NGT Project would have *no effect* on the Karner blue butterfly.

Eastern Prairie Fringed Orchid

The eastern prairie fringed orchid is a perennial, upright, leafy stem plant that ranges from 8 to 40 inches in height. This plant has 3- to 8-inch lance-shaped leaves with one single flower cluster called an inflorescence. More specifically, the single flower spike is comprised of anywhere from 5 to 40 creamy-white flowers. The eastern prairie fringed orchid is primarily located in sandy or peaty lakeshores or bogs. The orchid thrives in low-competition and grass- and sedge-dominated communities where natural processes, such as seasonal flooding or disturbance, maintain the early successional stage (Penskar and Higman, 2000).

Previous records place the orchid in Wayne and Sandusky Counties in Ohio, and Monroe and Washtenaw Counties in Michigan. NEXUS completed eastern prairie fringed orchid surveys, including habitat assessment and meander surveys, in all areas identified as potential habitat along the NGT Project route. No individuals were located within the NGT Project area. Therefore, we conclude that the NGT Project would have *no effect* on eastern prairie fringed orchid.

Eastern Massasauga Rattlesnake

The eastern massasauga rattlesnake is currently proposed for listing as threatened under the ESA; critical habitat has not been proposed at this time. While proposed species are not afforded protections under the ESA, once a listing becomes effective, prohibitions against take and jeopardizing the species' continued existence apply. A final decision whether to list the species is expected in 2016; if the species is listed as threatened, as proposed, Section 7 consultation will need to be reinitiated for the species.

The eastern massasauga exists in disjunctive population segments near both wetland habitats and along forest edges in Michigan and Ohio (MNFI, 2007). Populations in southern Michigan and Ohio typically use shallow, sedge- or grass-dominated wetlands, while those in northern Michigan prefer lowland coniferous forests. This species also requires sunny areas with scattered shade to exist with thermoregulation, so it will avoid heavily wooded or closed canopy areas. It is typical for massasauga to hibernate from the end of October through April in the hummocked wetland landscapes and move to drier upland areas along fields and old wood edges for hunting purposes in the summer months (New York State Department of Environmental Conservation, 2015).

NEXUS performed a habitat analysis to determine if suitable habitat for eastern massasauga would be impacted by the NGT Project. No suitable habitat for this species was found in Ohio along the NGT Project route; as such, no field or presence/absence surveys were conducted in Ohio in 2016. In Michigan, 10 potential habitat sites were identified through desktop review and 2 sites were confirmed as suitable massasauga habitat during field habitat surveys. Fall season presence/absence surveys were conducted in 2015 at the two sites with confirmed suitable habitat and no individuals observed. Spring emergence

surveys were conducted in May 2016 at both locations; no individuals were observed. The FWS agrees that the surveys, as conducted, are adequate to determine the species is not present in the Project area.

At this time, the FWS recommends project applicants in the range of eastern massasauga rattlesnake to consider voluntary conservation measures in areas of known or suspected massasauga habitat. These include minimizing ground disturbance in areas of potential massasauga habitat, and limiting the operation of vehicles and equipment, clearing of trees, and other construction-related activities in known or presumed occupied massasauga habitat to between October 31 and March 15 and when the ground is frozen and air temperatures are less than 45°F. During this time, under these conditions, eastern massasaugas are most likely underground and are less likely to be impacted by these activities.

Based on the survey findings, we have determined that the NGT Project would have *no effect* on the eastern massasauga in Ohio.

4.8.1.2 TEAL Project

Texas Eastern, as the non-federal representative to the FERC, initiated informal consultation with the FWS. In a January 6, 2016 letter to the FERC, the FWS identified 10 federally listed species and 1 proposed species within range of the TEAL Project. These species are summarized in table 4.8.1-2.

Species	FWS Status ^a	State Status ^b	Habitat	Determination of Effects
Indiana bat (<i>Myotis sodalis</i>)	E	OH – E	Inhabits caves and abandoned mines that provide cool and stable temperature during winter, and then inhabits under loose bark of exfoliating trees or in tree hollows during the summer.	No effect
Northern long-eared bat (<i>Myotis septentrionalis</i>)	T	OH – T	Hibernation sites used during the winter (caves, mines) and roosting sites for reproduction (tree cavities) during the summer.	May affect, incidental take is not prohibited
Eastern massasauga rattlesnake (<i>Sistrurus catenatus</i>)	P	OH – E	Wet prairies, sedge meadows, and early successional fields, preferred wetland habitats are marshes and fens.	No effect

a Federal Status: E = Endangered, T = Threatened, P = Proposed.
b State Status: E = Endangered, T = Threatened
Source: FWS, 2016

Indiana Bat

Life history information for Indiana bat is included in the previous NGT Project-specific section.

Texas Eastern conducted mist-net surveys for protected bat species in 2016 along the 4.4 mile proposed pipeline loop. Texas Eastern drafted a survey plan following the FWS 2016 *Range-wide Indiana Bat Summer Survey Guidelines*. Survey reports were submitted to FWS on May 18, 2016. No Indiana bats were detected during the 2016 summer presence/absence surveys, demonstrating probable absence of Indiana bats in TEAL Project area. Texas Eastern conducted portal searches during spring 2015 and no cave/mine portals were identified. Texas Eastern has also committed to winter tree clearing (i.e., October 1 through March 31). Therefore, we believe the TEAL Project will have *no effect* on the Indiana bat. Consultation for the Indiana bat is complete for the TEAL Project as of October 4, 2016.

Northern Long-eared Bat

Life history information for northern long-eared bat is included in the previous NGT Project-specific section.

Texas Eastern conducted mist-net surveys for protected bat species in 2016 along the 4.4 mile proposed pipeline loop. Texas Eastern drafted a survey plan following the FWS *2016 Range-wide Indiana Bat Summer Survey Guidelines*. Survey reports were submitted to FWS on May 18, 2016. Fourteen northern long-eared bats were captured during 2016 field surveys. One female bat was fitted with a radio transmitter. This bat was then tracked to three separate roost trees, one of which falls within 150 feet of the Project workspace. Texas Eastern conducted portal searches in spring 2015; no cave/mine portals were identified. Texas Eastern has verified with the FWS Columbus Field Office that there are no known hibernacula within 0.25 mile and no maternity roost trees within 150 feet of the TEAL Project. Texas Eastern has committed to clearing trees for the TEAL Project between October 1 and March 31. Impacts to the species are expected only if tree clearing in occupied suitable habitat takes place in spring and/or summer. Texas Eastern would utilize the final 4(d) rule for the northern long-eared bat in the event that it cannot adhere to winter clearing timelines. Texas Eastern would institute the summer clearing restrictions as defined in the final 4(d) rule. FERC, as the lead federal agency, has chosen to rely upon the finding of the programmatic Biological Opinion developed by FWS on January 5, 2016 to fulfill its Section 7 consultation obligations for this species. In order to avail ourselves of this streamlined consultation process, FERC must provide the FWS a completed Northern Long-Eared Bat 4(d) Rule Streamlined Consultation Form a minimum of 30 days before the onset of project activities. FERC must provide information pertaining to the amount of tree clearing (i.e., acreages) and the timing of clearing. If the FWS does not respond to the submission within 30 days, we may presume the determination is correct, and consider our Section 7 responsibilities are fulfilled for this species.

Therefore, we have concluded that the TEAL Project *may affect, but incidental take is not prohibited* for the northern long-eared bat. On October 4, 2016, we submitted our Northern Long-Eared Bat 4(d) Streamlined Consultation Form to the FWS. As such, consultation for the northern long-eared bat the TEAL Project is complete.

Eastern massasauga rattlesnake

Life history information for the eastern massasauga rattlesnake is included above in the previous NGT Project-specific section.

Although the TEAL Project is within the range of the eastern massasauga rattlesnake, the FWS has indicated that the TEAL Project area does not contain suitable habitat for the species (FWS, 2015). Therefore, we have determined that the TEAL Project would have *no effect* on the eastern massasauga.

4.8.1.3 Conclusion

We have recommended avoidance and mitigation measures where we believe the Projects, as proposed, would not adequately support certain federally listed species' conservation needs or agency-recommended conservation measures. We note that implementation of these recommendations would minimize impacts on federally listed species and their habitat associations (e.g., wetlands, waterbodies, sand ridges).

Based on the analysis contained in the BA, and with the implementation of the mitigation/conservation measures proposed by NEXUS, NEXUS' *Plan and Procedures*, and recommendations included in this EIS, we have determined that the **NGT Project:**

- would have *no effect* on eight federally listed species: Kirtland’s Warbler (*Setophaga kirtlandii*), Karner blue butterfly (*Lycaeides melissa samuelis*), Mitchell’s satyr butterfly (*Neonympha mitchelli mitchelli*), Poweshiek skipperling (*Oarisma poweshiek*), northern riffelshell mussel (*Epioblasma torulosa rangiana*), snuffbox mussel (*Epioblasma triquetra*), eastern prairie fringed orchid (*Platanthera leucophaea*), and eastern massasauga (*Sistrurus catenatus catenatus*);
- *may affect, but is not likely to adversely affect* the rayed bean (*Villosa fabalis*);
- *may affect, and is likely to adversely affect* both the Indiana bat (*Myotis sodalis*) and northern long-eared bat (*Myotis septentrionalis*); and
- would have *no effect* on designated critical habitat for the Poweshiek skipperling or Indiana bat.

Based on the implementation of the mitigation/conservation measures proposed by Texas Eastern, Texas Eastern’s *Plan* and *Procedures*, and recommendations included in this EIS, we have determined that the **TEAL Project**:

- would have *no effect* on the eastern massasauga (*Sistrurus catenatus catenatus*);
- would have *no effect* on the Indiana bat (*Myotis sodalis*);
- *may affect, but incidental take is not prohibited* for the northern long-eared bat (*Myotis septentrionalis*); and
- would have *no effect* on designated critical habitat for the Poweshiek skipperling or Indiana bat.

These determinations are based on consultations with the FWS and our own analyses. Thus, we conclude that Projects-related impacts on federally listed species would be reduced to levels that would not threaten a species population viability, or contribute to trends toward extinction. The FWS confirmed that Section 7 consultation is complete for the TEAL Project on October 4, 2016.

Because consultations are ongoing for federally listed species, **we recommend that:**

- **NEXUS should not begin construction activities until:**
 - a) the staff receives comments from the FWS regarding the proposed actions;**
 - b) the staff completes formal consultation with the FWS; and**
 - c) NEXUS has received written notification from the Director of OEP that construction or use of mitigation may begin.**

4.8.2 State-listed Species

In Ohio, the Ohio Division of Wildlife (OHDW) has legal authority over Ohio’s fish and wildlife, while the Ohio Division of Natural Areas and Preserves (OHDNAP) has authority over rare plants. In Michigan, the MDNR is responsible for special status plant and animal species. Records of rare species and

unique natural features are maintained in the MNFI natural heritage database, administered by the Michigan State University Extension service.

Ninety-one species that are state-listed as threatened, endangered, or of special concern have been identified as potentially present in the Projects area (see appendix J-1). Fourteen (14) of these species are also federally listed or proposed for federal listing. Eleven (11) of these are discussed above in section 4.8.1 and 3 federally listed were determined to not be present in the Projects area. The Projects would not impact 58 species; suitable habitat is not present in the Projects area, surveys have determined the absence of individuals, or the Projects have been routed to avoid suitable habitat. The remaining 19 species which have the potential to be impacted by the Projects are discussed in greater detail below.

Impacts on state-listed species may be greater than impacts on other vegetation and wildlife because these species may be more sensitive to disturbance, more specific to a habitat, and less able to move to unaffected suitable habitat that may not be available (or currently exists only in small tracts). Disturbances could therefore have a greater impact on a species' population. Potential impacts that could affect a species' conservation needs or decrease a population's viability include habitat fragmentation, loss, or degradation; decreased breeding or nesting success; increased predation or decreased food sources; and injury or mortality.

Potential impacts and corresponding minimization or mitigation measures are often related to a species' habitat associations. For example, the clearing and removal of grassland could have similar effects on the grasshopper sparrow, regal fritillary, Canadian milk vetch, and other grassland species. Corresponding measures to minimize impacts on scrub habitat, particularly within high-quality or important habitat, often benefit all grassland associate species. Similarly, measures that are implemented to minimize impacts on freshwater marshes would benefit all species within that habitat association.

The applicants have proposed measures to reduce habitat and species impacts, and continue to consult with resource agencies to identify and develop additional conservation and mitigation measures to further minimize impacts on state-listed species. For instance, the applicants have committed to following ODNR recommendations to prevent impacts on the barn owl by avoiding barns, silos, and abandoned structures in areas with documented records of this owl. Additionally, the applicants have committed to tree clearing restrictions to avoid adverse impacts on sensitive species. State permitting agencies have further opportunity during their permit review and authorization processes to require additional conservation and mitigation measures that would further protect and conserve sensitive species and their habitats according to each agencies' mission and conservation goals.

4.8.2.1 Mammals

The evening bat is the only exclusively state-listed mammal species identified in the NGT Project area as being potentially impacted by the Projects. The federally listed northern long-eared bat and the Indiana bat are also listed as threatened and endangered at the state level in Ohio, respectively; potential impacts on these species has been discussed previously in section 4.8.1.

The evening bat (*Nycticeius humeralis*) is listed as threatened in the state of Michigan. The evening bat is a small, forest-dwelling bat found in the U.S. from the East Coast west to eastern Nebraska and south through East Texas; in Michigan, it is found only in the southern portion of the state (Sargent and Carter 1999). The pelage is bicolored above (dark brown at the base and dull grayish brown at the tips) and lighter brown below (TPWD 2016). The species is differentiated from most other small bats by a curved and rounded tragus and two upper incisors as opposed to the four present in many myotids (TPWD 2016, MNFI 2007, Sargent and Carter 1999). The evening bat roosts behind loose bark and tree crevices, and can sometimes be found roosting in buildings. The species does not utilize caves, but may participate in

swarming activities at cave entrances in late summer (TPWD 2016, Arroyo-Cabrales and Álvarez-Castañeda 2008). Evening bats utilize echolocation to identify beetles, moths leafhoppers and flies, which they capture and consume in flight (Neely 2003). In the northern portions of the range, evening bats may be migratory. Female evening bats migrate north to maternity colonies in spring, while males stay in the southern portion of the range year-round. Females tend to migrate south from northern colonies in October (Neely 2003).

Mist-net surveys were conducted during the summer in 2015 and 2016 within the Project survey area in Michigan; two evening bats were captured and radio-tagged, neither of which were successfully tracked back to roost trees. Based on the survey results, modifications were made to the route to avoid potentially suitable habitat. All suitable roosting habitat within 1 mile of the evening bat captures has been avoided either by reroutes or by implementation of HDD. As suitable habitat has been avoided, impacts on the evening bat are not anticipated. The MIDNR concurred with this conclusion on October 10, 2016.

4.8.2.2 Birds

Eight state-listed bird species have been identified in the Projects area as being potentially impacted by the Projects; 7 in Ohio and 1 in Michigan. The American bittern, black tern, king rail, northern harrier, sandhill crane, trumpeter swan, and upland sandpiper all have the potential to occur in the Project area in Ohio (ODNR, 2015A). A review of the MNFI identified records for the grasshopper sparrow within 1 mile of the Project route in Michigan; it is state-listed as a species of special concern. Impacts on habitat that supports these species should be avoided during the relevant timeframes, to the extent practicable, to avoid impacts on the species as discussed below.

The NGT and TEAL Projects are within the range of the American bittern (*Botaurus lentiginosus*), state-listed as endangered in Ohio. The bittern is a stocky, medium-sized heron found in large, undisturbed wetlands with scattered small pools and dense vegetation. Coloration is brown with tan stripes, and is well-camouflaged. The species also occasionally occupy bogs, large wet meadows, and dense shrubby swamps. These habitats could potentially exist within the NGT Project area. ODNR recommends if these types of habitats occur along the pipeline route, construction be avoided during the nesting period of May 1 to July 31 (ODNR, 2015A). Based on our recommendation below, we conclude that impacts on the American bittern would be temporary and minor.

The NGT Project is within the range of the black tern (*Chlidonias niger*), state-listed as endangered in Ohio. The species is found in large, undisturbed, densely vegetated inland marshes with pockets of open water. Cattail marshes are preferred for nesting, but will utilize various kinds of marsh vegetation. Nests are built on top of muskrat houses or over floating vegetation. ODNR recommends if these types of habitats occur along the pipeline route, construction be avoided during the nesting period of April 1 to June 30 (ODNR, 2015A). Based on our recommendation below, we conclude that impacts from the Project would be temporary and minor for the black tern.

The NGT Project is within the range of the king rail (*Rallus elegans*), state-listed as endangered in Ohio. Found in freshwater wetland habitats, the species is primarily associated with dense cattails stands and other thick marsh vegetation. The king rail constructs deep, bowl-shaped nests out of grass; these are well-hidden in marsh vegetation. ODNR recommends if these types of habitats occur along the pipeline route, construction be avoided during the nesting period of May 1 to August 1 (ODNR, 2015A). Based on our recommendation below, we conclude that impacts from the Project would be temporary and minor for the king rail.

The NGT Project is within the range of the northern harrier (*Circus cyaneus*), state-listed as endangered in Ohio and is a common migrant and winter species in the state. The northern harrier rarely

nests in the area, but may occasionally breed in large marshes and grasslands. ODNR recommends if these types of habitats occur along the pipeline route, construction be avoided during the nesting period of May 15 to August 1 (ODNR, 2015A). Based on our recommendation below, we conclude that impacts from the Project would be temporary and minor for the northern harrier.

The NGT Project is within the range of the sandhill crane (*Grus canadensis*), state-listed as endangered in Ohio. Primarily a wetland-dependent species, sandhill cranes utilize large tracts of wet meadow, shallow marsh, or bog wetlands for breeding and nesting. In the winter, sandhill cranes will forage in agricultural fields; however, they roost in shallow, standing water or moist bottomlands. If grassland, prairie, or wetland habitat will be impacted, construction should be avoided in this habitat during the species' nesting period of April 1 to September 1. With avoidance of nesting periods, the Project is not likely to have an impact on this species (ODNR, 2015A). Based on our recommendation below, we conclude that impacts from the Project would be temporary and minor for the sandhill crane.

The NGT Project is within the range of the trumpeter swan (*Cygnus buccinator*), state-listed as threatened in Ohio. Trumpeter swans inhabit large, shallow marshes, lakes, and wetlands ranging in size from 40 to 150 acres. They prefer a diverse mix of emergent and submergent vegetation and open water. If this type of habitat will be impacted, construction should be avoided in this habitat during the species' nesting period of April 15 to June 15. With avoidance of nesting periods, the Project is not likely to have an impact on this species (ODNR, 2015A). Based on our recommendation below, we conclude that impacts from the Project would be temporary and minor for the trumpeter swan.

The upland sandpiper (*Bartramia longicauda*) is state-listed as endangered in Ohio. A review of the ODNR Natural Heritage Database identified multiple records for this species within 1 mile of the NGT Project corridor. Nesting upland sandpipers utilize dry grasslands including native grasslands, seeded grasslands, grazed and ungrazed pasture, hayfields, and grasslands established through the CRP. These habitats may occur within the Project area. ODNR requested that construction should be avoided in this habitat during the species' nesting period of April 15 to July 31 (ODNR, 2015A). Based on our recommendation below, we conclude that impacts from the Project would be temporary and minor for the upland sandpiper.

The grasshopper sparrow (*Ammodramus savannarum*) is state-listed as special concern in Michigan. A review of the MNFI database documented the species within one mile of the Project area. The species is found in a wide variety of grassland habitats, specifically dry sites where grassy vegetation is dense and relatively tall. Special concern species are not protected under the state's endangered species legislation, but efforts should be taken to minimize all potential impacts to the species and its habitats (MNFI, 2014). The NGT Project does not cross grassland areas that are potential habitat for the grasshopper sparrow. As such, no impacts from the NGT Project are anticipated on the grasshopper sparrow. The MIDNR concurred with this conclusion on October 13, 2016.

4.8.2.3 Reptiles and Amphibians

Two exclusively state-listed reptiles have been identified in the Projects area in Ohio as being potentially impacted by the NGT Project. No exclusively state-listed reptile or amphibian species are expected to be impacted within the Project area in Michigan. The federally proposed eastern massasauga rattlesnake is also listed as endangered at the state level in Ohio; potential impacts on this species has been discussed previously in section 4.8.1.

The Blanding's turtle (*Emydoidea blandingii*) is state-listed as threatened in Ohio. A review of the ODNR Natural Heritage Database identified multiple records for the Blanding's turtle within 1 mile of the

NGT Project corridor (ODNR, 2015A). Blanding's turtles inhabit marshes, ponds, lakes, streams, wet meadows, and swampy forests but are also found in dry areas while moving from one wetland to another.

The spotted turtle (*Clemmys guttata*) is state-listed as threatened in Ohio. A review of the ODNR Natural Heritage Database identified multiple records for the spotted turtle within 1 mile of the NGT Project corridor. Much of the pipeline is within the range of the spotted turtle (ODNR, 2015A). Spotted turtles prefer fens, bogs, and marshes but may also inhabit wet prairies, meadows, pond edges, wet woodlands, and shallow, slow-moving streams or ditches.

The ODNR recommended a turtle habitat suitability survey be conducted by an approved herpetologist (ODNR, 2015A). Wetland data collected during field surveys has been evaluated for the presence of potentially suitable habitat for the species. The ODNR requested that if suitable habitat is found to be present along the Project route, presence/absence surveys be conducted for individual turtles. A total of 26 areas of potentially suitable habitat were identified during desktop surveys. A field review determined 8 sites were suitable habitat for Blanding's and/or spotted turtles.

At all sites determined to be suitable turtle habitat, NEXUS would install exclusion fencing and sweeps would be conducted prior to construction to ensure no individual turtles are trapped within the construction area. NEXUS would continue to consult with the state of Ohio and identify the need for any additional species-specific mitigation measures.

4.8.2.4 Insects

Ohio and Michigan state-listed insects may be impacted by the NGT Project. The ODNR Natural Heritage Database has records within one mile of the proposed pipeline corridor for the chalk-fronted corporal (*Ladona julia*), a state endangered dragonfly, the elfin skimmer (*Nannothemis bella*), a state endangered dragonfly, the marsh bluet (*Enallagma ebrium*), a state threatened damselfly, and the racket-tailed emerald (*Dorocordulia libera*), a state endangered dragonfly. Impacts to wetlands should be avoided and/or minimized to the fullest extent possible to avoid impacts these species (ODNR, 2015A). Based on our recommendation below, we conclude that impacts from the Project would be temporary and minor for state-listed dragonfly and damselfly species.

The proposed NGT pipeline route is within the range of Ohio state-listed butterflies, including the purplish copper (*Lycaena helloides*). Due to the location, and the type of work proposed, we do not anticipate impacts to the purplish copper butterfly species (ODNR, 2015A).

The pipevine swallowtail (*Ammodramus savannarum*) is state-listed as special concern in Michigan. A review of the MNFI database documented the species within one mile of the Project area. The species is found in open fields and railroad embankments near oak-hickory woods, or in open areas near deciduous woodlands. The eggs are laid in small clusters on Virginia snakeroot, wild ginger, or Dutchman's pipe. Special concern species are not protected under the state's endangered species legislation, but efforts should be taken to minimize all potential impacts to the species and its habitats (MNFI 2014). Botanical surveys conducted in Michigan did not identify Virginia snakeroot, wild ginger, or Dutchman's pipe. Due to the avoidance of natural habitats and the lack of the preferred plant host species, no impacts from the Project are anticipated on the pipevine swallowtail. The MIDNR concurred with this conclusion on October 13, 2016.

4.8.2.5 Plants

No state-listed plant species are expected to be impacted within Projects area in Ohio (see appendix J-1). Two state-listed plants have been identified in the Projects area in Michigan as being potentially impacted by the Projects.

The cup plant (*Silphium perfoliatum*) is state-listed as threatened in Michigan. A review of the MNFI database documented the species within one mile of the Project area, and the plant was identified during 2015 botanical field surveys. Native occurrences are all associated with rivers, particularly the Huron, Raisin, and Galien Rivers. However, the species can also be found as chance introductions along weedy railroad rights of way (Penskar and Crispin 2010). No individuals were identified within the Michigan portion of the NGT Project. Therefore, impacts on the cup plant from the Project are not anticipated. The MIDNR concurred with this conclusion on October 13, 2016.

Ginseng (*Panax quinquefolius*) is state-listed as threatened in Michigan. A review of the MNFI database documented the species within one mile of the Project area, and the plant was identified during 2015 botanical field surveys. The species is predominantly found in rich hardwoods, often on slopes or ravines, ranging even into swampy portions. It also occurs in wooded dune hollows and leeward slopes along the Lake Michigan shoreline (Penskar and Higman 1996). No individuals were identified within the Michigan portion of the NGT Project. Therefore, impacts on ginseng from the Project are not anticipated. The MIDNR concurred with this conclusion on October 13, 2016.

Based on the above discussion, we conclude that the NGT Project could impact certain state-listed threatened and endangered species. However, avoidance, conservation, and mitigation plans currently proposed and developed in consultation with the appropriate state agencies would minimize the potential impacts. After evaluation of potential impacts to Michigan listed species and implementation of avoidance and minimization efforts as discussed with the MIDNR, we have concluded that no impacts are anticipated to Michigan state-listed species, and that impacts to habitat will be temporary and minor. The MIDNR concurred with this conclusion on October 13, 2016. Additional mitigation measures may be developed through ongoing consultations, therefore, **we recommend that:**

- **Prior to construction, NEXUS and Texas Eastern should file with the Secretary any additional mitigation measures for state-protected species in Ohio developed in consultation with the applicable state agencies.**

4.9 LAND USE, RECREATION, SPECIAL INTEREST AREAS, AND VISUAL RESOURCES

As discussed in section 2.1.1, NEXUS is proposing to construct approximately 255 miles of new 36-inch-diameter natural gas pipeline and approximately 0.9 mile of new 36-inch-diameter interconnecting pipeline to the existing TGP system. Aboveground facilities associated with the NGT Project would include 4 new compressor stations, 5 new M&R stations, 16 MLVs, 4 pig launchers, 4 pig receiver facilities, and 5 communication towers (see table 2.1.1-2). The NGT Project pipeline would originate in Columbiana County, Ohio, extend through Ohio and Michigan, and connect with the existing DTE Gas system in Wayne County, Michigan.

In conjunction with the NGT Project, Texas Eastern is proposing to construct approximately 4.4 miles of 36-inch-diameter pipeline loop; 1,790 feet of 30-inch-diameter interconnecting pipeline to Texas Eastern's existing Line 73 with the NGT Project; one new compressor station; modifications to an existing compressor station; two pig launchers; and two pig receivers; to remove an existing launcher/receiver site; and to conduct piping modifications (see section 2.1.2). The TEAL Project would originate in Monroe County, Ohio, include portions of Belmont County, and terminate in Columbiana County, Ohio.

This section discusses the land requirements for construction and operation of the Projects, describes the current use of those lands, and provides an evaluation of project-related impacts. This section quantifies the acreage of each land use type that would be affected and discusses measures that would be taken to avoid, minimize, or mitigate land use impacts. Impacts on recreational and special interest areas, as well as impacts on visual resources, are also presented.

4.9.1 Environmental Setting

Six general land use types would be affected by the NGT and TEAL Projects. Table 4.9.1-1 summarizes the acreage of each land use type that would be affected. The definitions of each land use type are as follows:

- Forest/Woodland: Upland and wetland forest.
- Open Land: Utility rights-of-way, open fields, pasture, vacant land, herbaceous and scrub-shrub uplands, non-forested lands, emergent wetland, and scrub-shrub wetland.
- Agricultural: Active hayfields and cultivated cropland, including specialty crops.
- Industrial/Commercial: Developed areas, natural gas utility facilities, quarries, roads and paved areas, manufacturing or industrial plants, auto salvage and scrap yards, electric power facilities, railroads and rail yards, and commercial or retail facilities.
- Residential: Existing and planned residential development areas; low-, medium-, and high-density residential neighborhoods; and residentially zoned areas.
- Open Water: Waterbody crossings visible on recent aerial photography.

TABLE 4.9.1-1

Acreage Affected by Construction and Operation of the NGT and TEAL Projects

Project, Facility, State, Component	Forest/Woodland		Open Land		Agricultural		Industrial/ Commercial		Residential		Open Water		Total	
	Const. ^b	Op. ^c	Const.	Op.	Const.	Op.	Const.	Op.	Const.	Op.	Const.	Op.	Const.	Op.
NGT PROJECT														
Pipeline Facilities ^a														
Ohio														
Mainline	330.7	157.9	355.6	132.0	2,746.4	949.3	25.1	9.3	52.5	16.9	8.2	4.4	3,518.5	1,269.7
TGP Interconnect	1.9	0.3	6.0	2.3	7.3	2.7	0.4	0.1	0.0	0.0	0.0	0.0	15.6	5.5
Michigan														
Mainline	41.0	15.6	103.6	25.9	645.6	232.5	33.9	7.1	3.3	0.9	3.8	2.0	831.2	284.0
Pipeline Facility Total	373.6	173.8	465.2	160.2	3,399.3	1,184.5	59.4	16.5	55.8	17.8	12.0	6.4	4,365.3	1,559.1
Access Roads														
Ohio														
Access Roads	0.8	0.0	20.8	1.1	27.5	2.5	3.0	<0.1	7.6	0.1	<0.1	0.0	59.7	3.7
Michigan														
Access Roads	0.8	0.0	3.2	0.0	3.7	0.0	1.2	0.3	0.3	0.0	0.0	0.0	9.2	0.3
Access Road Total	1.6	0.0	24.0	1.1	31.2	2.5	4.2	0.3	7.9	0.1	0.0	0.0	68.9	4.0
Pipe/Contractor Yards														
Ohio														
Yard 1-1	0.0	0.0	0.2	0.0	17.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.2	0.0
Yard 2-1	0.0	0.0	<0.1	0.0	16.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.0	0.0
Yard 3-1a	0.0	0.0	0.1	0.0	22.1	0.0	0.2	0.0	0.0	0.0	0.0	0.0	22.4	0.0
Yard 3-1b	0.0	0.0	0.8	0.0	37.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	38.0	0.0
Yard 3-2	0.0	0.0	0.0	0.0	75.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	75.3	0.0
Michigan														
Yard 4-1	0.0	0.0	0.4	0.0	40.9	0.0	0.6	0.0	0.0	0.0	0.0	0.0	41.9	0.0
Yard 4-3	0.1	0.0	0.0	0.0	13.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.4	0.0
Yard 4-4	0.0	0.0	<0.1	0.0	0.0	0.0	9.9	0.0	0.0	0.0	0.0	0.0	9.9	0.0
Pipe/Contractor Yards Total	0.1	0.0	1.5	0.0	221.8	0.0	10.7	0.0	0.0	0.0	0.0	0.0	234.1	0.0
Meter, Regulation, and Receipt Stations														
Ohio														
MR01	0.0	0.0	<0.1	0.0	10.3	3.5	<0.1	0.0	0.0	0.0	0.0	0.0	10.3	3.5
MR02&03	0.0	0.0	<0.1	0.0	10.2	5.3	0.1	0.0	0.0	0.0	0.0	0.0	10.3	5.3
MR05	0.0	0.0	0.1	0.0	9.9	1.9	< 0.1	0.0	0.0	0.0	0.0	0.0	10.0	1.9
MR06	0.0	0.0	0.0	0.0	7.8	1.1	0.0	0.0	0.0	0.0	0.0	0.0	7.8	1.1
Michigan														
MR04	0.0	0.0	0.4	0.4	0.0	0.0	0.6	0.3	0.0	0.0	0.0	0.0	1.0	0.7

TABLE 4.9.1-1 (cont'd)

Acreage Affected by Construction and Operation of the NGT and TEAL Projects

Project, Facility, State, Component	Forest/Woodland		Open Land		Agricultural		Industrial/ Commercial		Residential		Open Water		Total	
	Const. ^b	Op. ^c	Const.	Op.	Const.	Op.	Const.	Op.	Const.	Op.	Const.	Op.	Const.	Op.
Meter Station Total	0.0	0.0	0.5	0.4	38.2	11.4	0.7	0.3	0.0	0.0	0.0	0.0	39.4	12.5
Compressor Stations														
Ohio														
Hanoverton (CS1)	0.0	0.0	8.5	2.7	84.8	25.0	0.0	0.0	0.0	0.0	0.0	0.0	93.3	27.7
Wadsworth (CS2)	0.0	0.0	14.8	0.9	43.5	21.1	0.1	0.0	5.6	0.0	0.0	0.0	64.0	22.0
Clyde (CS3)	0.0	0.0	0.4	0.1	59.1	37.1	0.1	0.0	0.0	0.0	0.0	0.0	59.6	37.2
Waterville (CS4)	0.0	0.0	0.1	0.0	37.1	33.0	0.1	0.0	0.0	0.0	0.0	0.0	37.3	33.0
Compressor Station Total	0.0	0.0	23.8	3.7	224.5	116.2	0.3	0.0	5.6	0.0	0.0	0.0	254.2	119.9
Staging Areas														
Ohio														
Staging Areas	0.0	0.0	8.8	0.0	29.0	0.0	0.3	0.0	1.0	0.0	0.0	0.0	39.3	0.0
Michigan														
Staging Areas	0.0	0.0	1.0	0.0	8.4	0.0	0.1	0.0	0.0	0.0	0.0	0.0	9.5	0.0
Staging Areas Total	0.0	0.0	9.8	0.0	37.4	0.0	0.4	0.0	1.0	0.0	0.0	0.0	48.8	0.0
NGT Project Total	375.3	173.8	524.8	165.4	3,952.4	1,315.5	75.7	17.1	70.3	17.9	12.0	6.4	5,010.7	1,696.0
TEAL PROJECT														
Proposed Pipeline Loop	17.0	4.9	30.4	18.7	5.3	2.8	0.2	0.1	N/A	N/A	0.4	0.2	53.3	26.7
Connecting Pipeline to NGT	0.0	0.0	1.0	0.4	4.7	1.5	1.1	0.1	N/A	N/A	0.0	0.0	6.9	2.0
ATWS	11.3	0.0	8.7	0.0	13.5	0.0	0.8	0.0	N/A	N/A	0.0	0.0	34.3	0.0
Access Roads	1.4	0.1	2.4	0.0	0.5	0.5	0.6	0.4	N/A	N/A	0.0	0.0	4.9	1.0
Proposed Salineville Compressor Station	0.0	0.0	1.2	0.0	39.8	11.5	0.1	0.1	N/A	N/A	0.0	0.0	41.0	11.6
Existing Colerain Compressor Station	0.0	0.0	51.2	0.0	0.0	0.0	10.9	0.0	N/A	N/A	0.0	0.0	62.1	0.0
Line 73 Launcher/Receiver Site	0.0	0.0	0.7	0.0	0.0	0.0	0.5	0.0	N/A	N/A	0.0	0.0	1.1	0.0
Line 73 Regulator site	0.0	0.0	9.0	4.7	0.0	0.0	0.4	0.0	N/A	N/A	0.0	0.0	9.4	4.7
TEAL Project Total	29.7	5.0	104.5	23.8	63.9	16.3	14.5	0.6	N/A	N/A	0.4	0.2	213.0	45.9
NGT and TEAL Projects Total	405.0	178.8	629.3	189.1	4,016.3	1,331.8	90.2	17.7	70.3	17.9	12.4	6.6	5,223.7	1,741.9

TABLE 4.9.1-1 (cont'd)

Acreage Affected by Construction and Operation of the NGT and TEAL Projects

Project, Facility, State, Component	Forest/Woodland		Open Land		Agricultural		Industrial/Commercial		Residential		Open Water		Total	
	Const. ^b	Op. ^c	Const.	Op.	Const.	Op.	Const.	Op.	Const.	Op.	Const.	Op.	Const.	Op.
a	Pipeline facility acreages include impacts from ATWS and MLVs. The 16 MLVs would permanently impact 0.8 acre of agricultural land and 0.2 acre forest/woodland.													
b	Project-specific construction right-of-way widths are discussed in the following sections. Note that impacts presented are based on the construction right-of-way widths for the entire length of both Projects' pipelines; however, the construction right-of-way would be reduced at certain locations (e.g., wetlands), some portions of the right-of-way would overlap with existing rights-of-way that have been previously disturbed, and/or the HDD method would be used to avoid direct impacts on land use.													
c	Project-specific permanent right-of-way widths are discussed in the following sections. Note that impacts presented are based on a typical permanent right-of-way width of 50 feet for the entire length of both Projects' pipelines; however, most land use types would be allowed to revert to pre-construction conditions, limited vegetation maintenance would be allowed in wetlands, some portions of the right-of-way would overlap with existing rights-of-way that are maintained, and/or the HDD method would be used to avoid direct impacts on land use.													
Note:	Due to rounding, some addends may be off by 0.1.													
	N/A = not applicable													

Construction of the Projects would temporarily affect a total of 5,223.7 acres of land, including 405.0 acres of forest/woodland, 629.3 acres of open land, 4,016.3 acres of agricultural land, 90.2 acres of industrial/commercial land, 70.3 acres of residential land, and 12.4 acres of open water. On a state-by-state basis, construction of the Projects would temporarily affect 4,307 acres in Ohio and 916 acres in Michigan.

Operation of the Projects would affect a total of 1,741.9 acres of land, including 178.8 acres of forest/woodland, 189.1 acres of open land, 1,331.8 acres of agricultural land, 17.7 acres of industrial/commercial land, 17.5 acres of residential land, and 6.6 acres of open water. Following construction, lands outside of the permanent right-of-way and at ATWS, staging areas, pipe/contractor yards, and temporary access roads would be allowed to revert to their original land use types. Pipeline operation would not change the general land use but would preclude construction of aboveground structures within the 50-foot-wide permanent right-of-way.

This section summarizes the impacts on each land use type as defined above. Section 4.3 provides more detailed information regarding Projects-related impacts on waterbodies, wetlands are discussed in more detail in section 4.4, and quarries are discussed in more detail in section 4.1. Also, section 4.5 provides a detailed discussion of the various vegetation types and communities affected by the Projects.

Lands required for construction would experience temporary to long-term impacts based on the time it would take the land to recover to pre-construction conditions. Impacts are generally considered temporary if the affected resource would recover to pre-construction conditions almost immediately after construction. Short-term impacts generally occur during construction with the resource returning to pre-construction conditions within 3 years following construction. Long-term impacts require anywhere from an estimated 3 to 50 years to return to pre-construction conditions. Permanent impacts would occur as a result of activities that modify resources to the extent that they would not return to pre-construction conditions within 50 years, such as clearing of old growth forest or conversion of land to an aboveground facility site.

4.9.1.1 Pipeline Facilities

Land use-related impacts associated with the NGT and TEAL Projects would include disturbance of existing uses within the right-of-way during construction and creation of a new permanent right-of-way for operation of the pipeline. NEXUS and Texas Eastern propose to generally use a 100-foot-wide construction right-of-way that includes the 50-foot-wide permanent right-of-way. In wetland areas, NEXUS and Texas Eastern would use a 75-foot-wide construction right-of-way.

NGT Project

The NGT Project would consist of 255.9 miles of 36-inch-diameter pipe. Predominant land uses are agricultural land (76.7 percent), open land (12.1 percent), and forest/woodland (7.9 percent). Residences and other structures within 50 feet of the construction workspace are discussed in section 4.9.4.1. The remaining 3.2 percent of the land is comprised of commercial/industrial, residential, and open water.

In general, land use-related impacts associated with the NGT Project would include disturbance of existing land uses within the construction right-of-way during construction and retention of a new permanent right-of-way for operation of the pipeline. In addition to the typical construction right-of-way, ATWS adjacent to the outer dimensions of the construction right-of-way would be required to facilitate construction at road, railroad, utility, wetland, and waterbody crossings, as well as for areas requiring specialized construction techniques such as steep side slopes, bedrock outcrops, and HDDs. A list of ATWS areas for the NGT Project is located in appendix C-2.

About 113.0 miles (44 percent) of the right-of-way would be co-located with (i.e., overlap or abut) existing utility rights-of-way such as overhead electric transmission lines, pipelines, and railroads. Appendix C-1 lists locations where the construction right-of-way would be co-located with other existing utility rights-of-way and quantifies the amount of workspace overlapping existing rights-of-way. Appendix K-1 identifies specific locations where the NGT Project would cross existing utility rights-of-way.

We received comments from FirstEnergy expressing concern over the NGT Project disturbing existing or future FirstEnergy utility facilities, and not having enough information to evaluate the potential impacts of the NGT Project. The Hayes-West Fremont Transmission Line Project includes construction of a new 138-kilovolt (kV) transmission line that would extend approximately 30 miles from FirstEnergy's proposed new Hayes Substation in Erie County to the existing West Fremont Substation in Sandusky County, with a connection to a proposed distribution substation. The transmission line would be located within a 60-foot-wide right-of-way and would be built primarily on wooden poles. Clearing of the proposed right-of-way is scheduled for February 2017, and construction of the transmission line is scheduled for May 2017 (FirstEnergy, 2016a). Regarding disturbance of existing or future FirstEnergy utility facilities, FirstEnergy requested the NGT Project pipeline and facilities be located adjacent to, not across, FirstEnergy's existing utility rights-of-way that are owned in fee or by easement by FirstEnergy or their affiliated companies. Regarding additional information, FirstEnergy requested the identification of mileposts, facility names, distances from pipeline centerline to utility rights-of-way, depths of the pipeline, crossing distances, construction techniques, and limits of construction right-of-way.

The NGT Project pipeline and FirstEnergy's transmission line generally follow similar linear routes between MPs 127.0 and MP 148.0 along the north and south sides of Interstate 80 through Erie and Sandusky counties. NEXUS has routed the pipeline to avoid overlapping parallel utility rights-of-way, with the exception of five locations where the NGT Project would cross the transmission line right-of-way at MPs 127.3, 135.9, 137.5, 137.9, and 144.8. NEXUS has indicated it would work with FirstEnergy to coordinate construction activities. Because consultations are ongoing, **we recommend that:**

- **Prior to construction, NEXUS should provide updated consultation documentation from FirstEnergy regarding coordination of construction activities where the NGT Project and FirstEnergy's transmission lines would cross.**

TEAL Project

The TEAL Project would consist of 4.7 miles of 30- and 36-inch-diameter pipe. Predominant land uses are open land (45.6 percent), agricultural land (32.1 percent), and forest/woodland (16.3 percent). The remaining 6.0 percent of the land is comprised of commercial/industrial and open water.

General land use impacts associated with the TEAL Project would be the same as described earlier in this section and for the NGT Project. A list of ATWS areas for the TEAL Project is presented in appendix C-4. All of Texas Eastern's proposed pipeline facilities would be co-located within or adjacent to existing utility rights-of-way.

4.9.1.2 Aboveground Facilities

NGT Project

Construction of aboveground facilities for the NGT Project would affect a total of 293.6 acres of land. Of this total, 132.4 acres of land would be permanently retained for operation. NEXUS proposes to construct four new compressor stations in Ohio. The four compressor stations would temporarily affect 254.2 acres of land (88.3 percent of which is agricultural land) and would permanently convert 119.9 acres

of land into industrial/commercial land. Land located outside the permanent right-of-way would be allowed to revert to pre-construction land use.

Thirty-five (35) other aboveground facilities would be constructed as part of the NGT Project, including 5 M&R stations, 4 pig launchers, 4 pig receiver facilities, 16 MLVs, and 5 communication towers (see table 2.2.1-1). MLVs would be installed at other proposed aboveground facility sites or within the permanent right-of-way. The pig launcher and receiver sites and communication towers would be located within the limits of the compressor and M&R stations. Therefore, land use effects associated with pig launchers and receivers and communication towers are included within those associated with the applicable compressor or M&R station. Land located outside the permanent right-of-way of the M&R stations would be allowed to revert to pre-construction land uses. New facilities would result in a permanent land use conversion to industrial/commercial land. Aboveground facilities are further described in section 2.1.

TEAL Project

Construction of aboveground facilities for the TEAL Project would affect a total of 113.6 acres of land. Of this total, 16.3 acres of land would be permanently retained for operation. Texas Eastern would construct one new compressor station (Salineville Compressor Station) and upgrade one existing compressor station (Colerain Compressor Station) as part of the TEAL Project. Modifications to the Colerain Compressor Station would not result in any land use impacts or changes.

Other aboveground facilities associated with the TEAL Project include two new pig launchers, two new pig receivers, and one communication tower. Also, Texas Eastern would conduct modifications to an existing regulation facility and remove an existing launcher/receiver facility. Land use at the removed launcher/receiver would be allowed to revert back to agricultural land. Aboveground facilities are further described in section 2.1.2.2.

4.9.1.3 Pipe/Contractor Yards and Staging Areas

NGT Project

To support construction activities, NEXUS proposes to use 8 pipe/contractor yards and 82 staging areas (72 in Ohio and 10 in Michigan). The pipe/contractor yards and staging areas would temporarily affect 282.9 acres of land, including 259.2 acres of agricultural land, 0.1 acre of forest/woodland, 11.3 acres of open land, 11.1 acres of industrial/commercial land, and 1.0 acre of residential land. Following construction, these areas would be restored according to NEXUS' *E&SCP* or allowed to revert to pre-construction conditions or as requested by the landowner or land-managing agency. Pipe/contractor yards and staging areas are further described in section 2.2.1.1.

TEAL Project

There are no pipe/contractor yards associated with the TEAL Project.

4.9.1.4 Access Roads

NGT Project

In addition to public roads, NEXUS proposes to use 26 permanent access roads and 115 temporary access roads (see table 4.9.1-2). Of the 115 temporary access roads, 51 would be newly constructed, 28 would require expansion of existing roads, and 36 would be existing roads. The new and expanded temporary access roads would impact 68.9 acres of land. Following construction, these temporary roads

would be restored and reseeded according to NEXUS' *E&SCP*. Of the 26 permanent access roads, 22 of them would be newly constructed, 3 would be partially new and partially existing roads that would require expansion, and 1 would be an existing road that would require expansion. Permanent access roads would encumber 4.0 acres, of which 3.8 acres would be associated with the 22 newly constructed roads and the 3 partially new and partially existing roads, and 0.2 acre would be associated with the existing road. Generally, roads would be up to 25 feet wide. NEXUS' proposed temporary and permanent access roads and their required improvements are listed in appendix C-4, summarized in table 4.9.1-2 below, and discussed additionally in section 2.2.1.

TABLE 4.9.1-2		
Summary of NGT Project Access Roads		
State, Facility	Temporary Access Roads	Permanent Access Roads
OHIO		
Mainline		
Columbiana	9	0
Erie	13	0
Fulton	2	0
Lorain	11	0
Lucas	2	0
Medina	18	0
Sandusky	8	0
Stark	9	0
Summit	8	0
Wayne	4	0
Wood	13	0
Compressor Stations		
Columbiana	0	1
Lucas	0	1
Medina	0	1
Sandusky	0	1
Mainline Valve Stations		
Erie	0	2
Lorain	0	2
Lucas/Henry	0	1
Medina	0	2
Sandusky	0	1
Stark	0	2
Summit	0	2
Wood	0	1
Cathodic Protection Site		
Wayne	0	1
M&R Stations		
Columbiana	0	2
Erie	0	1
Sandusky	0	1
Ohio Total	97	22
MICHIGAN		
Mainline		
Lenawee	5	0
Monroe	1	0
Washtenaw	12	0
Mainline Valve Stations		
Lenawee	0	2

TABLE 4.9.1-2 (cont'd)		
Summary of NGT Project Access Roads		
State, Facility	Temporary Access Roads	Permanent Access Roads
Washtenaw	0	1
M&R Stations		
Washtenaw	0	1
Michigan Total	18	4
Grand Total	115	26

TEAL Project

In addition to public roads, Texas Eastern proposes to use two permanent access roads and four temporary access roads. Of the 4 temporary access roads, 3 would be newly constructed and 1 would require expansion of existing roads. The new and expanded temporary access roads would impact 4.9 acres of land. Following construction, these temporary roads would be restored and reseeded according to Texas Eastern’s *E&SCP*. The proposed access roads are listed in appendix C-4 and discussed further in section 2.2.2. The 2 permanent access roads would be newly constructed and would encumber 1.0 acre. Generally, roads would be up to 25 feet wide.

During operation, Texas Eastern would permanently maintain two roads to access the pig launcher site at MP 0.1 on the loop pipeline near Headley Ridge Road and the two filter separator sites (aboveground facilities) at MP 4.5 on the loop pipeline. No new access roads would be required for the Colerain Compressor Station. Permanent access roads would affect 0.3 acre of land. Section 2.2.2 describes the permanent facilities needed for the TEAL Project.

4.9.2 Project-specific Impacts and Mitigation

Constructing and operating the Projects would result in temporary and permanent land use impacts. In general, the effects of pipeline construction on open, agricultural, industrial/commercial, residential land, and open water would be minor and temporary to short term. Temporary to short-term impacts would be confined primarily to the duration of construction and would result from clearing of existing vegetation, row crops, and landscaping; ground disturbance from grading, creating the pipeline trench, and backfilling the pipeline trench; and increased equipment traffic associated with construction activities. Construction impacts would include temporary loss of land use, disturbance of the visual landscape, increased noise and dust, and increased local traffic congestion. Construction-related impacts would end after the right-of-way is restored and revegetated, and temporary work areas are relinquished to landowners. Following construction, the land for the temporary construction right-of-way, ATWS, staging areas, pipe/contractor yards, and temporary access roads would be restored and allowed to revert to prior uses.

Open land would be affected during construction by removing vegetation and disturbing soils. Impacts on open land would be minor and temporary to short term, and would be minimized by the implementation of NEXUS' and Texas Eastern’s *E&SCPs*, which are consistent with the requirements of FERC’s *Plan* and *Procedures*, and any specific requirements associated with applicable permits and regulations, or identified by landowners during easement negotiations. Temporary fencing would be used in affected pasture areas, with alternative feeding or boarding arrangements made if necessary, as negotiated with the landowner. Following construction, open land would be restored to pre-construction conditions. During operations of the Projects, routine mowing or vegetation clearing would not occur over the full width of the permanent right-of-way in wetlands or riparian areas. Since the permanent right-of-way would be maintained as open land, there would be no permanent change in land use. During operations, these areas would continue to function as open land.

Impacts on agricultural land would be minor and temporary to short term. Agricultural land would be affected during construction by crop removal, soil disturbance, increased dust, and interruption of drainage and irrigation systems along the pipeline route. Crops within the construction work areas would be taken out of production for one growing season while construction occurs and landowners would be compensated for the lost crops. If irrigation lines are damaged during construction, temporary repairs would be conducted immediately and permanent repairs would be completed following construction. NEXUS and Texas Eastern would minimize temporary impacts on agricultural land by maintaining landowner access to fields, storage areas, and other agricultural facilities during construction. Following construction, impacted agricultural land (except fruit and Christmas trees within the permanent right-of-way) would be restored to pre-construction conditions, in accordance with NEXUS' and Texas Eastern's *E&SCPs*, NEXUS' *Drain Tile Mitigation Plan*, and any specific requirements associated with applicable permits and regulations, or identified by landowners during easement negotiations. Given that landowners would be permitted to grow commonly cultivated and most specialty crops on the pipeline right-of-way during pipeline operations, there would be little permanent change in the land use of agricultural areas. Impacts on specialty crop land (including organic farms) are discussed by individual project in section 4.9.5. Impacts on and mitigation for prime farmlands and statewide important farmlands are discussed in section 4.2.1.2.

Residential lands that would be affected are discussed by individual project in the following sections. Construction methods proposed for residential areas are described in section 4.9.4.

Impacts on commercial/industrial land would be minor and temporary. Commercial/industrial land would be affected during construction by increased dust from exposed soils, construction noise, and traffic congestion. NEXUS and Texas Eastern would minimize impacts on industrial/commercial land uses by timing construction to avoid peak use periods, maintaining access to businesses at all times, expediting construction through these areas, and coordinating with the affected industrial/commercial landowners. NEXUS and Texas Eastern would coordinate directly with affected commercial/industrial landowners on an individual basis to further reduce potential adverse effects of construction and operations and to address the specific needs of each commercial/industrial facility. Following construction, commercial/business operations on the Projects' rights-of-way would be allowed to continue.

Open water affected by the Projects is discussed by individual project in the following sections. Construction methods proposed for waterbodies are described in section 4.3.2.7.

Forest/woodland would be affected during construction by tree removal within the construction rights-of-way and in ATWS areas, staging areas, pipe/contractor yards, aboveground facility sites, and new or modified access roads. The amount of tree clearing required for construction and operation is dependent on the width of the construction and permanent rights-of-way, and the degree to which these areas overlap other existing cleared rights-of-way.

Following construction, forested areas affected within temporary construction workspaces, including ATWS, staging areas, pipe/contractor yards and temporary access roads, would be allowed to reestablish as forest. Forested areas within the permanent right-of-way, aboveground facility sites, and new permanent access roads would not be allowed to revert to pre-construction conditions. Post-construction maintenance of the permanent right-of-way would prevent the reestablishment of trees, including orchards and tree crops.

NEXUS and Texas Eastern would work with landowners to maintain access to the forest/woodland portions of their property during pipeline construction and landowners would be compensated for the value of felled trees. The felled trees would be available to landowners upon request. NEXUS and Texas Eastern would restore temporary access roads that are cleared of trees, including logging roads, which are impacted

during construction. Following construction, landowners would be required to contact NEXUS and Texas Eastern prior to commencing logging or the use of logging roads that pass over the permanent right-of-way. Impacts on tree and shrub specialty crops are discussed in section 4.9.5.

Construction and operation of aboveground facilities and new access roads would result in minor to moderate and permanent impacts on land uses as a result of converting the area to a commercial/industrial use. Based on the estimated sound levels, adherence to local noise regulations, and our recommendations (see section 4.12.2), we believe the noise attributable to operation of the Hanoverton, Wadsworth, Clyde, Waterville, Salineville, and Colerain (existing) Compressor Stations would not cause a significant impact on the noise environment in the Projects area.

Land encumbrances associated with use restrictions on the permanent right-of-way and aboveground facility sites would permanently impact land uses. Landowners would have use of the permanent right-of-way, though permanent fencing and structures such as houses, trailers, garages, tool sheds, poles, guy wires, catch basins, septic tanks, leech fields, and swimming pools would not be permitted above the pipeline. Also, the tree planting within the permanent right-of-way would not be allowed. The permanent right-of-way would remain accessible for maintenance and inspection and for emergency response access. Maintenance activities would be conducted in accordance with NEXUS' and Texas Eastern's respective *E&SCPs*.

The following discussion provides additional detail to the impacts and mitigation measures described in section 4.9.2 and is unique to each project.

4.9.3 Land Ownership and Easement Requirements

Most of the lands affected by the NGT Project are privately owned. Public land affected by the NGT Project includes public road crossings; state land managed by the ODNR and ODOT; county lands owned by Stark, Medina, Lorain, Erie, Sandusky, Summit, and Toledo Counties; and municipal lands owned by the City of Green. No federally owned, tribally owned, or reservation land would be crossed or affected by the NGT Project. With the exception of public road crossings, all lands affected by the TEAL Project are privately owned. Section 4.9.7 discusses recreational and public interest areas located on public and private land.

Pipeline operators must obtain easements from landowners to construct and operate natural gas facilities, or acquire the land on which the facilities would be located. Easements can be temporary, granting the operator the use of the land during construction (e.g., for temporary workspace, access roads, pipe/contractor yards), or permanent, granting the operator the right to operate and maintain the facilities after construction. The applicants would need to acquire long-term easements and/or special use permits to construct and operate the new project facilities. These authorizations would convey temporary and permanent rights-of-way to NEXUS and Texas Eastern for construction and operation of the proposed facilities.

An easement agreement between a company and a landowner typically specifies compensation for losses resulting from construction, including losses of non-renewable and other resources, damages to property during construction, and restrictions on existing uses that would not be permitted on the permanent right-of-way after construction. The easement would give the company the right to construct, operate, and maintain the pipeline, and establish a permanent right-of-way. Landowners would be compensated for the use of their land through the easement negotiation process.

If an easement cannot be negotiated with a landowner and the Projects have been certificated by FERC, then NEXUS and Texas Eastern may use the right of eminent domain granted to it under Section

7(h) of the NGA and the procedure set forth under the Federal Rules of Civil Procedure (Rule 71A) to obtain the areas needed for construction and operation. NEXUS and Texas Eastern would still be required to compensate the landowner for the right-of-way and for any damages incurred during construction; however, the level of compensation would be determined by a court according to state or federal law. In either case, the landowner would be compensated for the use of the land. Eminent domain would not apply to lands under federal ownership.

4.9.4 Existing Residences, Commercial Buildings, and Planned Developments

4.9.4.1 Existing Residences

NGT Project

As currently designed, approximately 70.3 acres of residential lands would be affected by construction of the NGT Project. Following construction, 17.9 acres of residential land would be within the permanent right-of-way and would be subject to restrictions such as planting trees or placement of certain structures. The remaining 52.4 acres of land would not be subject to any restrictions. All residential lands would be restored to pre-construction conditions.

NEXUS' construction work area would be within 50 feet of 78 residences. In addition, 26 garages, 59 sheds, one gazebo, one wood deck, and two pools would be within 50 feet of the construction workspace, 16 of which would be within or on the edge of the construction work area. No homes are within the proposed construction work areas. These structures are listed in appendix K-2.

The construction workspace would be within or less than 10 feet of 7 residences because of construction constraints along those portions of the NGT Project route. Because of the increased potential for construction of the NGT Project to disrupt these residences and to ensure that property owners have adequate input to a construction activity occurring so close to their homes, **we recommend that:**

- **Prior to construction, NEXUS should file with the Secretary, for review and written approval by the Director of OEP, evidence of landowner concurrence with the site-specific RCPs for all locations in appendix K-2 of the EIS where the NGT Project construction work areas would be within 10 feet of a residence.**

During initial discussions with landowners, NEXUS identified a total of 65 septic systems within 150 feet of the NGT Project, including 52 systems in Ohio and 13 systems in Michigan. Table 4.9.4-1 lists the known septic systems by county, tract, and milepost. Prior to construction, NEXUS would verify the locations of septic systems. NEXUS would attempt to avoid septic systems. If avoidance is not possible, NEXUS would relocate the septic system prior to construction or provide a replacement system. In the event of damage during construction, NEXUS would provide a temporary repair of the septic system. Permanent repairs would occur as soon as practicable during the backfill/rough clean-up phase of construction. NEXUS would continue to work with landowners prior to construction to identify and verify the locations of septic systems.

TABLE 4.9.4-1

Septic Systems Crossed by the NGT Project ^a

State, Facility, County	Milepost Start ^b	Milepost End ^b	Tract Number(s)
OHIO			
Mainline			
Columbiana	5.5	5.6	OH-CO-046.0010
	6.3	6.4	OH-CO-055.0100
Stark	18.4	18.6	OH-ST-047.0000
	18.6	18.6	OH-ST-049.0000
	28.1	28.2	OH-ST-110.0000
	31.1	31.4	OH-ST-130.0000
Summit	44.8	44.9	OH-SU-143.0000
Wayne	52.9	52.9	OH-WA-020.0000
	54.4	54.5	OH-WA-036.0000
	55.7	55.7	OH-WA-046.0000
	56.4	56.5	OH-WA-053.0000
	56.5	56.6	OH-WA-054.0000
Medina	59.2	59.3	OH-ME-017.0000
	59.3	59.4	OH-ME-018.0000
	68.3	68.3	OH-ME-110.0000
	71.4	71.8	OH-ME-144.0000, OH-ME-144.0000-PAR-3-71.8, ME-144.0000-HTAR-2
	71.8	71.9	OH-ME-144.0010, OH-ME-144.0010-HTAR-2
	71.9	72.5	OH-ME-147.0000, OH-ME-147.0000-AB-2
	72.6	72.6	OH-ME-149.0000
	72.6	72.6	OH-ME-150.0000
72.6	72.7	OH-ME-151.0000	
72.7	72.8	OH-ME-153.0000	
73.4	73.7	OH-ME-161.0000	
73.9	74.0	OH-ME-165.0000	
Lorain	76.3	76.5	OH-ME-181.0010
	82.6	82.7	OH-LO-015.0000
	83.8	83.9	OH-LO-024.0000
	84.4	84.5	OH-LO-027.0000
	88.1	88.2	OH-LO-050.0010
	89.1	89.2	OH-LO-060.0000
Erie	100.4	100.6	OH-LO-128.0000
	125.7	125.8	OH-ER-135.0000
	125.8	125.8	OH-ER-136.0000
	125.8	125.9	OH-ER-138.0000
	125.8	125.9	OH-ER-139.0000
	126.3	126.3	OH-ER-144.0010
128.8	129.2	OH-ER-160.0000, OH-ER-160.0000-TAR-14-128.9, OH-ER-160.0000-CS, OH-ER-000.0001-SA-8-SPRD2	
Sandusky	150.3	150.5	OH-SA-122.0000
	155.8	155.9	OH-SA-159.0020
	157.6	157.7	OH-SA-170.0000
	162.8	162.9	OH-SA-208.0000
	163.7	163.7	OH-SA-217.0010
Wood	169.3	169.4	OH-WO-041.0010
	170.9	171.2	OH-WO-053.0000, OH-WO-053.0000-TAR-4-171.2
	171.5	171.7	OH-WO-058.0000

TABLE 4.9.4-1 (cont'd)

Septic Systems Crossed by the NGT Project ^a			
State, Facility, County	Milepost Start ^b	Milepost End ^b	Tract Number(s)
	173.5	173.6	OH-WO-078.0000
Lucas	189.1	189.3	OH-LC-063.0010
Fulton	193.7	193.8	OH-FU-015.0000
	194.3	194.8	OH-FU-019.0000
	196.2	196.7	OH-FU-029.0000
	200.9	201.4	OH-FU-057.0000
	204.9	205.3	OH-FU-079.0000
MICHIGAN			
Mainline			
Lenawee	210.5	211.0	MI-LE-012.0000
	218.4	218.9	MI-LE-042.0000
	225.7	226.1	MI-LE-091.0000
	229.9	230.1	MI-LE-113.0000
Monroe	233.2	233.3	MI-MR-028.0000
	234.3	234.6	MI-MR-035.0000
	236.3	236.4	MI-MR-046.0010
Washtenaw	243.3	243.3	MI-WA-042.0010
	247.1	247.4	MI-WA-067.0000, MI-WA-000.0001-SA-5-SPRD4, MI-WA-067.0000-MLV-17, OH-WA-067.0000-PAR-1-247.4
	247.4	247.6	MI-WA-068.0010
	248.2	248.2	MI-WA-081.0020
	248.7	248.7	MI-WA-094.0010
	252.0	252.0	MI-WA-118.0000
a	NEXUS identified the approximate location of septic systems located within 150 feet of the NGT Project centerline through landowner consultation, field survey data for properties where landowners have granted access for survey, and review of aerial photography and Lidar imagery for properties where landowner permission has not been granted.		
b	Mileposts are approximate.		

TEAL Project

The TEAL Project does not cross any residential or commercial areas and is not within 50 feet of any residential or commercial building or septic system.

Impacts and Mitigation

Temporary impacts on residential areas would include inconveniences caused by noise and dust generated by construction equipment; disruption to access of homes and businesses; increased localized traffic from transporting workers, equipment, and materials to the work site; disturbance of lawns, landscaping, gardens, and visual character caused by the removal of soil, turf, shrubs, trees, and/or other landscaping between residences and businesses and adjacent rights-of-way; potential damage to existing septic systems, wells, and other utilities; and removal of aboveground structures such as fences, sheds, playgrounds, or trailers from within the construction right-of-way.

NEXUS would use special construction methods while working in residential areas to minimize disruptions and to reduce impacts during construction. Specialized construction techniques such as the stove-pipe or drag-section may be used through residential areas to minimize impacts. The stove-pipe construction method is used when the pipeline is to be installed in very close proximity to existing

structures. The drag-section technique is another method to reduce the width of the construction right-of-way. Special construction methods are described in more detail in section 2.3.2.

NEXUS developed *RCPs* for residential and commercial structures within 50 feet of the construction workspace (see appendix E-5). These *RCPs* include a dimensioned drawing depicting each residence and structure in relation to the pipeline construction, workspace boundaries, the proposed permanent right-of-way, and other nearby residences, structures, roads, and miscellaneous features (e.g., other utilities, playgrounds, catch basins, and sewers).

As discussed in the *E&SCPs* and/or shown in the *RCPs*, NEXUS and Texas Eastern would implement the following general measures to minimize construction-related impacts on residential areas:

- Notify landowners of planned construction activities prior to construction, including any scheduled disruption of household utilities. The duration of the interruption would be kept as brief as possible. Local utility companies would be invited to be on site during construction when necessary.
- Maintain access to homes except for the brief periods essential for laying the new pipeline, which would be coordinated with landowners.
- Install safety fence at the edge of the construction right-of-way for a distance of 100 feet on either side of a residence or business establishment.
- For a distance of 100 feet on either side any residence or business establishment, maintain a minimum distance of 25 feet between any structure and the edge of the construction work area.
- Attempt to leave mature trees and landscaping intact within the construction work area unless the trees and landscaping interfere with the installation techniques or present unsafe working conditions, or as specified in landowner agreements.
- Accommodate any special concerns regarding private landscaping and compensate landowners for unavoidable impacts.
- Minimize the time the trench is left open.
- Control dust in accordance with NEXUS' and Texas Eastern's *Fugitive Dust Plans*.
- If crushed stone/rock access pads are used in residential areas, place rock on non-woven synthetic geotextile fabric to facilitate rock removal after construction.
- Restore residential areas in accordance with landowner agreements, including landscaping, fences, driveways, stone walls, sidewalks, and water supply and septic systems.
- Remove all construction debris.

We have reviewed the site-specific *RCPs* and generally find them acceptable.

Construction would typically occur between 7:00 a.m. and 6:00 p.m. (6 days a week), with the exception of HDD crossings, hydrostatic testing, and pipeline commissioning activities. Where the pipeline centerline is within 25 feet of a residence, NEXUS and Texas Eastern would not excavate the trench until

the pipe is ready for installation and would backfill the trench immediately after pipe installation or place temporary steel plates over the trench to maintain landowner access. Other activities such as tree trimming, clearing activities, and right-of-way restoration activities would be completed in accordance with state and federal timing restrictions and weather permitting.

Following construction, landowners would continue to have use of the permanent right-of-way provided it does not interfere with the easement rights granted to NEXUS and Texas Eastern for operation and maintenance of the pipeline facilities. For example, no structures would be allowed on the permanent right-of-way, including houses, decks, playgrounds, tool sheds, garages, poles, guy wires, catch basins, swimming pools, trailers, leach fields, septic tanks, or other structures not easily removed. Semi-permanent structures that would be permitted to be used on the permanent right-of-way include items such as swing sets, sporting equipment, miniature swimming pools, doghouses, and gardens that are easily removed.

In addition, NEXUS and Texas Eastern have prepared *Issue Resolution Plans*. The plans identify a toll-free Landowner Hotline through which landowners can contact project representatives with questions, concerns, and complaints during construction. NEXUS and Texas Eastern personnel would staff the hotline Monday through Friday from 7:00 a.m. to 5:00 p.m., and Saturday from 7:00 a.m. to 12:00 p.m. After hours, an answering machine would be available to receive calls. If the identified issue cannot be immediately responded to, NEXUS and/or Texas Eastern personnel would attempt to contact the caller the same business day and no later than 24 hours after the initial call. Once documented, NEXUS and/or Texas Eastern personnel would work with the landowner until the issue is resolved. In the event NEXUS' and/or Texas Eastern's response is not satisfactory to the landowner, the landowner would have the opportunity to contact FERC's Landowner Helpline.

We conclude that with implementation of NEXUS' proposed construction methods, revised site-specific *RCPs*, *Issue Resolution Plan*, and our recommendations, construction impacts on residents and landowners would be minimized to the greatest extent practicable, and would mostly be temporary.

4.9.4.2 Planned Developments

NEXUS and Texas Eastern contacted local and county officials in the affected municipalities, conducted research of publically available websites, and coordinated with local landowners to identify planned residential, commercial, or industrial developments within 0.25 mile of the proposed project facilities. The developments that were identified are discussed below.

NGT Project

Based on consultations with landowners and local officials, the NGT Project would be located within 0.25 mile of 62 planned or ongoing residential and commercial/industrial developments. Appendix K-3 describes the identified ongoing or planned developments and provides the status of construction or completion. These include 33 residential developments, 11 commercial/industrial developments, 3 recreational areas, 2 protected natural areas, 2 mixed-use developments, 2 roadway projects, 2 wetlands/ponds, 2 airport expansions, 2 mining operations, an orchard, a sewage line, and an unknown development;

We received comments concerning project impacts on planned developments. These included general concerns about precluding future development on private landowners' properties and identification of specific planned developments. The primary impact that a pipeline project could have on a proposed development would be to place permanent right-of-way on lots set aside for development, which could affect the constructability of the lots. Depending on the number and location of affected lots, the developer could choose to redesign the affected portion of the development. Depending on the stage of the development, this redesign could require additional review and approval by local permitting officials, which

could delay the development. The pipeline project could also impact approved and proposed developments if the construction schedules for the project and development projects coincide.

We received comments on the draft EIS related to potential impacts on the existing MAPS Air Museum and Akron-Canton Airport expansion. The MAPS Air Museum is located 0.6 mile southeast of the pipeline near MP 37.2 on airport property. Due to the distance between the NGT Project and the museum, impacts on the museum would not occur. According to the Akron-Canton Airport Master Plan, several non-aeronautical development areas are in various stages of development in the vicinity of the airport. The NGT Project would cross 0.34 mile of a development area identified as Port Green at CAK (or Port Green Industrial Park) at MP 37.0, which is designated as non-essential for aviation-related activities. The 180-acre development area consists of 10 to 12 business sites that were constructed in 2015 (Akron-Canton Airport Master Plan, 2015). While the NGT Project would not affect any structures associated with the development area, forest/woodland and open land would be affected by the NGT Project. Construction and operation of the NGT Project would not affect expansion of any airport runways or facilities.

Temporary impacts on commercial areas would include inconveniences caused by noise and dust generated by construction equipment; disruption to access of homes and businesses; increased localized traffic from transporting workers, equipment, and materials to the work site; disturbance of lawns, landscaping, gardens, and visual character caused by the removal of soil, turf, shrubs, trees, and/or other landscaping between businesses and adjacent rights-of-way; potential damage to existing septic systems, wells, and other utilities; and removal of aboveground structures such as fences, sheds, or trailers from within the right-of-way.

Impacts due to construction and operation of the NGT Project would vary depending upon the stage of the planned developments, ownership of the parcels, and status of easement negotiations at the time of construction. In any situation, NEXUS would obtain the appropriate state or county permits (rezoning, development plan, etc.), and would either purchase the property or negotiate an easement from the current landowner in order to construct and operate the NGT Project.

While NEXUS has provided information on planned developments, we have reviewed the information in appendix K-3 and find that certain information is omitted that should be included, such as proximity of some planned developments to the most recent recently proposed construction workspace. Therefore, **we recommend that:**

- **Prior to construction, NEXUS should provide an update on consultations with developer(s) regarding construction timing and any requested mitigation measures for any planned developments that are crossed by the NGT Project and listed in appendix K-3 of the EIS.**

NEXUS would also implement the mitigation measures contained in its *E&SCP* and any additional measures as arranged with specific landowners. We conclude that implementation of the identified mitigation measures would minimize or mitigate the impacts of pipeline construction on planned residential and commercial developments to less than significant levels. Operational impacts would be limited to the encumbrance of a permanent right-of-way, which would prevent the construction of permanent structures within the right-of-way.

TEAL Project

No planned residential or commercial developments were identified within 0.25 mile of the TEAL Project.

4.9.5 Agricultural Areas

4.9.5.1 Organic Farm Lands and Specialty Crops

NGT Project

The NGT Project would cross land that supports four certified organic farms and several tracts of land supporting specialty crops. Farms can be certified organic by the USDA if they fulfill a set of standards outlined as part of the National Organic Program (NOP). Organic farms produce products using methods that preserve the environment and avoid most synthetic materials, such as pesticides and antibiotics. Organic farmers, ranchers, and food processors must follow a defined set of standards to produce organic food and fiber (USDA, 2016b). The Specialty Crops Competitiveness Act of 2004 (7 USC 1621 note) and amended under Section 10010 of the Agricultural Act of 2014, Public Law 113-79 (the Farm Bill) defines specialty crops as “fruits and vegetables, tree nuts, dried fruits, horticulture, and nursery crops (including floriculture).” Eligible plants must be cultivated or managed and used by people for food, medicinal purposes, and/or aesthetic gratification to be considered specialty crops (USDA AMS, 2016).

Table 4.9.5-1 lists the organic farms and specialty crop lands that the NGT Project would cross. Specialty crops that would be crossed in Ohio include alfalfa, oats, rye, spelt, clover, strawberries, assorted vegetables including corn (some of which is used to produce popcorn and seed corn), bell and hot peppers, tomatoes, pumpkins, squash, cucumbers (some of which are used to produce pickles), cabbage, asparagus, zucchini, beets, beans, peas, elderberry, apiaries used to produce honey, and apple, peach, plum, and Christmas trees. Specialty crops that would be crossed in Michigan include alfalfa, cauliflower, soybeans (for oil), and sunflowers. Construction would affect 305.2 acres of specialty crops, of which 291.0 acres occur in Ohio and 14.2 acres occur in Michigan. NGT Project operation would affect 96.8 acres of specialty crops, of which 92.2 acres occur in Ohio and 4.6 acres occur in Michigan.

State, Facility, County	MP Start	MP End	Crop Type	Acres Affected	
				Construction ^a	Operation ^b
OHIO					
TGP Interconnecting Pipeline					
Columbiana	0.1	0.2	Alfalfa	6.1	1.0
Mainline					
Columbiana	0.1	0.3	Alfalfa	5.3	1.8
Columbiana	1.3	1.5	Alfalfa	95.7	28.7
Columbiana	2.1	2.2	Alfalfa/Elderberry	0.3	0.0
Columbiana	2.5	2.8	Alfalfa	5.1	1.9
Columbiana	2.8	2.9	Alfalfa	1.3	0.5
Columbiana	2.9	3.1	Alfalfa	3.5	1.4
Columbiana	4.3	4.7	Peach Trees	5.4	2.0
Columbiana	4.3	4.7	Peach Trees	1.7	0.0
Columbiana	4.7	4.8	Peach Trees	1.5	0.7
Columbiana	4.9	5.0	Alfalfa	1.7	0.6
Columbiana	5.0	5.0	Alfalfa	0.8	0.2
Columbiana	5.0	5.1	Alfalfa	1.2	0.4
Columbiana	5.1	5.3	Alfalfa	3.0	1.0

TABLE 4.9.5-1 (cont'd)

Organic Farm Lands and Specialty Crops Crossed by the NGT Project

State, Facility, County	MP Start	MP End	Crop Type	Acres Affected	
				Construction ^a	Operation ^b
Columbiana	5.9	5.9	Alfalfa	1.2	0.5
Columbiana	7.6	7.7	Strawberries	1.7	0.4
Columbiana	7.7	7.9	Honey, Peach, Plum, Apple, Pear Trees	2.7	0.9
Stark	23.7	24.2	Asparagus, Peppers, Zucchini, Beets, several types of Beans and Peas, Cabbage	8.4	3.1
Summit	41.6	41.5	Honey	0.7	0.4
Wayne	54.2	54.3	Alfalfa	2.5	0.8
Wayne	54.6	54.8	Peaches, Plum, Apple Trees, Alfalfa	2.1	0.7
Wayne ^c	55.1	55.6	Spelt, Corn, Corn/Oat and Pea, Pasture/Grass/Hay, Small Grain/Hay, Dairy Cattle, Milk	7.3	2.7
Wayne ^d	55.6	55.7	Organic spelt	1.8	0.6
Wayne ^e	55.8	56.1	Organic spelt	4.6	1.7
Medina	59.3	59.4	Alfalfa	2.4	0.8
Medina	59.5	59.7	Apple and Peach Trees	2.5	0.9
Medina	72.8	72.9	Christmas Trees	2.2	0.6
Medina	72.9	72.9	Christmas Trees	0.1	0.0
Erie	108.0	108.0	Apple Trees	0.2	0.0
Erie	108.0	108.4	Apple Trees	6.4	2.4
Erie	110.3	110.3	Honey - 3-4 hives located in SW part of property	8.0	1.8
Erie	110.8	110.9	Apple and Peach Trees	4.0	1.3
Erie	111.1	111.4	Fruit Trees	4.6	1.5
Erie	111.7	111.8	Honey	1.6	0.7
Erie	111.9	111.9	Honey	0.2	0.1
Erie	117.2	117.7	Rye	11.6	2.7
Erie	117.7	118.1	Rye	10.4	2.7
Erie	118.3	118.4	Popcorn	2.5	0.7
Erie	118.9	119.2	Popcorn	4.4	1.5
Erie	122.0	122.0	Popcorn	0.5	0.1
Erie	122.3	122.5	Clover	3.0	1.2
Erie	124.9	125.4	Seed Corn	6.6	2.6
Erie	129.7	130.0	Bell Peppers, Tomatoes, Pumpkins	6.3	2.4
Erie	130.1	130.2	Squash, Cucumbers, Cabbage	2.3	0.8
Sandusky	136.9	137.4	Cabbage, Pumpkins, Squash, Cucumbers, Peppers (Jalapeños, Bell, and Banana)	8.1	3.0
Sandusky	137.4	137.5	Cabbage, Pumpkins, Squash, Cucumbers, Peppers (Jalapeños, Bell, and Banana)	1.9	0.4
Sandusky	142.2	142.5	Strawberries	4.1	1.6
Sandusky	142.5	142.6	Strawberries	1.5	0.7
Sandusky	142.6	142.7	Strawberries	1.7	0.5
Sandusky	160.3	160.4	Peppers, Pickles	2.4	0.7
Sandusky	160.4	160.8	Peppers, Pickles	5.8	2.3
Sandusky	160.8	160.8	Peppers/Pickles	0.9	0.4

TABLE 4.9.5-1 (cont'd)

Organic Farm Lands and Specialty Crops Crossed by the NGT Project					
State, Facility, County	MP Start	MP End	Crop Type	Acres Affected	
				Construction ^a	Operation ^b
Wood ^f	164.7	164.9	Organic grains and produce	4.2	1.6
Wood	177.8	178.1	Oats/Alfalfa	4.1	1.6
Wood	178.1	178.3	Oats/Alfalfa	3.9	1.5
Wood	178.3	178.4	Oats/Alfalfa	1.0	0.4
Fulton	202.8	203.0	Alfalfa	2.0	0.8
Fulton	202.9	203.2	Alfalfa	4.0	1.6
Ohio Total				291.0	92.2
MICHIGAN					
Mainline					
Lenawee	219.5	219.6	Cauliflower	2.5	0.8
Monroe	233.2	233.3	Alfalfa	2.0	0.6
Washtenaw	245.8	246.3	Soybean (for oil)	9.6	3.2
Washtenaw	247.4	247.4	Sunflowers	0.1	0.0
Michigan Total				14.2	4.6
Project Total				305.2	96.8

a Land affected during construction for pipeline facilities is comprised of the permanent right-of-way, temporary workspace, and ATWS where applicable.

b Land affected during operation of the pipeline includes only the permanent right-of-way.

c Sunbeam Organic Farm is certified in organic crops (corn, corn/oat and pea, pasture/grass/hay, and small grain/hay) and in livestock (dairy cattle, milk). Specialty crops include spelt.

d Koger organic farm grows organic spelt.

e Sauer/Stauffer organic farm grows organic spelt.

f Hirzel Farms is certified in organic crops (cabbage, rye seed, soybeans, spelt, spring wheat, and yellow corn) and in handling (broker: yellow corn, cereals, cleaning and bagging of grains, clover, dry beans, oats, oilseeds, rye seed, soybeans, spelt, sunflowers, vetch, wheat). Specialty crops include organic grains and produce.

Based on a review of the NOP’s 2014 list of certified organic operations in Ohio and Michigan as well as NEXUS’ landowner consultations, the NGT Project would cross four organic farms (see table 4.9.5-1) and would be within 1.0 mile of six others within Ohio: Toledo Alfalfa Mills, Joe Curfman Farm, White Oak Farm, Infinite Garden Farm, Weihl Farm, and Naked and Happy Eggs.

No certified organic farms were identified within 1.0 mile of the NGT Project in Michigan.

The organic certification process involves developing and implementing an individualized Organic System Plan. The Organic System Plan outlines the practices and procedures to be performed and maintained, a list of each substance to be used as a production or handling input, a description of monitoring practices, the record-keeping systems, and management practices and physical barriers established to prevent commingling and contact with prohibited substances (7 CFR 205.201). Organic System Plans are proprietary in nature.

To promote continued participation in the NOP, NEXUS would coordinate with certified organic farm operators to identify construction and operations practices that are consistent with organic farm

certification practices. In addition to the general construction measures identified in NEXUS's *E&SCP*, mitigation measures specific to organic farms may include the following:

- Coordinate with landowners to maintain access to fields, storage areas, structures, and other agricultural facilities during construction;
- Maintain irrigation and drainage systems that cross the right-of-way;
- Protect active pasture land by installing temporary fencing, using alternative locations for livestock to cross the construction workspace, and/or alternating feeding arrangements, as negotiated with the landowner;
- Segregate and store topsoil such that only topsoil from the organic farm is replaced; and
- Use landowner-approved seed during restoration.

NEXUS would work with affected landowners to avoid and minimize potential impacts on specialty crops. NEXUS would compensate landowners for any project-related damages and lost production on organic farms and specialty crop lands. NEXUS would compensate organic farm landowners for any damages resulting from construction of the NGT Project.

NEXUS has provided site-specific crossing plans for the Sunbeam Organic Dairy Farm and Hirzel Farm. These plans consist of notes for wash station and entry locations to minimize potential for invasive species infestations; references to restoration being conducted in accordance with an environmental management plan and landowner stipulations for prohibited substances; use of standard soil handling techniques; and environmental monitors to be used on organic farms during construction. Based on our recommendation in the draft EIS, NEXUS prepared an Organic Farm Protection Plan, in addition to site-specific crossing plans (see Attachment 8 – Response 31 of NEXUS' August 26, 2016 filing to the Commission in FERC accession number 20160826-5230). The Organic Farm Protection Plan addresses prohibitions on substances allowed on farm property (both during construction and operation); soil handling procedures; erosion control and buffers; off right-of-way water migration; noxious weed and invasive species control; mitigation/restoration methods; post-construction monitoring; compensation for construction-related damages; and damages due to decertification.

Following construction, organic farming and specialty crop production would resume within the permanent right-of-way, with the exception of tree and shrub specialty crops such as Christmas trees or apple trees, in accordance with landowner agreements.

We conclude that with implementation of NEXUS' proposed construction methods, the creation of site-specific Organic Farm Protection Plans, and implementation of NEXUS's *E&SCP*, impacts on organic farms and specialty crop lands would be minimized to the greatest extent practicable and would not be significant.

TEAL Project

The TEAL Project does not cross any certified organic farms or specialty crop lands.

4.9.5.2 Forest and Agricultural Management Programs

The State of Ohio has two voluntary programs that offer tax reductions to landowners for qualifying forest and agricultural lands. The Current Agricultural Use Value (CAUV) program offers tax relief to

landowners for qualifying agricultural lands containing 10 or more acres that are devoted exclusively to commercial production of crops and animals, or commercial agricultural lands under 10 acres that meet the minimum yearly gross income requirements (State of Ohio, 2016). Lands enrolled in the CAUV program are appraised based on production capacity of the soil and the market value. Thus, the value is dependent upon the soil type, region, slope, and erosion factors of the land.

Similarly, the Ohio Forest Tax Law (OFTL) program provides tax relief to landowners for qualifying forestland that is devoted exclusively to forestry with a primary object of timber production and may include, but is not limited to, maple syrup production, wildlife conservation, recreation, and aesthetics. Eligible land that meets the definition of forestland and landowners who meet the program requirements in order to have land certified under the OFTL. Eligible land must be 10 or more contiguous acres and not less than 120 feet wide, and must include the minimum number of approved trees or square footage for plantations (ODNR, 2016d). Commercial orchards and Christmas tree plantations do not qualify as forestland under the OFTL.

Additionally, landowners can enroll their land into conservation easements. Conservation easements constitute a legally binding agreement that limits certain types of uses or prevents development from taking place on the land in perpetuity while the land remains in private ownership. Conservation easements protect land for future generations while allowing owners to retain many private property rights, live on and use their land, and potentially providing landowners with tax benefits (Nature Conservancy, 2016).

NGT Project

The NGT Project pipeline would cross several parcels of land enrolled in the CAUV/OFTL forest management programs or protected by conservation easements. The total acreage of these parcels amounts to 182.4 acres.

As listed in table 4.9.5-2, construction of the NGT Project would affect 13.0 acres of enrolled land and operations would affect 5.2 acres.

County	Approximate Milepost Range	Program Name	Parcel Size (acres)	Total	
				Construction	Operation
Stark	33.6 – 34.0	CAUV / OFTL	21.4	4.8	2.4
Summit	38.8 – 38.8	Conservation Easement	19.4	1.2	0.5
Summit	38.8 – 39.0	Conservation Easement	78.9	3.0	0.8
Lorain	95.4 – 95.5	Conservation Easement	54.0	2.1	0.7
Lorain	95.5 – 95.6	Conservation Easement	8.7	1.9	0.8
Total			182.4	13.0	5.2

NEXUS would work with landowners to determine how the NGT Project crossing of CAUV/OFTL and conservation easements affects the continued participation in the program by landowners. NEXUS would compensate landowners for damages during construction and maintenance of the NGT Project, including lost incentives based on the specific terms of the easement or related agreements as negotiated between the parties, or determined by a court.

We conclude that with implementation of NEXUS’ proposed mitigation measures and *E&SCP*, impacts on forest management programs and conservation easements would be minimized to the greatest extent practicable.

TEAL Project

The TEAL Project would not cross any land enrolled in a forest management program or protected by a conservation easement.

4.9.5.3 Conservation Reserve Program and Conservation Reserve Enhancement Program

The CRP is a land conservation program administered by the USDA's Farm Service Agency (FSA). In exchange for a yearly rental payment, landowners enrolled in the program agree to remove environmentally sensitive land from agricultural production and plant species that would improve environmental health and quality. The long-term goal of the program is to re-establish valuable land cover to help improve water quality, prevent soil erosion, and reduce loss of wildlife habitat. The Conservation Reserve Enhancement Program (CREP), which is a subset of the CRP and also administered by the FSA, is focused on targeting high-priority conservation issues identified by local, state, or tribal governments or non-governmental organizations (FSA, 2015).

NGT Project

As listed in appendix K-4, construction of the NGT Project would affect a total of 524.5 acres of FSA-enrolled lands, including 292.4 acres in Ohio and 232.1 acres in Michigan. Operation of the NGT Project would affect a total of 185.6 acres of FSA-enrolled lands, including 104.8 acres in Ohio and 80.8 acres in Michigan.

Following construction, NEXUS would restore the right-of-way to meet the long-term objectives for the land enrolled in this program. However, some enrolled lands may have provisions for tree plantings that overlap the permanent right-of-way. Construction of the pipeline would not change the general use of the land but trees would be not allowed to be maintained within the permanent right-of-way. As such, if the right-of-way is currently maintained with trees, the program agreement may need to be altered to accommodate the pipeline. On FSA-enrolled lands where tree clearing is necessary, NEXUS committed to work with landowners and local FSA and NRCS officials to determine if the NGT Project would affect the continued participation in the program by landowners. If precluded from the program due to tree removal, NEXUS would reimburse the landowner for lost yearly rental payments, plus related penalties.

CRP lands occur primarily in agricultural areas, and, therefore the impacts and mitigation measures NEXUS would implement on these lands would be similar to those described for general agricultural areas (see section 4.9.2) and described in its *E&SCP*. However, comments were received about the absence of specific discussion of impacts or mitigation proposed for crossing lands under conservation practices. The ODA guidelines referred to by commenters suggested that all conservation practices (e.g. spring developments, grassed waterways, and terraces) be restored to pre-construction condition. We feel that a firm commitment to restoration to pre-construction conditions should benefit existing conservation practices crossed by the Project. **Therefore, we recommend:**

- **Prior to construction, NEXUS should file with the Secretary, for review and written approval of the Director of OEP, its revised *E&SCP* to identify where it would implement measures to ensure lands crossed by the NGT Project, such as CRP lands, would be restored to pre-construction conditions, or in accordance with the landowner's request.**

We conclude that with implementation of NEXUS' updated proposed construction and mitigation measures, such as its *E&SCP*, our recommendations, and a commitment to reimburse the landowner,

impacts on FSA-enrolled lands that consist of non-forested land uses would be minimized to the greatest extent practicable and would not be significant.

TEAL Project

The TEAL Project would not cross any land enrolled in FSA programs.

4.9.5.4 Agricultural Drain Tiles and Irrigation Structures

NGT Project

The proposed NGT Project would cross agricultural fields that contain a widespread network of subsurface drain tile systems. Drain tile is installed in agricultural areas to help improve drainage in soils with high groundwater and/or poor drainage, and therefore improve productivity. Known agricultural drain tiles crossed by the NGT Project are listed in appendix K-5. Based on the information provided by NEXUS, the Project would not cross any known irrigation systems.

NEXUS developed a *Drain Tile Mitigation Plan (DTMP)* that was included in the draft EIS (see appendix E-3) that provides a general overview of the types of drain tile systems potentially encountered during construction, and describes NEXUS' drain tile mitigation strategy during pre-construction, construction, and post-construction. The *DTMP* describes how NEXUS would communicate with landowners, perform preliminary drain tile assessments, identify existing drain tiles, repair damaged drain tiles, and monitor the NGT Project. Project-specific impacts on, and proposed mitigation measures related to, include, but are not limited to:

- Contacting affected landowners in advance of construction activities to gain an understanding and knowledge of existing and planned drainage systems traversed by the proposed Projects;
- Providing locational information of any drain tiles discovered in pre-construction surveys or planning onto property maps to landowners requesting them;
- Repairing drain tile damages that result from construction-related activities so that they are at least equivalent to their pre-construction condition, using materials comparable to those currently in place;
- Using available qualified local Drain Tile Contractors with experience in Ohio and Michigan to conduct drain tile repairs/replacements, who would work under the direction of, and with the direct involvement of, the pipeline construction contractor and the NEXUS construction management team; and
- After the replacement of topsoil in the right-of-way, monitoring drain tile repaired and replaced within the right-of-way for 3 years, or until restoration is considered successful, to assess any drain tile settling, crop production, and drainage issues.

We received comments regarding concerns over damage to existing drain tiles as a result of construction. Concerns focused on issues of crop loss as a result of disrupting the drainage system, flooding, timing of and procedures for drain tile repair and replacement, loss of prime farmland, and landowner compensation. Construction activities such as trenching could have the potential to damage these systems. To avoid cutting or damaging these systems, NEXUS would work with individual landowners prior to construction to identify and mark drain tile systems. Existing systems would be checked for pre-existing

damage. If damaged during construction, NEXUS would temporarily repair the drain tile(s) until the pipe is lowered into the trench and permanent repairs can be completed and hydrology restored. System interruptions would typically last 1 day. NEXUS would compensate the landowner for the costs associated with repairing drain tile damages directly related to construction.

We also received comments expressing concern that construction of the NGT Project, as stated in the *E&SCPs* and in NEXUS' *DTMP*, would still lead to damaged drain tile systems and decreased agricultural productivity. Specific remedies suggested included:

- Providing locational information to the landowner of all subsurface drains that are found and/or repaired which includes *elevation* as well as location within the right-of-way, and presented in the form of a photograph/description of the repair, and a map;
- Using a closed-circuit TV camera to assess construction damage of drain tiles within the right-of-way; and
- Increasing the depth of NEXUS' pipeline burial to a depth of 5 feet in agricultural land to in order to provide sufficient safety and separation from existing or future drain tiles.

Regarding locational information of found and/or repaired drain tiles, we note that the *DTMP* includes a provision to use GPS technology capable of 3-D survey grade accuracy, or other similarly accurate technology, to document drain tile location, alignment, and grade. Elevational information would thus be included on the property drawings, and we do not recommend adoption of this ODA provision.

Concerning the use of closed circuit TV camera probing, we note that NEXUS's *DTMP* includes a provision for examining drains across the entire project right-of-way using but not necessarily using closed circuit TV camera. This requirement does not rise to the level of being necessary given that the passing and spoil side portions of the trench would be much less likely to sustain damage in comparison to the trenching width. NEXUS should be able to discover the extent of any drain tiles damaged when it performs repairs, and thus we do not recommend adopting this ODA provision.

The ODA's recommended 2 feet of cover would force NEXUS to use a 7- to 9-foot deep trench to accommodate potential drain tile maintenance. We note the *DTMP* requires NEXUS to construct the pipeline at a depth of approximately 6- to 12-inches below any planned drain tile to accommodate planned installation of drain tile systems, and that any known planned drain tile systems would be identified on NEXUS' as-built alignment sheets. However, given the extent of drain tile expected to be encountered in agricultural construction areas, at depths typically between 3 to 4 feet, it would be prudent to employ a modification to NEXUS' proposed 3-foot-depth proposed in select areas of agricultural construction. **Therefore, we recommend:**

- **Prior to construction, NEXUS should file with the Secretary, for review and written approval of the Director of OEP, a revised Drain Tile Mitigation Plan to require a depth of burial of 4 feet in cultivated or rotated croplands, if requested by the landowner.**

In addition to the general measures and recommendations listed above, and committed to in NEXUS' *DTMP*, landowners have the opportunity during easement negotiations to request that site-specific factors and/or development plans for their property be considered, and that specific measures be taken into account.

We conclude that with implementation of NEXUS' proposed construction and mitigation measures, such as NEXUS' *Drain Tile Mitigation Plan* and *E&SCP*, and our recommendations, impacts on drain tile systems would be minimized to the greatest extent practicable.

TEAL Project

There are no agricultural drain tiles or irrigation/drainage structures crossed by the TEAL Project.

4.9.6 Roadways and Railroads

The NGT and TEAL Projects would cross 362 public roads and 112 private roads. Of these, 242 would be crossed using the bore method, 202 would be crossed using the open-cut method, and 30 would be crossed using the HDD method. A description of each crossing method is provided in section 2.3.2.3.

Potential effects associated with roadway crossings include temporary disruption of traffic flow, disturbance of existing underground utilities (i.e., water and sewer lines), and hindrance of emergency vehicle access. During construction, NEXUS and Texas Eastern would maintain passage of emergency vehicles by creating temporary travel lanes or placing of steel plate bridges to allow continued traffic flow during open trenching. Traffic lanes and residential access would be maintained throughout construction, except for the temporary periods essential for pipeline installation, which would be coordinated with the landowner. Construction debris including mud would be kept off paved roads at access points used by construction equipment. See section 4.10.7 for a discussion on transportation and traffic-related impacts.

4.9.6.1 NGT Project

Table 4.9.6-1 summarizes the number of roads that would be crossed by the NGT Project in each county. Of the 468 roads crossed, 379 are in Ohio and 89 are in Michigan. These roads range from maintained dirt and gravel to paved county and township roads, state highways, and interstate highways. Appendix K-6 identifies all roadways (public and private) crossed by the NGT Project along with the associated crossing method. There are no anticipated permanent effects on existing uses of the roadways crossed by the NGT Project.

In areas where traffic volumes are high or other circumstances (e.g., congested areas) exist, NEXUS would obtain the assistance of law enforcement to ensure traffic flow and the safety of pedestrians and vehicles. NEXUS would obtain the necessary permits to access, modify, and/or work within road rights-of-way in coordination with the Ohio and Michigan state and county transportation departments.

The NGT Project would cross 24 active railroads (18 in Ohio and 6 in Michigan) and 4 inactive railroads (3 in Ohio and 1 in Michigan), which would be crossed using the conventional bore or HDD method (see table 4.9.6-2). Use of bore and HDD methods would avoid impacting the normal operation of the active railroads during construction.

State, County	Number of Roadways Crossed		Total Number of Roadways Crossed
	Private	Public	
OHIO			
Columbiana	21	20	41
Stark	13	33	46
Summit	13	24	37
Wayne	7	12	19
Medina	4	32	46
Lorain	2	21	23
Huron	0	4	4
Erie	13	30	43
Sandusky	7	49	56
Wood	3	21	24
Lucas	4	12	16
Henry	0	1	1
Fulton	1	22	23
Ohio Total	98	281	379
MICHIGAN			
Lenawee	1	27	28
Lenawee/Monroe	0	1	1
Monroe	1	10	11
Washtenaw	11	38	49
Michigan Total	13	76	89
Project Total	111	357	468

State, County	Approx. MP	Name	Active/ Inactive	Proposed Construction Method
OHIO				
Columbiana	11.2	Norfolk Southern Corporation	Active	Bore
Stark	18.6	Norfolk Southern Corporation	Active	Bore
Stark	28.1	Wheeling & Lake Erie Railway Company	Active	Bore
Summit	34.3	Metro Regional Transit Authority RR (Cuyahoga Valley Scenic Railroad)	Inactive (Until 2019)	Bore
Summit	48.2	CSX Transportation Inc.	Active	HDD
Medina	56.8	Wheeling & Lake Erie Railway Company	Active	Bore
Medina	69.5	CSX Transportation, Inc.	Active	Bore
Medina	72.8	Wheeling & Lake Erie Railway Company	Active	Bore
Medina	73.6	CSX Transportation, Inc.	Active	Bore
Medina	75.5	CSX Transportation, Inc.	Active	Bore
Lorain	87.1	CSX Transportation, Inc.	Active	Bore
Lorain	96.3	Lake Shore Railway Association Inc. (Amherst-Wellington Connector)	Inactive	Bore
Erie	115.9	Norfolk And Western RR	Active	Bore
Erie	128.4	Norfolk And Western RR	Active	Bore
Sandusky	147.6	Norfolk Southern Corporation	Active	Bore
Sandusky	159.5	Northern Ohio & Western RR	Active	Bore
Wood	166.8	CSX Transportation, Inc.	Active	Bore

TABLE 4.9.6-2 (cont'd)

Railroads Crossed by the NGT Project				
State, County	Approx. MP	Name	Active/Inactive	Proposed Construction Method
Wood	173.9	CSX Transportation, Inc.	Active	Bore
Wood	179.1	CSX Transportation, Inc.	Active	Bore
Lucas	182.1	Toledo Lake Erie Western RR	Inactive	Bore
Fulton	197.8	Norfolk Southern Corporation	Active	Bore
MICHIGAN				
Lenawee	210.0	Genesee & Wyoming Railroad Services Inc.	Active	Bore
Lenawee	217.1	Adrian & Blissfield RR	Active	Bore
Monroe	233.0	Norfolk & Western RR	Active	Bore
Washtenaw	238.5	Omega Rail Management	Active	Bore
Washtenaw	249.7	Norfolk Southern Corporation	Inactive	Bore
Washtenaw	254.3	Norfolk Southern Corporation	Active	HDD
Washtenaw	254.3	Amtrak RR (Michigan Department of Transportation Owned)	Active	Bore

We conclude that with implementation of NEXUS' proposed construction and mitigation measures as well as its *E&SCP*, impacts on roadways and railroads would be minimized to the greatest extent practicable and would not be significant. Additionally, NEXUS would obtain the necessary permits and approvals from federal, state, and local agencies.

4.9.6.2 TEAL Project

As listed in appendix K-7, the TEAL Project would cross five public roads and one private road; no railroads would be crossed.

Similar to the NGT Project, Texas Eastern would obtain the assistance of law enforcement to ensure traffic flow and the safety of pedestrians and vehicles in areas where traffic volumes are high or other circumstances (e.g., congested areas) exist. Texas Eastern would obtain the necessary permits to access, modify, and/or work within road rights-of-way in coordination with the Ohio state and county transportation departments.

We conclude that with implementation of Texas Eastern's proposed construction and mitigation measures as well as its *E&SCP*, impacts on roadways and railroads would be minimized to the greatest extent practicable and would not be significant. Additionally, Texas Eastern would obtain the necessary permits and approvals from federal, state, and local agencies.

4.9.7 Recreation and Special Interest Areas

The NGT Project would not cross any national or state-designated Wild and Scenic Rivers, or lands managed by or associated with the U.S. Bureau of Land Management, Wetland Reserve Program, Emergency Conservation Program, Grassland Reserve Program, national forests, national parks, or Indian Reservations. However, it would cross or be located within 0.25 mile of public and private lands that support recreation or special interests. Features directly affected include trails, conservation and recreation areas, sports facilities, places of worship, a cemetery, scenic and historic byways, a scenic river, state parks and forests, nature areas/preserves, a national heritage area, and municipal parks, as listed in table 4.9.7-1. Waterbodies crossed and included on the NRI are discussed in section 4.3.2.4.

The TEAL Project would not cross or be located within 0.25 mile of any public or private lands that support recreation or special interests. Therefore, with the exception of general recreation (e.g., hunting) discussed below, it is no longer addressed in this section.

The primary concern when crossing recreation and special interest areas is the impact of construction on the purpose for which the area was established (e.g., the recreational activities, public access, and resources the area aims to protect). Construction would temporarily limit recreational use in a specific area; could generate dust and noise, which could be a nuisance to recreational users; and could interfere with or diminish the quality of the recreational experience by affecting wildlife movements or disturbing trails and their users. Construction could also alter visual aesthetics by removing existing vegetation and disturbing soils.

In general, project impacts on recreational and special interest areas occurring outside of forest/woodland would be minor and temporary (limited to the period of active construction), which typically would last only several days to several weeks in any one area. These impacts would primarily be minimized by implementing NEXUS' *E&SCP*, which describes topsoil and subsoil segregation, erosion control measures, waterbody and wetland crossings, etc. In addition, NEXUS has proposed specific mitigation measures as described below for some of the recreation and special interest areas that would be affected.

Following construction, most land uses disturbed would be restored and able to revert to their former uses. Forest/woodland affected by construction within the temporary right-of-way and ATWS areas, however, would experience long-term impacts because of the time required for the forest/woodland to regenerate to its pre-construction condition, and forest/woodland within the permanent right-of-way would experience permanent impacts because it would be precluded from being reestablished at the site or within the maintained portion of the right-of-way.

TABLE 4.9.7-1

Recreation and Special Interest Areas Crossed by the NGT Project

State, Agency	Facility	County	MP Start	MP End	Name of Area	Land Ownership / Land Management	Crossing Method	Acreage Affected by Construction	
								Con.	Op.
OHIO									
Federal									
Federal Highway Administration									
	Mainline	Summit	47.9	47.9	Ohio & Erie Canalway America's Byway	Federal Highway Administration	HDD	<0.1 ^a	0.0
State									
Ohio Department of Natural Resources									
	Mainline	Wood / Lucas	181.4	181.5	Maumee State Scenic River	ODNR	HDD	<0.1 ^a	0.0
	Mainline	Lucas	181.5	181.7	Missionary Island Wildlife Area	ODNR	HDD	<0.1 ^a	0.0
	Mainline	Lucas	181.7	181.8	Maumee State Scenic River	ODNR	HDD	<0.1 ^a	0.0
	Mainline	Summit	41.0	41.2	Portage Lakes State Park (Nimisila Reservoir)	ODNR	HDD	<0.1 ^a	0.0
	Mainline	Summit	41.6	41.7	Portage Lakes State Park (Nimisila Creek)	ODNR	Flume or Dam and Pump	2.6	0.9
	Mainline	Henry	190.0	190.2	ODNR Property (adjacent to Maumee State Forest)	ODNR	Open-Cut	3.9	1.4
	Mainline	Fulton	190.1	190.3	ODNR Property	ODNR	Open-Cut	5.2	1.6
	Mainline	Fulton	193.3	193.5	Maumee State Forest	ODNR	Open-Cut	4.7	2.8
Ohio Department of Transportation									
	Mainline	Columbiana	2.0	2.0	Lincoln Highway Historic Byway (Ohio State Route 9/U.S. Route 30)	ODOT	Bore	0.2	0.1
	Mainline	Wood	181.2	181.2	Maumee Valley Scenic Byway (West River Road)	ODOT / Maumee Valley Heritage Corridor	HDD	<0.1 ^a	0.0
	Mainline	Lucas	181.8	181.8	Maumee Valley Scenic Byway (South River Road)	ODOT / Maumee Valley Heritage Corridor	HDD	<0.1 ^a	0.0
County/Municipal									
Stark County Park District									
	Mainline	Stark	16.2	16.2	Stark Farmland Trail (proposed)	Stark County Park District	Bore	0.1	<0.1
	Mainline	Stark	17.0	17.0	Iron Horse Trail	Stark County Park District	Open-Cut	<0.1	<0.1
	Mainline	Stark	18.3	18.3	Stark Electric Railway Trail (proposed)	Stark County Park District	Bore	0.1	<0.1
	Mainline	Stark	27.2	27.2	Upper Middle Branch Trail (proposed)	Stark County Park District	Bore	0.1	<0.1
Summit County Metro Parks									
	Mainline	Summit	48.2	48.2	Ohio & Erie Canal / Towpath Trail	Summit Metro Parks / Private Landowners	HDD	<0.1 ^a	0.0
Medina County Park District									
	Mainline	Medina	69.5	69.5	Chippewa Rail Trail	Medina County Park District	Bore	0.2	0.1

TABLE 4.9.7-1 (cont'd)

Recreation and Special Interest Areas Crossed by the NGT Project									
State, Agency	Facility	County	MP Start	MP End	Name of Area	Land Ownership / Land Management	Crossing Method	Acreage Affected by Construction	
	Mainline	Medina	68.9	69.0	Chippewa Lake Nature Area	Medina County Park District / Western Land Conservancy	Open Cut	0.7	0.3
	Mainline	Medina	69.6	69.7	Chippewa Lake Nature Area	Medina County Park District	Open Cut	7.8	2.6
	Mainline	Medina	70.3	70.6	Chippewa Lake Nature Area	Medina County Park District	Open Cut	6.8	2.8
	Mainline	Medina	71.1	71.3	Buckeye Woods Park / Schleman Nature Preserve	Medina County Park District	HDD	<0.1 ^a	0.0
	Lorain County Metro Parks								
	Mainline	Lorain	98.1	98.1	North Coast Inland Trail	Lorain County Metro Park District	Bore	0.2	0.1
	Sandusky County Park District								
	Mainline	Sandusky	151.2	151.3	North Coast Inland Trail	Sandusky County Park District	Bore	0.2	0.1
	Mainline	Sandusky	153.2	153.4	Creek Bend Farm	Sandusky County Park District	Open Cut	3.0	1.3
	Metroparks of the Toledo Area								
	Mainline	Lucas	181.7	181.8	Farnsworth Metropark / Towpath Trail	Metroparks of the Toledo Area	HDD	<0.1 ^a	0.0
	City of Green								
	Mainline	Summit	35.3	35.4	Ariss Park	City of Green	Open Cut	3.1	0.9
	Mainline	Summit	35.5	35.6	Ariss Park / Hwy 77	City of Green	Open Cut / Bore	1.7	0.6
	Mainline	Summit	37.1	37.1	Greensburg Park	City of Green	Open Cut	<0.1	<0.1
	Private/Other								
	Mainline	Columbiana	3.5	3.5	North Country National Scenic Trail (on Buffalo Road)	Private Landowners / Hanover Township, Columbiana County Board of Trustees	Open Cut	0.3	0.1
	Mainline	Columbiana	8.0	8.0	Statewide Bike Routes- J	Columbiana County Engineer	HDD	<0.1 ^a	0.0
	Mainline	Stark	33.0	33.0	Buckeye Trail	Private Landowners	Open Cut	0.1	<0.1
	Mainline	Summit, Stark	33.4	35.4	Ohio & Erie Canalway National Heritage Area	Private Ownership / NPS Management	Open Cut	35.3	12.2
	Mainline	Stark	34.0	34.0	Buckeye Trail	Private Landowners	Bore	0.1	<0.1
	Mainline	Summit	34.3	34.3	Cuyahoga Valley Scenic Railroad	Metro Regional Transit Authority	Bore	0.0	<0.1
	Mainline	Summit	38.8	39.0	Singer Lake Bog	Cleveland Museum of Natural History	Open Cut	3.9	1.3
	Mainline	Summit	41.2	41.2	Buckeye Trail	Private Landowners	HDD	<0.1 ^a	0.0
	Mainline	Summit	41.5	49.6	Ohio & Erie Canalway National Heritage Area	Private Ownership / NPS Management	Open Cut	128.3	49.3
	Mainline	Summit	47.9	47.9	Buckeye Trail / Ohio to Erie Trail	Private Landowners	HDD	<0.1 ^a	0.0
	Mainline	Medina	68.0	68.0	Chippewa Lake Baptist Church	Private Landowners	Open Cut	0.9	0.9
	Mainline	Medina	68.9	68.9	State Wide Bike Route- C	Lafayette Township, Board of Trustees	Bore	<0.1	<0.1
	Mainline	Medina	78.0	78.0	Buckeye Trail	Private Landowners / York Township, Board of Trustees	Bore	0.1	<0.1
	Mainline	Lorain	83.9	84.4	Western Reserve Land Conservancy	Private Landowners/ Western Reserve Land Conservancy	Open Cut	7.8	3.0

TABLE 4.9.7-1 (cont'd)

Recreation and Special Interest Areas Crossed by the NGT Project

State, Agency	Facility	County	MP Start	MP End	Name of Area	Land Ownership / Land Management	Crossing Method	Acreage Affected by Construction	
	Mainline	Lorain	95.4	95.6	Western Reserve Land Conservancy (also encompasses Black Swamp Woods)	Private Landowners/ Western Reserve Land Conservancy	Open Cut	4.1	1.5
	Mainline	Lorain	96.3	96.3	Amherst-Wellington Connector	Lake Shore Railway Association	Bore	0.1	<0.1
	Mainline	Erie	110.2	110.2	Statewide Bike Route- N	Erie County Engineer	HDD	<0.1 ^a	0.0
	Mainline	Erie	116.3	116.3	Statewide Bike Routes N-CP	Erie County Engineer	Bore	0.1	<0.1
	Mainline	Erie	118.5	118.8	Erie County Conservation League	Erie County Conservation League	Open Cut	4.6	1.7
	Mainline	Erie	122.0	122.0	St. John's United Church of Christ Milan Ohio Inc.	Private Landowners	Open Cut	0.5	0.1
	Mainline	Erie	128.8	128.8	Statewide Bike Route N-CP	Groton Township, Board of Trustees	Bore	0.1	<0.1
	Mainline	Sandusky	151.7	151.7	Buckeye Trail	Private Landowners / Sandusky County Engineers	Bore	0.1	<0.1
	Mainline	Sandusky	162.4	162.4	Buckeye Trail	Private Landowners / Sandusky County Engineers	HDD	<0.1 ^a	0.0
	Mainline	Wood	177.3	177.3	Statewide Bike Route E	Middleton Township	Bore	0.1	<0.1
	Mainline	Wood	178.1	178.1	Bowling Green- Perrysburg Connector (proposed)	Middleton Township	Bore	0.1	<0.1
	Mainline	Wood	179.9	179.9	Buckeye Trail	Private Landowners / ODOT	HDD	<0.1 ^a	0.0
	Mainline	Wood	180.8	180.8	Riverby Hills Golf Club	Private Landowners	Open Cut	0.1	<0.1
	Mainline	Lucas	181.8	181.8	Highland Memory Gardens Cemetery	Private Landowners	HDD	<0.1 ^a	0.0
	Mainline	Lucas	183.1	183.1	Statewide Trail A	Various county, city or township offices	Bore	0.1	<0.1
	Mainline	Henry	190.0	190.0	North Country National Scenic Trail; Wabash Cannonball Trail	Northwestern Ohio Rails To Trails Association, Inc.	Open Cut	0.1	<0.1
	Mainline	Fulton	195.9	195.9	North Country National Scenic Trail; Wabash Cannonball Trail	Northwestern Ohio Rails To Trails Association, Inc.	Bore	0.1	<0.1
							Ohio Total	226.9	86.1
MICHIGAN									
	Mainline	Washtenaw	249.1	249.1	Community Free Will Baptist Church	Private Landowners	Open Cut	0.8	0.4
	Mainline	Washtenaw	250.3	250.3	South Hydro Park	Charter Twp of Ypsilanti	Staging Area	0.4	0.0
	Mainline	Washtenaw	250.9	251.1	North Hydro Park	Charter Twp of Ypsilanti	HDD	<0.1 ^a	0.0
	Mainline	Washtenaw	251.2	251.4	The Ponds at Lakeshore Disc Golf Course	Private Landowners	Open Cut	3.1	1.1
							Michigan Total	4.3	1.5
							NGT Project Total	231.2	87.6
a	Construction and operation impacts <0.1 acre represent minor hand cutting of brush to lay a guide wire for the HDD, which may consist of a pathway measuring a few feet in width in densely vegetated areas..								

NEXUS would work with the landowners of the recreational and special interest areas to avoid, minimize, or mitigate impacts on these areas, as requested. Each recreational or special interest area is discussed below, along with any site-specific measures that NEXUS would adopt to avoid or minimize construction-related impacts on the feature. NEXUS would attempt to maintain access to the areas during construction of the pipeline. NEXUS would compensate landowners for any loss of crop or timber for any area disturbed during construction. In addition to the areas directly affected, table 4.9.7-2 lists the recreational and special interest areas that are within 0.25 mile of the NGT Project.

TABLE 4.9.7-2

Recreation and Special Interest Areas within 0.25 Mile of the NGT Project

State, Facility, County	Ownership/Management	Name of Area	Distance in feet and Direction from Nearest Point of Construction ROW
OHIO			
Mainline			
Stark	Stark County Park District	Stark Farmland Trail (proposed)	267 East from Access Road; 760 West from MP 14.8
Stark	Private Landowners	Sportsman's Rod & Gun Club	112 South from MP 25.4
Stark	Multiple Landowners	Statewide Bike Route	988 Southwest from MP 27.3
Stark	Private Landowners	Lake O' Pines Park	881 North from MP 30.2
Summit	City of Green	Green Youth Sports Complex	697 East from MP 36.8
Summit	City of Green	Boettler Park and Southgate Park	353 Southeast from MP 38.0
Summit	Cleveland Museum of Natural History	Singer Lake Bog	1,158 South from MP 38.2
Summit	Private Landowners	Loyola Retreat House	500 Northwest from MP 40.4
Summit	Private Landowners	Camp Y-NOAH (YMCA)	38 South from Access Road; 942 South from MP 40.9
Summit	Private Landowners	Spring Hills Golf and Tennis Club	311 South from MP 49.3
Wayne	Village of Doylestown	Doylestown Park	1,054 South from MP 53.4
Medina	Private Landowners	Romeyn Recreational Enterprises Inc.	575 West from MP 65.1
Medina	Medina County Park District	Chippewa Lake Nature Area	368 West from MP 69.0
Medina	Medina County Park District	Chippewa Lake Nature Area	544 South from MP 69.5
Medina	Private Landowners	Medina Country Club	369 East from MP 69.2
Lorain	Private Landowners	Gordon Blackhall Memorial Range	966 Southwest from MP 81.2
Lorain	Lorain County Metro Park District	Midview Soccer League Complex	213 South from MP 86.0
Lorain	Lorain County Metro Park District	Indian Hollow Reservation and Sheldon Woods	562 Northeast from MP 87.7
Lorain	Multiple Landowners	Statewide Bike Route	560 North from MP 90.8
Lorain	Lorain County Metro Park District	Carlisle Preservation	0' West from MP 91.4
Lorain	City of Oberlin	Oberlin Recreational Complex	369 North from MP 94.6
Erie	Private Landowners	Western Reserve Land Conservancy	230 East from MP 110.1
Erie	Erie County Metro Parks Board	Edison Woods Preserve	17 Northeast from MP 112.1
Sandusky	State of Ohio	Wildlife Habitat Restoration Program Murray, P.	530 North from MP 144.2
Sandusky	Private Landowners	Black Swamp Conservancy, Placemark	438 North from MP 153.8
Sandusky	Private Landowners	Black Swamp Conservancy, CBR Farms	429 North from MP 154.2
Sandusky	Private Landowners	Black Swamp Conservancy, Toledo Alfalfa Mills Farm	0' North from MP 155.6
Sandusky	Private Landowners	Black Swamp Conservancy, Chet Mauch Farm	49 South from MP 156.6

TABLE 4.9.7-2

Recreation and Special Interest Areas within 0.25 Mile of the NGT Project

State, Facility, County	Ownership/Management	Name of Area	Distance in feet and Direction from Nearest Point of Construction ROW
Wood	Private Landowners	Tanglewood Golf Course	724 North from MP 173.2
Henry	ODNR	Maumee State Forest	817 South from MP 189.3
Henry	ODNR	Maumee State Forest	670 Southwest from MP 190
Fulton	Private Landowners	White Pine Golf Course	207 Southwest from MP 190.5
Fulton	ODNR	Maumee State Forest	416 Northeast from MP 191.7
Fulton	ODNR	Maumee State Forest	696 East from MP 192.8
Fulton	ODNR	Maumee State Forest	634 East from MP 193.3
Fulton	State of Ohio	Fulton Pond Wildlife Area	8 East from MP 198.8
Aboveground Facilities			
Columbiana	ODOT	Lincoln Highway Historic Byway	1,171 Northwest from Hanoverton Compressor Station boundary
Erie	Multiple Landowners	Statewide Bike Route N-CP	206 East from MR05 boundary
Lucas	Private Landowners	Statewide Trail A	529 East from Waterville Compressor Station boundary
MICHIGAN			
Mainline			
Washtenaw	Washtenaw County Parks and Recreation	Draper-Houston Meadows Preserve & Nature Park	47 East from MP 237.4

Direct effects would not occur on areas located within 0.25 mile of the NGT Project and outside of the construction right-of-way. However, during pipeline construction, indirect impacts from noise and visual impacts would occur; these would be temporary and limited to the time of construction. During operation, moderate and permanent visual and noise impacts would result from clearing of trees from the permanent right-of-way and, if applicable, the placement of permanent facilities such as compressor stations or MLVs within proximity to the recreation and special interest areas. NEXUS would implement the measures outlined in its *E&SCP* to prevent disturbance to off-site areas.

No public hunting or game management areas would be crossed by the NGT or TEAL Projects. However, construction of the Projects may affect general recreational activities such as hunting and fishing. For example, construction of the pipeline may affect hunting activities that occur on private land if the hunting season occurs within the construction time frame. Hunting seasons in Ohio and Michigan vary depending by species. For example, deer hunting is allowed between September and February; turkey hunting is allowed between September and November and April and May; and most small game species hunting is allowed between September and January (ODNR Division of Wildlife, 2016a; MDNR, 2016). Currently, construction of the TEAL Project is planned from March 2017 through October 2017. Construction of the NGT Project is planned from March 2017 through November 2017. To minimize conflicts with hunting activities, NEXUS and Texas Eastern would notify adjacent landowners prior to construction.

In addition, recreational fishing occurs in the NGT and TEAL Project areas. Common fish species occurring in the waterbodies affected by the Projects are discussed in section 4.7.1 and listed in table 4.7.1-1. Sections 2.3.2.1 and 4.7.2 discuss construction methods proposed at waterbodies and Project-related impacts on waterbodies and fisheries, respectively.

The following discussions describe recreational and special interest areas designated by federal, state, and county/municipal entities, and the opportunities available at each area crossed by the NGT Project. As stated above, no federal, state, or county/municipal designated recreational or special interest

areas would be crossed by the TEAL Project. NEXUS has proposed general mitigation measures and provided site-specific crossing plans that are being completed in consultation with the applicable landowner or managing agency (see appendix P). Site-specific crossing plans have not been provided for Chippewa Lake Baptist Church, St. John's United Church of Christ Milan, and the Community Free Will Baptist Church. Because some of these plans have not been completed, we are recommending in the following discussions that NEXUS file outstanding site-specific crossing plans for certain features. We have included draft versions of the available site-specific crossing plans in appendix E-5.

4.9.7.1 Federal

Federal Highway Administration

Ohio & Erie Canalway America's Byway

The Ohio & Erie Canalway America's Byway is a 110-mile route that was designated in 1996 as a State Scenic Byway by the ODOT and designated as Ohio & Erie Canalway America's Byway in 2000 by U.S. Secretary of Transportation. Ohio & Erie Canalway America's Byway is a collection of 150 roads that recognize certain roads as All-American Roads or National Scenic Byways based on one or more archeological, cultural, historic, natural, recreational and scenic qualities. The Ohio & Erie Canalway America's Byway is recognized as a National Scenic Byway, and is administered by the Federal Highway Administration of the DOT (Ohio & Erie Canal Association, 2016a). The Ohio & Erie Canalway America's Byway travels through the Ohio & Erie Canal National Heritage Area (NHA).

As listed in table 4.9.7-1, the NGT Project would cross Ohio & Erie Canalway America's Byway at MP 47.9 (Van Buren Road at this location) using the HDD method, as described in section 2.3.2.1. Land use on either side of the byway crossing consists of open land, agricultural land, and residential land. This crossing also includes crossing of the Tuscarawas River and the Ohio-to-Erie Trail (Buckeye Trail at this location). The trails are discussed individually below.

Direct impacts would be avoided; however, byway travelers may experience temporary visual and noise impacts associated with construction personnel and equipment and HDD activities. Also, as a result of the HDD method, tree clearing and vegetation maintenance within the permanent right-of-way on either side of the crossing would not be necessary, thus avoiding permanent visual impacts on recreational users. Recreational uses of the byway would not be affected by operations.

4.9.7.2 State

Ohio Department of Natural Resources

Maumee State Scenic River

The Maumee State Scenic River is located in northwestern Ohio and flows northeasterly through portions of Paulding, Defiance, Henry, Wood and Lucas Counties. Scenic rivers are classified according to the outstanding qualities a stream possesses including the stream's length, adjacent forest cover, biological characteristics, water quality, present use, and natural conditions. Ohio's Scenic Rivers Act provides three categories for river classification: wild, scenic and recreational (ODNR Division of Watercraft, 2016). The ODNR Division of Watercraft administers the state scenic rivers program.

As listed in table 4.9.7-1, the NGT Project would cross the Maumee State Scenic River at two locations between MPs 181.4 and 181.8 using the HDD method. The Maumee State Scenic River is designated as a "recreational river" at this crossing. A recreational river includes those rivers or sections

of rivers that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past (State of Ohio, 2016). Land use at this crossing consists of forest/woodland (Missionary Island Wildlife Area and along the river banks) and open water (Maumee River). Project-related impacts would be similar to those described for other areas crossed using the HDD method. Recreational uses of the river would not be affected by operations.

Missionary Island Wildlife Area

The Missionary Island Wildlife Area includes 296 acres of land located along the Maumee River in Lucas and Wood Counties, and is owned and managed by the ODNR Division of Wildlife. Recreational opportunities include wildlife watching, hunting, trapping, fishing, and boating (ODNR Division of Wildlife, 2016b).

As listed in table 4.9.7-1, the NGT Project would cross the Missionary Island Wildlife Area between MPs 181.5 to 181.7 using the HDD method. Land use at this crossing consists of forest/woodland. Project-related impacts would be similar to those described for other areas crossed using the HDD method. Recreational uses of the wildlife area would not be affected by operations.

Portage Lakes State Park

Portage Lakes State Park is a 411-acre state park located in Summit County and is owned and managed by the ODNR Division of Parks and Recreation. The park offers recreational experiences such as boating, swimming, hunting and fishing, and wildlife viewing (ODNR Division of Parks and Recreation, 2016).

As listed in table 4.9.7-1, the NGT Project would cross the southern portion of Portage Lakes State Park in two locations between MPs 41.0 and 41.2 and between MPs 41.6 and 41.7. The first crossing between MPs 41.0 and 41.2 consists of the Nimisila Reservoir and would be crossed using the HDD method. Land use at the first crossing consists of agricultural land, open water (Nimisila Reservoir), and forest/woodland.

Direct impacts would be avoided at the first crossing where the reservoir would be crossed using the HDD method; however, a small portion of ATWS associated with HDD entry/exit point at MP 40.9 is located within the park and would impact agricultural land. Where land use is agricultural, land uses would return to pre-construction conditions. Recreational users may experience temporary visual and noise impacts associated with construction personnel and equipment and HDD activities. Recreational uses of the park would not be affected by operations.

The second crossing between MPs 41.6 and 41.7 consists of Nimisila Creek, which would be crossed using the flume or dam and pump method, as described in section 2.3.2.1. Land use at the second crossing consists of forest/woodland, open water (Nimisila Creek), and open land. The open land portions of each crossing are associated with an existing utility right-of-way.

Construction would affect 2.6 acres and operations would affect 0.9 acre at the Nimisila Creek crossing. Project-related construction and operation impacts associated with the second crossing include clearing and tree removal of the construction workspace, and routine vegetation maintenance within the permanent right-of-way required during pipeline operation. As a result, the NGT Project would cause the conversion of forest/woodland to open land within the permanent right-of-way. Impacts associated with tree clearing and vegetation maintenance would be a long-term to permanent impact. Following construction, the area would be restored, and areas outside of the permanent right-of-way would be returned

to pre-construction conditions in accordance with NEXUS' *E&SCP*. Additionally, NEXUS would compensate the land managing agency for the value of trees removed by construction and operation of the project. Recreational users would be temporarily affected by Project-related noise, dust, traffic, and visual impacts. These impacts would be limited to the time of construction. Recreational uses of the park would not be affected by operations; however, long-term impacts associated with tree removal would be visible.

ODNR Property

As listed in table 4.9.7-1, the pipeline crosses two parcels owned by the ODNR between MPs 190.0 and 190.2 and between MPs 190.1 and 190.3 using the open-cut method as described in section 2.3.2.1. This area is also within the Historic Oak Openings Region (see section 4.5.1.1) and adjacent to the Maumee State Forest. The first crossing at MP 190.0 coincides with the North Country National Scenic Trail (NCNST) and Wabash Cannonball Trail. Land use at the first crossing consists of forest/woodland and agricultural land. Land use at the second crossing consists of agricultural land and commercial/industrial (County Road A).

Construction would affect 9.1 acres and operations would affect 3.0 acres at the ODNR Property crossings. Project-related construction and operation impacts would be similar to those described in section 4.9.2, depending on the specific land use type affected throughout the area, and to those described for other areas crossed using the open-cut method. Following construction, these areas would be restored, and areas outside of the permanent right-of-way would be returned to pre-construction conditions in accordance with NEXUS' *E&SCP*. Recreational uses of the trail would be allowed to continue; however, long-term impacts associated with tree removal would be visible.

An alternative route for the pipeline at the first crossing is under consideration as discussed in section 3.0. This alternative route would shift the pipeline east and bisect a contiguous portion of forest/woodland within the Maumee State Forest.

Maumee State Forest

The Maumee State Forest includes a combination of several parcels totaling 3,194 acres in Fulton and Henry Counties, and is owned and managed by the ODNR's Division of Forestry. Recreational opportunities offered by the forest include fishing, hunting, camping, hiking, biking, picnicking, winter recreation, wildlife observations, horseback riding, and all-purpose vehicle use (ODNR Division of Forestry, 2016a). The Maumee State Forest is managed under the multiple-use concept including, but not limited to, timber, wildlife habitat, forestry research, demonstration of good forest management, soil and water protection, recreational use, and unique natural features (ODNR Division of Forestry, 2016b).

As listed in table 4.9.7-1, the NGT Project would cross the Maumee State Forest boundary between MPs 193.3 and 193.5 using the open-cut method. This portion of the Maumee State Forest is designated as land management area Compartment A2 and is located within the Historic Oak Openings Region (see section 4.5.1.1). Land use at this crossing consists of forest/woodland.

According to the Maumee State Forest 2016 Work Plan, several areas within Compartment A2 are being considered for prescribed burning in 2016. These areas include the Stewardship Trail Demo Area, a phragmites (common reed grass) patch near Road 4, and the Rusin Tract Old Fields. The Stewardship Trail is approximately 650 feet west of the construction workspace, and the nearest facility, the Maumee State Forest office building, is approximately 665 feet west of the construction workspace.

Construction would affect 4.7 acres and operations would affect 2.8 acres at the state forest crossing. Project-related construction and operation impacts would be similar to those described in section

4.9.2, depending on the specific land use type affected throughout the area, and to those described for other areas using the open-cut method. Following construction, these areas would be restored, and areas outside of the permanent right-of-way would be returned to pre-construction conditions in accordance with NEXUS' *E&SCP*. Recreational uses of the forest would be allowed to continue; however, long-term impacts associated with tree removal would be visible.

Ohio Department of Transportation

Lincoln Highway Historic Byway (Ohio State Route 9/U.S. Route 30)

The 241-mile-long Lincoln Highway Historic Byway in Ohio was established in March 2004 after being awarded the state-designated byway status through the ODOT (Ohio Lincoln Highway Heritage Corridor, 2016; ODOT, 2016a). The byway is also referred to as Ohio State Route 9 and U.S. Route 30. Much of U.S. Route 30 has been rebuilt as a four-lane divided highway, but several original brick paved sections still exist (Lincoln Highway Association, 2016). The ODOT manages the Lincoln Highway Historic Byway and partners with organizations to preserve, protect, and enhance the intrinsic resources of the byway.

As listed in table 4.9.7-1, the NGT Project would cross the Lincoln Highway Historic Byway at MP 2.0 using the bore method, as described in section 2.3.2.1. At this crossing, the byway is a two-lane divided paved road. Land use on either side of the byway crossing consists of open land and open water (Sandy Creek). Direct impacts on the byway would be avoided through use of the bore method and traffic would continue during construction; however, scenic travelers may experience temporary visual and noise impacts associated with construction personnel and equipment and bore activities. Following construction, recreational uses of the byway would not be affected by operations. The ATWS associated with the bore crossing would result in minor and temporary residential tree removal.

Maumee Valley Scenic Byway (West and South River Roads)

The Maumee Valley Scenic Byway is part of Ohio Scenic Byway Program. The nearly 90-mile route begins on the north side of the Maumee River in Defiance and follows River Road until it ends in Maumee. On the south side of the Maumee River, the byway starts at Napoleon and ends in Rossford (ODOT, 2016b).

As listed in table 4.9.7-1, the NGT Project would cross the Maumee Valley Scenic Byway in two locations at MP 181.2 and MP 181.8 using the HDD method. The first crossing at MP 181.2 (West River Road in this location) is a two-lane divided paved road. Land use at the first crossing consists of agricultural and forest/woodland. The second crossing at MP 181.8 (South River Road in this location) is also a two-lane divided paved road. Land use at the second crossing consists of open land. The byway segments crossed by the NGT Project are managed by the Maumee Valley Heritage Corridor (Maumee Valley Heritage Corridor, 2016).

Project-related impacts would be similar to those described for other areas crossed using the bore method. Recreational uses of the byway would not be affected by operations. The access road associated with the HDD crossing would require minor tree removal along West River Road.

4.9.7.3 County/Municipal

Stark County Park District

Stark Farmland Trail (Proposed)

The Stark Farmland Trail is a proposed on-road trail that would provide a north-south connection between Alliance and Minerva using rural roadways, and would be an alternate to the Iron Horse Trail (Stark County Park District, 2016a). According to the Stark County Transportation Plan (Stark County Area Transportation Study, 2013), the proposed Stark Farmland Trail would be completed in 2040. The Stark County Park District would own and manage the Stark Farmland Trail. As listed in table 4.9.7-1, the NGT Project would cross a future segment of the Stark Farmland Trail at MP 16.2 (Beechwood Ave NE at this location) using the bore method. Land use on either side of the road/future trail consists of agricultural land.

Project-related impacts would be the same as those described throughout this section for agricultural land, and those that would be crossed using the bore method. Following construction, vehicular uses of the road and future uses of the trail would not be affected by operations.

Iron Horse Trail

The Iron Horse Trail is a former railroad right-of-way that once connected Alliance to Minerva (Stark County Park District, 2016b). Recreational activities along the natural surface trail include hiking and walking. The Stark County Park District owns and manages the Iron Horse Trail. As listed in table 4.9.7-1, the NGT Project would cross the Iron Horse Trail at MP 17.0 using the open-cut method. Land use on either side of the trail consists of forest/woodland.

Construction would affect 0.04 acre and operations would affect 0.03 acre at the Iron Horse Trail crossing. Project-related construction and operation impacts would be similar to those described in section 4.9.2, depending on the specific land use type affected throughout the area, and to those described for other areas crossed using the open-cut method. Following construction, these areas would be restored, and areas outside of the permanent right-of-way would be returned to pre-construction conditions in accordance with NEXUS' *E&SCP*. Recreational uses of the trail would not be affected by operations. Because the trail at would be temporarily closed and specific mitigation measures, such as a detour, have not yet been identified, **we recommend that:**

- **Prior to construction, NEXUS should file with the Secretary a site-specific crossing plan for the Iron Horse Trail at MP 17.0 that identifies the location(s) of a detour, public notification procedures, signage, and consideration of avoiding days of peak usage. The crossing plan shall be developed in consultation with the landowner and trail managing agencies.**

Stark Electric Railway Trail (Proposed)

The Stark Electric Railway Trail is a proposed recreational trail that would connect Canton, Louisville and Alliance. According to the Stark County Transportation Plan (Stark County, 2013), the Stark Farmland Trail would be completed in 2030. The Stark County Parks District would own and manage the Stark Electric Railway Trail. As listed in table 4.9.7-1, the NGT Project would cross a future segment of the Stark Electric Railway Trail at MP 18.3 (Easton Street NE in this location) using the bore method. Land use on either side of the trail consists of open land and residential land.

Project-related impacts would be similar to those described for other areas crossed using the bore method. Following construction, vehicular uses of the road and future uses of the trail would not be affected by operations.

Upper Middle Branch Trail (Proposed)

The proposed Upper Middle Branch Trail would become a primary north-south connector within the center of Stark County. It would connect Hartville to Canton at Riverside Park. Much of the route would parallel the Middle Branch of the Nimishillen Creek (Stark County Park District, 2016c). As listed in table 4.9.7-1, the NGT Project would cross the proposed Upper Middle Branch Trail at MP 27.2 (Gans Avenue NE at this location) using the bore method. Land use on either side of the road/future trail consists of open and agricultural land.

Project-related impacts would be similar to those described for other areas crossed using the bore method. Following construction, vehicular uses of the road and future uses of the trail would not be affected by operations.

Summit County Metro Parks

Ohio & Erie Canal Towpath Trail

The Ohio & Erie Canal Towpath Trail is one of Ohio's longest and most popular scenic bikeways. The "towpath," as it is more commonly known, is part of the larger Ohio-to-Erie Trail (Ohio Bikeways, 2016) and the Buckeye Trail system. About 41 miles of the towpath trail are in Summit County and managed by Summit Metro Parks. The trail segment crossed by the NGT Project is on land leased by Metro Parks from PPG Industries (Summit Metro Parks, 2016).

As listed in table 4.9.7-1, the NGT Project would cross the trail at MP 48.2 using the HDD crossing method. Land use adjacent to the trail crossing consists of open water (Tuscarawas River) and forest/woodland. The crossing of the trail is adjacent to and parallel with overhead wires. Project-related impacts would be similar to those described for other areas crossed using the HDD method. Recreational uses of the wildlife area would not be affected by operations. Recreational uses of the trail and river would not be affected by operations.

Medina County Park District

The Medina County Park District owns and manages more than 6,300 acres of land, including 17 open parks and preserves and 12 additional sites set aside for future development (Medina County Park District, 2016a). As listed in table 4.9.7-1, the NGT Project would cross several tracts of Medina County Park District land from MPs 69.5 to 71.3 including the Chippewa Rail Trail, Chippewa Lake Nature Area, Chippewa Inlet Trail, and Buckeye Woods Park/Schleman Nature Preserve. Each of these areas are described individually below.

Chippewa Rail Trail

The Chippewa Rail Trail is a former railroad line that was purchased by the Medina County Park District in 1992. Funds from an ODOT grant were used to develop the Chippewa Rail Trail from Chippewa Road to Wycliffe Drive in Lafayette Township. The 10-foot-wide by 2.75-mile-long asphalt trail offers hiking, biking, and rollerblading (Medina County Park District, 2016b).

As listed in table 4.9.7-1, the NGT Project would cross the Chippewa Rail Trail at MP 69.5 using the bore method. Land use on either side of the trail consists of forest/woodland.

Project-related impacts would be the same as those described throughout this section for forest/woodland, and those that would be crossed using the bore method. Following construction, vehicular uses of the road and future uses of the trail would not be affected by operations. The ATWS associated with the bore crossing would be located such that tree removal would be required starting about 40 feet from the southwest side of the trail.

Chippewa Lake Nature Area

The Chippewa Lake Nature Area is located south of Buckeye Woods Park and on the west and north side of Chippewa Lake. As listed in table 4.9.7-1, the NGT Project would cross the Chippewa Lake Nature Area in three locations between MPs 68.9 and 69.0, MPs 69.6 and 69.7, and MPs 70.3 and 70.6 using the open-cut method. The first crossing between MPs 68.9 and 69.0 includes a parcel that was acquired through a partnership with the Western Reserve Land Conservancy (Western Reserve Land Conservancy, 2016). This parcel is located between the Chippewa Rail Trail and Lake Road. Land use at this crossing consists of agricultural land and forest/woodland. Land use at the second crossing (MPs 69.6 and 69.7) and third crossing (MPs 70.3 and 70.6) consists of open land and forest/woodland.

Construction would affect 15.3 acres and operations would affect 5.7 acres at the Chippewa Lake Nature Area crossings. Project-related construction and operation impacts would be similar to those described in section 4.9.2, depending on the specific land use type affected throughout the area, and to those described for other areas crossed using the open-cut method. Following construction, these areas would be restored, and areas outside of the permanent right-of-way would be returned to pre-construction conditions in accordance with NEXUS' *E&SCP*. Recreational uses of the areas would be allowed to continue; however, long-term impacts associated with tree removal would be visible.

Buckeye Woods Park / Schleman Nature Preserve

Buckeye Woods Park is the largest park in the Medina County park system and includes the Schleman Nature Preserve. The preserve, located along the western boundary of Buckeye Woods Park, was donated to the Medina County Park District to remain undeveloped for the enjoyment of nature and wildlife viewing. Recreational trails within the preserve include the 1.5-mile Green Trail and the 1.0-mile Yellow Trail. The Green Trail connects to the Chippewa Inlet Trail in Buckeye Woods Park (Medina County Park District, 2016c).

As listed in table 4.9.7-1, the NGT Project would cross the Schleman Nature Preserve between MPs 71.1 and 71.3 using the HDD method. Land use at this crossing consists of forest/woodland. Project-related impacts would be similar to those described for other areas crossed using the HDD method.

We received several comments from Medina County Park District during scoping that expressed concern over impacts on the Schleman Nature Preserve and a wetland mitigation area, as well as crossing the Chippewa Rail and Chippewa Inlet Trails. More specifically, Medina County Park District noted the long-term impacts of clearing trees within, and north of, the Schleman Nature Preserve; potential impacts to a wetland mitigation project that was constructed and currently maintained by Medina County Park District; steep slopes near the Chippewa Rail Trail crossing that would make it difficult to construct within and repair the slopes; and due to the proximity of the Chippewa Inlet Trail to the Chippewa Inlet (a waterbody), the Park District is opposed to an aboveground crossing of the Inlet waterbody, and has requested the trails remain open during construction.

Regarding the crossing of Schleman Nature Reserve and the private forested land north of the preserve, NEXUS proposes to cross the area using the HDD method to avoid impacts (see table 4.9.7-1). Regarding the wetland mitigation area, NEXUS has rerouted the NGT Project to avoid impacts to the wetland mitigation area. Inlet waterbody crossings and wetlands are discussed in sections 4.3 and 4.4, respectively. Regarding the crossing of the trails, based on our recommendations in the draft EIS, NEXUS proposes to cross the Chippewa Rail Trail using the bore method, and no longer crosses the Chippewa Inlet Trail.

Lorain County Metro Parks and Sandusky County Park District

North Coast Inland Trail

The 65-mile North Coast Inland Trail is a 12-foot-wide asphalt paved trail that was built over abandoned railroad tracks and extends from Elyria to Toledo. The NGT Project would cross the trail at two locations in Lorain and Sandusky Counties. Lorain County Metro Parks manages a 13-mile segment from Elyria to Kipton (Lorain County Metro Parks, 2016), and Sandusky County Park District manages a 28-mile segment from Bellevue to Elmore (Sandusky County Park District, 2016a).

As listed in table 4.9.7-1, the NGT Project would cross the North Coast Inland Trail twice using the bore method. The first crossing at MP 98.1 is located in Lorain County. Land use on either side of the first trail crossing consists of forest/woodland. The second crossing at MP 151.2 is located in Sandusky County and coincides with the Buckeye Trail at this location. Land use on either side of the second trail crossing consists of open land and forest/woodland.

Project-related impacts would be the same as those described throughout this section for open land and forest/woodland, and those that would be crossed using the bore method. Following construction, vehicular uses of the road and future uses of the trail would not be affected by operations. The ATWS associated with the bore crossing appear to be located such that tree removal would not be required.

Sandusky County Park District

Creek Bend Farm

Creek Bend Farm is located along a 2-mile stretch of Muddy River in Sandusky County. The 310-acre park includes grass walking trails, food plots, Muddy Creek, a tree farm, farm grounds and buildings, and a pasture. The park also includes the recently constructed Wilson Nature Center. The property, listed on the National Register of Historic Places, was the home of Fran Roush and Bob Roush, former Sandusky County Commissioner (Sandusky County Park District, 2016b). Creek Bend Farm is managed by Sandusky County Park District.

As listed in table 4.9.7-1, the NGT Project would cross the Creek Bend Farm between MPs 153.2 and 153.4 using the open-cut method. Land uses at the crossing include forest/woodland, open land (warm season grasses and a grass trail), and open water (Muddy Creek).

Construction would affect 3.0 acres and operations would affect 1.3 acres of the farm crossing. Project-related construction and operation impacts would be similar to those described in section 4.9.2, depending on the specific land use type affected throughout the area, and to those described for other areas crossed using the open-cut method. Following construction, these areas would be restored, and areas outside of the permanent right-of-way would be returned to pre-construction conditions in accordance with NEXUS' *E&SCP*. To minimize impacts associated with construction and creation of a new right-of-way, the NGT Project would parallel an existing cleared utility right-of-way at this crossing. Following

construction, recreational uses of the grass trail and farm land would be allowed to continue; however, long-term impacts associated with tree removal would be visible.

We received comments from Sandusky County Park District during scoping expressing concern over impacts on the Muddy Creek Corridor, which runs through Creek Bend Farm and is part of ongoing research and monitoring programs, trail use during construction, proposed crossing methods, and an existing deed restriction on Creek Bend Farm. More specifically, Sandusky County Park District requested that NEXUS consider using the bore method to cross the North Coast Inland Trail and Creek Bend Farm to accommodate continued recreational use of the area during construction, and noted that there are development restrictions on Creek Bend Farm that prohibit granting of utility easements.

Based on our recommendation in the draft EIS, NEXUS would cross the North Coast Inland using the bore method. In the draft EIS, we also recommended an evaluation of the feasibility of crossing Creek Bend Farm (MP 15.3) using the bore method. NEXUS has determined the bore crossing method is not feasible due to the crossing distance of 2,300 feet, which is significantly greater than what would be feasible using conventional bore technology. NEXUS has been in consultation with Sandusky County Park District regarding potential construction-related impacts to the crossing of Creek Bend Farm, and closing the farm during construction. The Park District indicated the park is only used seasonally, and there would be no concerns with closing the park during construction. NEXUS would provide the Park District with a 1-week advance notice of construction activities on the property. Regarding the Muddy Creek Corridor crossing, NEXUS would use the flume or dam and pump method to cross Muddy Creek, as described in sections 2.3.2.1. Comments received regarding wetland crossings within Creek Bend Farm have been addressed in section 4.4.3.1. Regarding utility easement restrictions, NEXUS indicated there are no special interest areas that prohibit pipeline and other utility easements impacted by the NGT Project.

Metroparks of the Toledo Area

Farnsworth Metropark and Towpath Trail

Farnsworth Metropark is a narrow park located along the Maumee River that includes the Towpath Trail, a boat launch, fishing, a playground, picnic shelters, and primitive camping sites. The 8.3-mile-long Towpath Trail is part of the Buckeye Trail system and follows the remains of the Miami and Erie Canal. The trail connects Farnsworth, Bend View, and Providence metroparks. Metroparks of the Toledo Area owns and manages Farnsworth Metropark and the Towpath Trail (Metroparks of the Toledo Area, 2016).

As listed in table 4.9.7-1, the NGT Project would cross the park and trail between MPs 181.7 and 181.8 using the HDD method. Land use at this crossing consists of forest/woodland, open land, and commercial/industrial (parking lot). Project-related impacts would be similar to those described for other areas crossed using the HDD method. Recreational uses of the park and trail would not be affected by operations.

City of Green

Ariss Park

Ariss Park is owned and maintained by the City of Green and is located east and west of Interstate Highway 77 on Wise Road. The 80-acre park includes a 0.5-mile limestone walking trail loop, three tackle football fields, two flag football fields, restrooms, a concession stand, and a press box (City of Green, 2016a).

As listed in table 4.9.7-1, the NGT Project would cross Ariss Park in two locations using the open-cut and bore methods. The first crossing is along the southern border of Ariss Park between MPs 35.3 and 35.4 and would be crossed using the open-cut method. Land use at the first crossing consists of a mix of forest/woodland and active agricultural fields. The pipeline would cross approximately 1,200 feet south and southeast of the closest playing field and parking area.

The second crossing between MPs 35.5 and 35.6 includes Interstate Highway 77 and would be crossed using the bore method across the highway and the open-cut method from MP 35.6 to the park boundary. Land use at the second crossing consists of commercial/industrial (Interstate Highway 77), forest/woodland, and open land associated with an existing utility right-of-way.

Construction would affect 4.8 acres and operations would affect 1.5 acres of the park. At the first crossing, Project-related construction and operation impacts would be similar to those described in section 4.9.2, depending on the specific land use type affected throughout the area, and to those described for other areas using the open-cut method. At the second crossing, Project-related impacts would be the same as those described for other areas crossed using the bore and open-cut methods. Following construction, these areas would be restored and areas outside of the permanent right-of-way would be returned to pre-construction conditions in accordance with NEXUS' *E&SCP*. Where land use is open and agricultural at the crossing, land uses would be allowed to return to pre-construction conditions.

In the draft EIS we recommended that NEXUS extend the bore entry/exit further west to avoid impacting forest/woodland on the west side of Highway 77. NEXUS stated that extending the bore crossing to avoid forest/woodland would result in a total crossing distance of 1,065 feet, which is greater than what is allowed by conventional bore technology and is therefore infeasible.

To minimize impacts associated with construction and creation of a new right-of-way at the second crossing (MPs 35.5 and 35.6), the pipeline would be co-located with an existing electric transmission line right-of-way. However, clearing and tree removal of the Project workspace would still be required during construction, and routine vegetation maintenance of forested areas within the permanent right-of-way would be required during pipeline operations. As a result, the NGT Project would require the conversion of forest land to open land within the permanent right-of-way. Impacts associated with tree clearing and vegetation maintenance would be long term to permanent as well as incremental to and consistent with the existing co-located right-of-way features. Following construction, recreational uses of the park would be allowed to continue; however, long-term impacts associated with tree removal would be visible.

We received comments from the City of Green during scoping expressing concern over past contamination within the park. Specifically, when the City of Green first developed the park for fields and parking, the Ohio EPA required soil testing for all disturbed areas based on reports of illegal dumping of industrial waste from Akron Rubber in the 1960s. To date, test results have not detected soil contamination. In the event contaminated media is encountered during construction, NEXUS would stop work and contact the appropriate state and federal agencies and would develop a site-specific Hazardous Waste Management Plan in consultation with applicable agencies to address management and disposal of hazardous materials in accordance with applicable regulations.

Greensburg Park

Greensburg Park is owned and maintained by the City of Green and is located south of Greensburg Road on Massillon Road. The 27.9-acre park includes a pavilion, playground, soccer and baseball fields, batting cages, and a concession stand (City of Green, 2016b).

As listed in table 4.9.7-1, the NGT Project would cross the southeastern corner of the park at MP 37.1 using the open-cut method. Land use at this crossing consists of forest/woodland. The construction right-of-way would be located approximately 75 feet southeast of the closest baseball field.

Construction would affect <0.1 acre and operations would affect <0.1 acre of the park. Project-related construction and operation impacts would be similar to those described in section 4.9.2, depending on the specific land use type affected throughout the area, and to those described for other areas crossed using the open-cut method. Following construction, these areas would be restored, and areas outside of the permanent right-of-way would be returned to pre-construction conditions in accordance with NEXUS' *E&SCP*. Recreational uses of the park would be allowed to continue; however, long-term impacts associated with tree removal would be visible.

4.9.7.4 Private and Other

Ohio

North Country National Scenic Trail

The NCNST crosses seven states, beginning in New York and ending in North Dakota (NPS, 2016). Much of the NCNST in Ohio is followed through roaded rural areas, and on or adjacent to roaded areas (North Country Trail Association, 2016). The trail is administered by the NPS in cooperation with other government agencies, private organizations, and individual landowners. The North Country Trail Association is a neutral non-profit organization that works in partnership with the NPS to build, maintain, and promote the NCNST. Because numerous public agencies and private interests are participating in the NCNST's development, the type of trail, available support facilities, and rules and regulations governing the use of the trail vary from segment to segment (ODNR, 2005).

As listed in table 4.9.7-1, the NGT Project would cross the NCNST at three locations:

- MP 3.5, Buffalo Road would be crossed using the open-cut method;
- MP 190.0, coincides with the Wabash Cannonball Trail and an existing utility right-of-way and is located within the Historic Oak Openings Region, would be crossed using the open-cut method; and
- MP 195.9, coincides with the Wabash Cannonball Trail and is located within the Historic Oak Openings Region, would be crossed using the bore method.

Land uses on either side of the trail at these crossings consists of open land, agricultural land, and forest/woodland.

Construction at MPs 3.5 and 190.0 would affect 0.4 acre and operations would affect 0.1 acre of land. Where land use is forest/woodland (MPs 3.5 and 190.0), clearing and tree removal would be required during construction, and routine vegetation maintenance of forest/woodland within the permanent right-of-way would be required during pipeline operations. Project-related construction and operation impacts at MPs 3.5 and 190.0 would be similar to those described in section 4.9.2, depending on the specific land use type affected throughout the area, and to those described for other areas crossed using the open-cut method. Following construction, these areas would be restored, and areas outside of the permanent right-of-way would be returned to pre-construction conditions in accordance with NEXUS' *E&SCP*. To reduce impacts on the scenic trail, the NGT Project would cross an existing electric transmission line right-of-way at MP 190.0.

Project-related impacts at MP 195.5 would be similar to those described for other areas crossed using the bore method. Following construction, recreational uses of the trail would not be affected by operations.

The crossing at MP 3.5, which is Buffalo Road, would require a temporary trail closure due to the use of the open-cut crossing method. NEXUS has indicated that hikers of the NCNST at MP 3.5 could walk along the side of Buffalo Road during construction. While NEXUS would coordinate with local officials to have traffic safety personnel on hand during periods of construction, they have not committed to establishing a detour or posting construction warning signs. Due to safety concerns, we conclude that additional mitigation is necessary. Because the trail at MP 3.5 would be temporarily closed and specific mitigation measures, such as a detour, have not yet been identified, **we recommend that:**

- **Prior to construction, NEXUS should file with the Secretary a site-specific crossing plan for the NCNST at MP 3.5 that identifies the location(s) of a detour, public notification procedures, signage, and consideration of avoiding days of peak usage. The crossing plan shall be developed in consultation with the landowner and trail managing agencies.**

Statewide Bike Routes

As listed in table 4.9.7-1, the NGT Project would cross the following state-designated bike routes:

- Statewide Bike Route J at MP 8.0, Knox School Road, which would be crossed using the HDD method;
- Statewide Bike Route C at MP 68.9, Ryan Road at this location, which would be crossed by the bore method;
- Statewide Bike Route N at MP 110.2, Main Road, which would be crossed by the HDD method;
- Statewide Bike Routes N-CP at MP 116.3, River Road, which would be crossed by the bore method;
- Statewide Bike Route N-CP at MP 128.8, Billings Road, which would be crossed by the HDD method;
- Statewide Bike Route E at MP 177.3, Pargillis Road, which would be crossed by the bore method; and
- Statewide Trail A at MP 183.1, Noward Road at this location, which would be crossed by the bore method.

Where NEXUS would use the HDD crossing method (Statewide Bike Routes J and N), direct impacts on the bike routes would be avoided and use would be allowed to continue throughout construction. However, recreational users may experience temporary visual and noise impacts associated with construction personnel and equipment and HDD activities. Recreational uses of the bike route would not be affected by operations. Also, because the bike routes would be crossed by the HDD method, tree clearing and vegetation maintenance within the permanent right-of-way on either side of the crossing would not be necessary, thus avoiding permanent visual impacts on recreational users.

Where NEXUS would use the bore crossing method (Statewide Bike Routes C, N-CP, E, and Statewide Trail A), direct impacts on the bike routes would be avoided and use would be allowed to continue throughout construction. However, recreational users may experience temporary visual and noise impacts associated with construction personnel and equipment and bore activities. Recreational users of Bike Routes N-CP may experience temporary and permanent visual and noise impacts from the proposed M&R station (MR05) along Billings Road and the proposed mainline valve (MLV-9) remote blowoff facility. Following construction, recreational uses of the bike routes would continue throughout project operation.

ATWS and access roads associated with the trail crossings appear to be located such that no tree removal would be required adjacent to the trails, with the exception of the crossing at MP 68.3 (State Bike Route C) where minor tree removal appears to be required along Chippewa Road, about 75 feet east of Ryan Road.

Buckeye Trail

The Buckeye Trail was first envisioned in the 1950s as a trail from the Ohio River to Lake Erie. Today, the Buckeye Trail is over 1,444 miles long and forms a loop through 49 of Ohio's 88 counties. The Buckeye Trail is a dedicated, recognized, and protected route that is developed and maintained by the Buckeye Trail Association. Because numerous public agencies and private interests host portions of the trail, ownership varies from segment to segment (Buckeye Trail Association, 2016).

As listed in table 4.9.7-1, the NGT Project would cross the Buckeye Trail in nine locations. Of these crossings, two (MP 34.0 and MP 47.9) are located within the Ohio & Erie Canalway NHA. Land uses at the trail crossings consist of forest/woodland, agricultural land, commercial/industrial, and open land.

Construction would affect 1.0 acre and operations would affect <0.1 acre of land at the MP 33.0 crossing. Project-related construction and operation impacts would be similar to those described in section 4.9.2, depending on the specific land use type affected throughout the area, and to those described for other areas crossed using the open-cut method. Following construction, these areas would be restored, and areas outside of the permanent right-of-way would be returned to pre-construction conditions in accordance with NEXUS' *E&SCP*. Where the trail would be crossed using the HDD or bore methods, NGT Project-related impacts would be similar to those described for other areas crossed using the HDD or bore methods, respectively. ATWS and access roads associated with all but one of the bike route crossings appear to be located primarily in agricultural land with no tree removal required adjacent to the trails. The trail crossing at MP 151.7 appears to include tree removal within the construction workspace, about 25 feet east of the trail. Recreational uses of the trail would not be affected by operations.

Erie Canalway National Heritage Area

In 1996, Congress designated the Ohio & Erie Canalway as an NHA to help preserve the rails, trails, landscapes, towns, and sites along the first 110 miles of the canal. Recreational opportunities within the NHA include birding and hiking along the Ohio & Erie Canal Towpath Trail or riding on the Cuyahoga Valley Scenic Railroad (CVSR). While the federal government designated this area as a NHA, the Ohio & Erie Canalway NHA is independently managed and operated through local organizations and receives technical assistance from the Cuyahoga Valley National Park (Ohio & Erie Canalway Association, 2016b). The Ohio & Erie Canalway Association is the official management entity for the heritage area (Ohio & Erie Canalway Association, 2009).

As listed in table 4.9.7-1, the NGT Project crosses the Ohio & Erie Canalway NHA at two locations between MPs 33.4 and 35.4 in Stark and Summit Counties, and between MPs 41.5 and 49.6 in Summit County. The first crossing between MPs 33.4R and 35.4R includes the Buckeye Trail and CVSR. The second crossing between MPs 41.5 and 49.6 includes Portage Lakes State Park, the Ohio to Erie Trail, the Buckeye Trail/Ohio to Erie Trail, the Ohio & Erie Canalway America's Byway, and the Towpath Trail. Crossing methods and impacts along the NHA would vary and are discussed by individual feature below.

In total, NGT Project construction for all features crossed within the NHA would affect 163.5 acres of forest/woodland, agricultural land, open land, open water, commercial/industrial land, and residential land. In general, construction impacts and mitigation measures that NEXUS would implement would be similar to those described for the land uses discussed in section 4.9.2. Following construction, permanent impacts in the NHA would total 61.5 acres as a result of the conversion of the existing forest/woodland to open land within the permanent right-of-way. These areas would be restored, and areas outside of the permanent right-of-way would be returned to pre-construction conditions in accordance with NEXUS' *E&SCP*. Forest/woodland clearing required along the NHA would result in a change to the surrounding visual character.

Cuyahoga Valley Scenic Railroad

The CVSR is one of the oldest tourist excursion railways in the country. CVSR operates on 51 miles of track from Independence south through Cuyahoga Valley National Park to Akron and Canton on the Sandyville Line. The CVSR offers regularly scheduled excursions, events and tours throughout the year. The Akron Metro Regional Transit Authority owns the rail line (Ohio & Erie Canalway Association, 2016c).

As listed in table 4.9.7-1, the NGT Project would cross the scenic railroad at MP 34.3 using the bore crossing method. Land use at this crossing consists of open land and forest/woodland. Project-related impacts would be similar to those described for other areas crossed using the bore method. Tree clearing associated with the bore method would primarily be limited to the ATWS needed to complete the crossing.

Singer Lake Bog

The 344-acre Singer Lake Bog is owned and protected by the CMNH in partnership with the City of Green. The preserve includes 50 acres of leatherleaf-bog and a 5-acre kettle lake. Many rare wildlife and plant species are located within the bog.

As listed in table 4.9.7-1, the NGT Project would cross the preserve between MPs 38.8 and 39.0, about 230 feet northeast of the bog within the preserve property; the bog itself would not be crossed. The preserve would be crossed using the open-cut method. Land use at this crossing consists predominantly of agricultural land and smaller areas of forest/woodland associated with the ATWS.

Construction would affect 3.9 acres and operations would affect 1.3 acres at the preserve crossing. Project-related construction and operation impacts would be similar to those described in section 4.9.2, depending on the specific land use type affected throughout the area, and to those described for other areas crossed using the open-cut method. Following construction, these areas would be restored, and areas outside of the permanent right-of-way would be returned to pre-construction conditions in accordance with NEXUS' *E&SCP*. Recreational uses of the preserve would be allowed to continue; however, long-term impacts associated with tree removal would be visible.

Comments received during the scoping period expressing concern over impacts to the bog and nearby forested wetlands are addressed in section 4.5.

Chippewa Lake Baptist Church

The Chippewa Lake Baptist Church holds church and prayer services, Sunday school, and various adult and child-oriented services, as well as a youth camp (Chippewa Lake Baptist Church, 2016).

As listed in table 4.9.7-1, the southern half of the parcel owned by Chippewa Lake Baptist Church would be crossed by the NGT Project pipeline at MP 68.0 using the open-cut method. Land use at this crossing consists of open land. The proposed pipeline is located south of church structures and associated parking lot by approximately 620 feet and 515 feet, respectively.

Construction would affect 0.9 acre and operations would affect 0.9 acre at this crossing. Project-related construction and operation impacts would be similar to those described in section 4.9.2, depending on the specific land use type affected throughout the area, and to those described for other areas crossed using the open-cut method. Following construction, these areas would be restored, and areas outside of the permanent right-of-way would be returned to pre-construction conditions in accordance with NEXUS' *E&SCP*. A sparsely wooded landscaped area is located between the pipeline and the church and would provide some visual screening.

Western Reserve Land Conservancy

The Western Reserve Land Conservancy works with landowners, communities, government agencies, park systems, and other nonprofit organizations to permanently protect natural areas and farmland. Created in 2006 by the merger of eight local land trusts, the Western Reserve Land Conservancy has grown to become the largest land trust in Ohio and one of the largest in the United States. The Land Conservancy's goal is to preserve about 400,000 acres in northern Ohio and to create an interconnected network of protected property throughout the region. About 200,000 acres have been preserved by park systems, other government agencies, and land trusts such as the Land Conservancy (Western Reserve Land Conservancy, 2016).

As listed in table 4.9.7-1, the NGT Project would cross privately owned lands between MPs 83.9 and 84.4 and MPs 95.4 and 95.6 using the open-cut method. Land use at the first crossing between MPs 83.9 and 84.4 is privately owned and land use consists of agricultural land, forest/woodland, and open land. The second crossing between MPs 95.4 and MP 95.6 is a private preserve and land use consists of agricultural land and forest/woodland.

Construction would affect 11.9 acres and operations would affect 4.5 acres at the crossing. Project-related construction and operation impacts would be similar to those described in section 4.9.2, depending on the specific land use type affected throughout the area, and to those described for other areas crossed using the open-cut method. Following construction, these areas would be restored, and areas outside of the permanent right-of-way would be returned to pre-construction conditions in accordance with NEXUS' *E&SCP*. Following construction, land uses would be allowed to continue; however, long-term impacts associated with tree removal would be visible.

Amherst-Wellington Connector

The Amherst-Wellington Connector references the abandoned Lorain and West Virginia Railroad that connected the Wheeling and Lake Erie Railroad at Wellington, Ohio and the steel plants at Lorain on Lake Erie. Shipments of coal and steel started in 1906. When the railroad was purchased by Norfolk and Western in 1963, the route was used more as a connector than for major product shipment. The 1969 flood severely damaged the track near Wellington, and the railroad was formally abandoned in 1979 (Abandoned Rails, 2016). Today, the Lake Shore Railway Association owns 20 miles of the abandoned railroad and

manages a 6-mile segment, about 1.7 miles south of the NGT Project, as a tourist railroad between the City of Wellington and Hughes Road (Lake Shore Railway Association, 2016).

As listed in table 4.9.7-1, the NGT Project would cross an abandoned segment of the Amherst-Wellington Connector at MP 96.3 using the bore method. At this crossing, the railroad is inactive and abandoned. Land use on either side of the railroad crossing consists of forest/woodland and open land.

Project-related impacts would be similar to those described for other areas crossed using the bore method. Impacts associated with tree clearing would be long-term to permanent.

Erie County Conservation League

The Erie County Conservation League was founded in 1948 with the purpose of conserving soil, water, air, and wildlife; improving of hunting, fishing and outdoor recreational activities; and supporting firearms ownership and teaching safe, responsible use of firearms. The facilities include trap and skeet shooting ranges, an archery range, and several rifle shooting ranges of various distances (Erie County Conservation League, 2016). The Erie County Conservation League facilities are privately owned and managed.

As listed in table 4.9.7-1, the NGT Project would cross the parcel between MPs 118.5 and 118.8 using the open-cut method. Land use at this crossing consists of agricultural land, open land, and forest/woodland.

Construction would affect 4.6 acres and operations would affect 1.7 acres of land. Project-related construction and operation impacts would be similar to those described in section 4.9.2, depending on the specific land use type affected throughout the area, and to those described for other areas crossed using the open-cut method. Following construction, these areas would be restored, and areas outside of the permanent right-of-way would be returned to pre-construction conditions in accordance with NEXUS' *E&SCP*. Recreational uses of the facilities would be allowed to continue; however, long-term impacts associated with tree removal would be visible.

St. John's United Church of Christ Milan Ohio Inc.

The St. John's United Church of Christ, Milan, Ohio, Inc. was established in 1865 and incorporated in 1998. The church property includes the church, cemetery, parking lot, a park with tennis, volleyball, and shuffleboard courts, a picnic shelter, and agricultural land (St. John's United Church of Christ, 2016).

As listed in table 4.9.7-1, the NGT Project would cross the southwestern corner of the church parcel at MP 122.0 using the open-cut method. The proposed pipeline is located southwest of church structures and associated parking lot by approximately 1,180 feet and 1,080 feet, respectively. Land use at the crossing is agricultural.

Construction would affect 0.5 acre and operations would affect 0.1 acre at this crossing. Project-related construction and operation impacts would be similar to those described in section 4.9.2, depending on the specific land use type affected throughout the area, and to those described for other areas crossed using the open-cut method. Following construction, these areas would be restored, and areas outside of the permanent right-of-way would be returned to pre-construction conditions in accordance with NEXUS' *E&SCP*.

Bowling Green-Perrysburg Connector (Proposed)

The Bowling Green-Perrysburg Connector is a proposed non-motorized trail facility along Hull Prairie Road between River Road south and Hannah Road, that travels east to Brim Road, and then south to the Bowling Green bike network. Trail construction is scheduled between 2016 and 2025 (Toledo Metropolitan Area Council of Governments, 2016).

As listed in table 4.9.7-1, the NGT Project would cross the proposed Bowling Green-Perrysburg Connector trail at 178.1 (along Hull Prairie Road) using the bore method. Land use on either side of the road crossing consists of agricultural land and open land.

Project-related impacts would be similar to those described for other areas crossed using the bore method. Following construction, vehicular uses of the road and future uses of the trail would not be affected by operations.

Riverby Hills Golf Club

The Riverby Hills Golf Course in Bowling Green, Ohio is a privately run 18-hole golf course established in 1925 (Golf Link, 2016).

As listed in table 4.9.7-1, the NGT Project would cross the Riverby Hills Golf Course at MP 180.8 using the open-cut method. Land use at this crossing consists of open land and forest/woodland.

Construction would affect 0.6 acre and operations would affect 0.1 acre of land. Project-related construction and operation impacts would be similar to those described in section 4.9.2, depending on the specific land use type affected throughout the area, and to those described for other areas crossed using the open-cut method. Following construction, these areas would be restored, and areas outside of the permanent right-of-way would be returned to pre-construction conditions in accordance with NEXUS' *E&SCP*. Following construction, recreational uses of the golf course would be allowed to continue; however, long-term impacts associated with tree removal adjacent to the southern boundary would be visible.

Wabash Cannonball Trail

The Wabash Cannonball Trail is one of Ohio's longest rail-trails, covering 63 miles in Northwest Ohio. The multi-use recreational trail provides non-motorized access to hikers, bikers, equestrians, and cross-country skiers. The trail is owned by several partners within Fulton, Henry, Lucas, and Williams Counties and administered by the Northwestern Ohio Rails-to-Trails Association, Inc. in the areas crossed by the NGT Project. The land-owning partners of the Wabash Cannonball Trail are Lucas County, the city of Maumee, Northwestern Ohio Rails-to-Trails Association, Inc., the Metropark District of the Toledo Area, the city of Wauseon, and the village of Whitehouse. Portions of the trail are also certified segments of the North Country National Scenic Trail.

As listed in table 4.9.7-1, the NGT Project would cross the Wabash Cannonball Trail in two locations at MP 190.0 and MP 195.9 using the open-cut method. The Wabash Cannonball Trail coincides with the North Country National Scenic Trail at these two locations. The first trail crossing would occur at MP 190.0 where the pipeline crosses an existing electric transmission line. The second trail crossing would occur at MP 195.9 where the trail is located on an old railroad bed within a linear forest/woodland surrounded by agricultural land. The crossings are located in the Historic Oak Openings Region (see section 4.5.1.1). Land uses adjacent to these crossings consist of forest/woodland, open land, and agricultural land.

Project-related impacts would be similar to those described above for the North Country National Scenic Trail.

Highland Memory Gardens Cemetery

Highland Memory Gardens Cemetery is a privately owned cemetery located adjacent to the Maumee Valley Scenic Byway (South River Road).

As listed in table 4.9.7-1, the NGT Project would cross the southwest corner of the cemetery at MP 181.8 using the HDD method. The pipeline would not cross burial plots. Additionally, the pipeline would be installed below the depth typically required for burial plots (about 6 feet). Land use at this crossing consists of open land.

Project-related impacts would be similar to those described for other areas crossed using the HDD method.

Michigan

Community Free Will Baptist Church

Community Free Will Baptist Church was founded in 1987 and has been at the current location since 2000 (Community Free Will Baptist Church, 2016).

As listed in table 4.9.7-1, the Community Free Will Baptist Church be crossed by the NGT Project pipeline at MP 249.1 using the open-cut method. The proposed pipeline is located in an open field east of church and associated parking lot by approximately 750 feet and 630 feet, respectively. Land use at this crossing consists of open land.

Construction would affect 0.8 acre and operations would affect 0.4 acre of land. Project-related construction and operation impacts would be similar to those described in section 4.9.2, depending on the specific land use type affected throughout the area, and to those described for other areas crossed using the open-cut method. Following construction, these areas would be restored, and areas outside of the permanent right-of-way would be returned to pre-construction conditions in accordance with NEXUS' *E&SCP*.

South Hydro Park

The 2.8-acre South Hydro Park is located on Textile Road east of the Ford Lake Dam and south of the Huron River in Washtenaw County. The undeveloped park offers opportunities for fishing and canoe/kayak launching.

As listed in table 4.9.7-1, the NGT Project would cross the park at MP 250.3 using the open-cut method. The pipeline would not cross South Hydro Park, however, a temporary staging area is partially within an open area of the park near MP 250.3. Land use within the temporary staging area is agricultural.

Construction would affect 0.4 acre and operations would not affect the property. Project-related construction and operation impacts would be similar to those described in section 4.9.2, depending on the specific land use type affected throughout the area, and to those described for other areas crossed using the open-cut method. Following construction, these areas would be restored, and areas outside of the permanent right-of-way would be returned to pre-construction conditions in accordance with NEXUS' *E&SCP*. Recreational use of the temporary staging area would be allowed to continue during construction.

After construction, the staging area would be seeded and allowed to revegetate with no further maintenance or disturbance associated with the pipeline. The ATWS associated with the staging area appears to be located such that minor tree removal would be required adjacent to the existing access road, outside the park boundary.

North Hydro Park

The 46.6-acre North Hydro Park is located east of the Ford Lake Dam and on the north shores of the Huron River in Washtenaw County. The park was recently renovated and includes a boardwalk, paved trails, interpretive signage, a canoe/kayak launch, fishing, a pavilion, several picnic areas, and natural features (Ypsilanti Township Parks and Recreation, 2016).

As listed in table 4.9.7-1, the NGT Project would cross the park between MPs 250.9 and 251.1 using the HDD method. Land use at this crossing consists of forest/woodland, open land, and open water (Huron River). Project-related impacts would be similar to those described for other areas crossed using the HDD method. Following construction, recreational uses of the park would be allowed to continue. The ATWS associated with the HDD crossing appears to be located such that tree removal would be required outside the park boundary, east of the river.

The Ponds at Lakeshore Disc Golf Course

The Ponds at Lakeshore Disc Golf Course in Ypsilanti, Michigan is a privately run, 30-hole disc golf course established in 2009 on a former ball golf course and is open to the public.

As listed in table 4.9.7-1, the NGT Project would cross the disc golf course between MPs 251.2 and 251.4 using the open-cut method. Land use at this crossing consists of open land with interspersed trees, and forest/woodland along the southern property boundary.

Construction would affect 3.1 acres and operations would affect 1.1 acres of land. Project-related construction and operation impacts would be similar to those described in section 4.9.2, depending on the specific land use type affected throughout the area, and to those described for other areas crossed using the open-cut method. Following construction, these areas would be restored, and areas outside of the permanent right-of-way would be returned to pre-construction conditions in accordance with NEXUS' *E&SCP*. The ATWS associated with the crossing appears to avoid tree clearing within the forest/woodland. Recreational uses of the facility would be allowed to continue; however, long-term impacts associated with tree removal would be visible.

4.9.7.5 Conclusion

In general, recreation areas and special use areas crossed by the NGT Project are expected to experience some temporary impacts during construction, such as clearing of trees, noise, dust, and limited access, which may prevent or curtail recreational activities. Users of these areas, such as hikers, wildlife enthusiasts, sightseers, bikers, and other recreationalists, may be prevented from use of the immediate area around the temporary right-of-way during construction. Nearby recreation areas and special use areas are expected to experience similar temporary impacts as areas are crossed, but as the distance from the construction work area increases, these impacts would generally decrease.

NEXUS would continue to consult with the appropriate federal, state, and managing agencies to develop and implement measures to mitigate and reduce impacts on these areas as needed. Direct access to some entry points within these areas may be temporarily limited or restricted due to increased traffic or

road closures during construction. For further discussion of transportation impacts and mitigation measures, refer to section 4.9.4.

4.9.8 Coastal Zone Management Areas

In 1972, Congress passed the Coastal Zone Management Act to “preserve, protect, develop, and where possible, to restore or enhance, the resources of the nation’s coastal zone for this and succeeding generations” and to “encourage and assist the states to exercise effectively their responsibilities in the coastal zone through the development and implementation of management programs to achieve wise use of the land and water resources of the coastal zone” (16 USC 1452, Section 303 (1) and (2)).

Section 307 (c)(3)(A) of the Coastal Zone Management Act states that “any applicant for a required federal license or permit to conduct an activity, in or outside the coastal zone, affecting any land or water use or natural resource of the coastal zone of that state shall provide a certification that the proposed activity complies with the enforceable policies of the state’s approved program and that such activity would be conducted in a manner consistent with the program.” In order to participate in the Coastal Zone Management Program, a state is required to prepare a program management plan for approval by the National Oceanic and Atmospheric Administration’s (NOAA) Office of Ocean and Coastal Resource Management (OCRM). Once the OCRM has approved a state’s plan, including its enforceable program policies, the state program gains “federal consistency” jurisdiction. This means that any federal action (e.g., a project requiring federally issued licenses or permits) that takes place within the state’s coastal zone must be found to be consistent with state coastal policies before the action can take place.

NGT Project

Portions of the NGT Project are subject to a federal Coastal Zone Consistency Review because it would: 1) involve activities within the coastal zone of Ohio; and 2) require several federal permits and approvals (see permits listed in table 1.5-1). The NGT Project would not cross or be located within 0.25 mile of a designated coastal zone in Michigan. Ohio has approved CZMPs administered by the ODNR. A description of the Ohio program, the applicable NGT Project activities, and information provided by NEXUS regarding consistency of the NGT Project with state policies is provided below.

The ODNR, through the Office of Coastal Management, is the lead agency for administering the Ohio Coastal Management Program (OCMP), as approved by NOAA in 1997 and updated through subsequent filings. This program provides ODNR with the authority to review federal projects affecting the Ohio coast to ensure consistency with state policies.

The Lake Erie CZMA includes portions of nine counties bordering Lake Erie and its tributaries. The NGT Project pipeline crosses about 9,342 feet (1.8 miles) of the Lake Erie CZMA that includes the Sandusky River.

NEXUS plans to cross the Sandusky River using the HDD method, from MP 145.7 to 146.1, to avoid impacts on aquatic resources. NEXUS filed its Federal Consistency review with ODNR on March 17, 2016. On April 8, 2016, NEXUS received its consistency certification from the ODNR.

TEAL Project

The TEAL Project would not cross or be located within 0.25 mile of a designated coastal zone.

4.9.9 Contaminated Sites

NGT Project

Based on database research, NEXUS identified 127 sites as potential or known sources of contamination within 0.25 mile of the NGT Project pipeline and aboveground facilities. Based on their distance from the Project, facility type, regulatory status, and other site-specific information, the potential to encounter contamination that may be associated with 124 of the 127 sites during Project construction is low. The three remaining sites are discussed in more detail below.

- The Country View Apartment complex at MP 37.4 had a release of crude oil and/or petroleum condensate in 2005 and was referred to the OEPA Division of Environmental Response and Revitalization (DERR). The spill may be associated with an oil well adjacent to the Project area. NEXUS indicated OEPA files contained no information that DERR conducted additional response to the spill. NEXUS has committed to manage any petroleum-contaminated soil associated with the spill that might be encountered during construction in accordance with its *SPCC Plan* and *E&SCP*, as well as applicable provisions of OAC 3745-52 and OAC 3745-279.
- The Ford Motor Company – Rawson Plant at MP 250.2 occurs on multiple regulatory databases indicative of a release of a hazardous substance or petroleum product at the site. More specifically, four releases of unknown chemicals and one release of diesel fuel were reported at the site between 1990 and 2011. NEXUS indicated the release incident files are closed, and the MDEQ is considering whether files pertaining to the site can be released for review.
- The former Willow Run Powertrain Plant would be crossed between MPs 253.3 and 254.1. The plant was originally constructed by Henry Ford for the production of B-24 bombers during World War II. After World War II the plant was used to produce automobiles, C-119 and C-123 military aircraft, automobile transmissions as well as the machining, cleaning, and painting of metal parts and products. General Motors renovated the main building in 2005 but ceased operations at the plant in December 2010. In March 2011, Revitalizing Auto Communities Environmental Response (RACER) Trust acquired the property as part of a national program to rehabilitate former General Motors plants and has since been responsible for maintaining and rehabilitating the property. The site is being administered under the EPA's Resource Conservation Recovery Act and overseen by the MDEQ.

There have been numerous environmental assessments of the Willow Run site during the past 30 years and a number of concerns have been identified (University of Michigan, 2013):

- Oil accumulation has been documented underneath portions of the main plant building;
- Light non-aqueous phase liquid containing low levels of polychlorinated biphenyls (PCB) and some metals have been detected in soil around the site;
- Chlorinated volatile organic compounds (VOC) were found on-site, particularly in areas where parts cleaning units once operated. However, recent surveys suggest the concentrations of these compounds in soil are low and are not present at detectable concentrations in perimeter monitoring wells; and

- Historic soil and groundwater sampling suggest the presence of benzene, aluminum, mercury, and others pollutants.

NEXUS would cross the site using the open cut method between MPs 253.3 and 254.1, and the HDD method beginning at MP 254.1. In July 2016, NEXUS conducted a subsurface investigation to assess the potential to encounter pre-existing contamination associated with the RACER site and reported that contaminants in excess of levels applicable for industrial properties, as defined by Part 201 of the Natural Resources and Environmental Protection Act, P.A. 451 of 1994, as amended (Part 201), were not detected. In addition to implementing measures in its Project-specific *SPCC Plan* and *E&SCP*, NEXUS has committed to develop construction practices that include proper handling of contaminated soil and groundwater that may be encountered during construction in compliance with Part 201.

NEXUS' *SPCC Plan* and *E&SCP* describe measures that would be implemented to avoid and minimize the release of hazardous substances and petroleum products during construction, but do not specifically address the potential to encounter pre-existing contamination. In addition, further information regarding the extent of contamination at the Ford Motor Company – Rawson Plant may be forthcoming from MDEQ, and NEXUS continues to develop contaminated media management plans to ensure compliance with applicable regulations. Therefore, **we recommend that:**

- **Prior to construction, NEXUS should file with the Secretary for review and approval of the Director of OEP, an updated *SPCC Plan* and *E&SCP* that acknowledge the potential to encounter pre-existing contamination during construction, and specifically identifying the Country View Apartment Complex, the Ford Motor Company – Rawson Plant, and the RACER site as areas with increased potential to encounter pre-existing contamination. The updated *SPCC Plan* and *E&SCP* should also detail site-specific measures NEXUS would implement to avoid exacerbating existing contamination, if encountered.**

We received comments regarding illegal dumping near the intersection of Grill Road and Hametown Road, about 0.3 mile north of the pipeline near MP 51.2. Specifically, landowners were concerned that construction of the NGT Project would impact buried barrels of unknown contaminants that may be leaching and impacting drinking water supplies on nearby farms. **We recommend that:**

- **Prior to construction, NEXUS should coordinate with the landowner(s) near MP 51.2, where the dumping of unknown contaminants occurred, and file with the Secretary a site-specific plan to properly manage any contaminated soil or groundwater in compliance with applicable regulations or demonstrate that a site-specific plan is not needed.**

Section 4.9.7.3 discusses comments received from the City of Green expressing concern over past dumping at Ariss Park.

TEAL Project

Based on field and database research, there are no properties within 0.25 mile of the TEAL Project facilities that are listed as potential or known sources of contamination.

4.9.10 Visual Resources

Visual resources refers to the composite of basic terrain features, geologic features, hydrologic features, vegetation patterns, and anthropogenic features that influence the visual appeal of an area for

residents or visitors. The visual quality or character of the landscape is the baseline against which the visual impacts of a proposed action or its alternatives is measured. Existing visual character is used as a point of reference to determine if a proposed project would be compatible or inconsistent with the exiting visual character of an area.

The proposed Projects would cross federal, state-, county-, and privately owned lands in Ohio and Michigan. The Projects would cross federal lands that include one designated national scenic trail administered by the NPS and the American Byway administered by the Federal Highways Administration (FHWA). The Projects would also cross a national scenic trail administered by the NPS.

Visual impacts to non-designated areas are discussed in section 4.9.10.

4.9.10.1 Pipeline

Visual resources within the Projects are a function of geology, climate, and historical processes, and include topographic relief, vegetation, water, wildlife, land use, and human uses and development. Portions of the NGT Project and all of the TEAL Project would be co-located or adjacent to existing pipeline and/or utility rights-of-way. As a result, the visual resources along those portions of the Project routes have been previously affected by other similar activities.

The width of the construction right-of-way would vary depending on the size of the pipe, the number of pipes to be installed, and the topography and land use type of the area. Construction right-of-way widths would vary from 75 to 145 feet. NEXUS and Texas Eastern would maintain 50-foot-wide permanent rights-of-way during operations.

Visual impacts associated with the construction right-of-way and extra workspaces include the removal of existing vegetation and the exposure of bare soils, as well as earthwork and grading scars associated with heavy equipment tracks, trenching, blasting (if required), and machinery and tool storage. Other visual effects could result from the removal of large individual trees that have intrinsic aesthetic value, the removal or alteration of vegetation that may currently provide a visual barrier, or landform changes that introduce contrasts in visual scale, spatial characteristics, form, line, color, or texture.

Visual impacts would be greatest where the pipeline route parallels or crosses roads and the construction right-of-way may be seen by passing motorists, from residences where vegetation used for visual screening or for ornamental value is removed, and where the pipeline is routed through forested areas. The duration of visual impacts would depend on the type of vegetation that is cleared or altered and would be shortest in open areas where the re-establishment of vegetation following construction would be relatively rapid (generally less than 5 years). The duration would be greater in forested land, which would take many years or decades to regenerate. The greatest potential visual impact would result from the removal of large specimen trees, which would take longer than other vegetation to regenerate and would be prevented from re-establishing within the permanent right-of-way.

The area crossed by the pipelines is predominately agricultural land and forested lands. While trees cleared within temporary construction workspace would be allowed to regenerate to pre-construction conditions following construction, impacts on forest resources within these areas would last for many years. The forested setting would help to minimize the number of visual receptors along the forested portion of the right-of-way. The visual effect of the pipeline would also be mitigated by the HDD crossings, where surface impacts and impacts on visual resources between the entry and exit holes would be avoided. After construction, all disturbed areas would be restored, and areas outside of the permanent right-of-way would be returned to pre-construction conditions in compliance with federal, state, and local permits; landowner

agreements; and NEXUS' and Texas Eastern's easement requirements, with the exception of aboveground facility sites.

4.9.10.2 Aboveground Facilities

A total of 5 new compressor stations (with associated communication towers), 5 new M&R stations, 16 MLVs, and 6 launcher/receiver facilities would be constructed for the NGT and TEAL Projects. Adjacent residents and motorists would be able to view construction equipment and personnel during the construction phase, as well as view some of the facilities while in operation.

NEXUS would construct four new compressor stations for the NGT Project. Texas Eastern would construct one new compressor station and upgrade an existing station. Compressor station sites typically include several buildings, piping, meter stations, MLVs, exhaust stacks, and pig launcher/receiver facilities. Each site would be enclosed by slatted chain-link fencing. Comments received during scoping identified concerns regarding the visual impacts associated with the construction and operation of compressor stations.

Construction of NEXUS' Hanoverton Compressor Station (CS1) would impact a total of 93.3 acres of mainly open and agricultural land during construction. A total of 27.7 acres would be used during operations. There are several residences west of the site, including the community of Kensington; however, the site is well-screened by forested land between these residences and the compressor station, which would limit visual impacts on residents. The closest residence is located 360 feet east of the station. Slatted fencing would also be installed around the perimeter of the station. In accordance with the *August 2016 Visual Screening Plan*, trees would be planted along the southern edge of the property, further reducing visual impacts.

NEXUS' Wadsworth Compressor Station (CS2) would be located in open and agricultural land. A total of 60.0 acres would be affected during construction and 22.0 acres during operations. Vegetation would screen the southern and eastern sides of compressor station from view. Occupants of the homes adjacent to the western side of the station (along Guilford Road) may be able to view construction activities as well as several of the structures and fencing at the compressor station. A communication tower would also be constructed at the Wadsworth Compressor Station. These factors would represent a minor, but permanent impact on the viewshed of the adjacent residences and users of Guilford Road. In accordance with the *August 2016 Visual Screening Plan*, trees would be planted along the northern and western boundaries of the facility, reducing the overall impacts on visual resources adjacent roads and residential structures.

NEXUS' Clyde Compressor Station (CS3) would be constructed on 59.6 acres of open and agricultural land, with 37.2 acres impacted by operations. The site is open with no vegetative buffer. The nearest residence is located 340 feet south of the station and could potentially experience some visual impacts. During construction, residents would likely be able to view construction vehicles and workers. Though NEXUS would install slatted fencing, the compressor station and associated communication tower would be visible during operations from Interstate 80/90, N County Road 294, and State Highway 101 East. These impacts are anticipated to be a minor but permanent.

Construction of NEXUS' Waterville Compressor Station (CS4) would take place primarily within agricultural lands, but also affecting a small amount of open land and industrial/commercial land. A total of 37.3 acres would be impacted during construction, with 33.0 acres permanently impacted during operations. The nearest residence is located approximately 600 feet east of the station, across U.S. Highway 24 and could potentially experience some visual impacts. During construction, residents would likely be able to view construction vehicles and workers. Though NEXUS would install slatted fencing, the

compressor station and associated communication tower would be visible during operations and would also be visible from U.S. Highway 24. As such, these impacts are anticipated to be a minor but permanent. In accordance with the *August 2016 Visual Screening Plan*, trees would be planted along the northern boundary of the facility, reducing overall impacts on visual resources associated with residences north of the site.

NEXUS has designed aboveground facilities to preserve existing tree buffers within purchased parcels to the extent practicable. To further mitigate visual impacts, NEXUS would install perimeter fences, directionally controlled lighting, and slatted fencing at its compressor station sites. Several residents expressed concern about the visual impacts of the Hanoverton, Wadsworth, and Waterville Compressor Stations and a review of the sites indicate there is a direct line of sight between a number of homes and each of the compressor stations. NEXUS provided visual screening plans for these compressor stations in August 2016, which include tree planting in order to establish vegetative screening between the compressor stations and adjacent residences.

Texas Eastern's Salineville Compressor Station would be constructed on 41.0 acres of open land, agricultural land, and industrial/commercial land. A total of 11.5 acres would be impacted by operations. The site is open with no vegetative buffer. The nearest residence is located 470 feet north of the station and could potentially experience some visual impacts. During construction, residents would likely be able to view construction vehicles and workers. Texas Eastern would install colored slatted fencing and plant vegetative screening if needed. As such, visual impacts are anticipated to be a minor but permanent.

The Colerain Compressor Station is an existing aboveground facility that would be upgraded as a part of the TEAL Project. A total of 62.0 acres would be used during construction, but no additional area would be added to the existing footprint during operations. No further visual impacts are anticipated.

The NGT Project would require construction of five new M&R stations. These facilities are primarily located in agricultural land and would affect 7.8 to 10.3 acres during construction. During operations, M&R stations would affect 1.0 to 5.2 acres. Of these meter stations, the Kensington M&R Station and the Texas Eastern M&R Receipt Station would be built adjacent to the existing Kensington Processing Plant, with existing disturbance to the local viewshed. Visual impacts resulting from the construction of the new M&R stations is expected to be minimal but permanent. Similarly, the Willow Run M&R station would be constructed adjacent to the existing DTE Gas facility and a rail yard. Due to the existing visual impact to this area, visual impacts resulting from the construction of the new M&R station are expected to be minimal but permanent. The TGP M&R Station would be constructed in an agricultural field. Some existing vegetative buffer would be left in place and there are relatively few residences in the area. As such, visual impacts from construction of the TGP M&R Station would be minor but permanent. The Dominion East Ohio M&R Station would be constructed in an agricultural field with no existing vegetation buffer. The station would be visible from the I-80/I-90 corridor located 300 feet to the south. The nearest residence would be located 200 feet to the west. Though slatted fencing would be installed, residents and passing motorists could potentially experience some visual impacts. These impacts would be moderate and permanent.

Pig launchers and pig receivers would be constructed within M&R site boundaries. Visual impacts resulting from construction and operation of these facilities are included with the M&R discussions above.

A total of 16 MLVs would be constructed for the NGT Project. Impacts on visual resources resulting from the construction and operation of the MLVs would be minimal as each site is small (typically less than 0.1 acre) and would be operated within the permanent right-of-way or within an aboveground facility (e.g., compressor or meter station site). MLVs along the permanent right-of-way would be painted to blend in with the surrounding landscape and if needed, vegetative buffers would be planted. As such, visual impacts are expected to be minor but permanent.

The TEAL Project would require modifications of a regulator site and a launcher/receiver site. No land use modifications would be made and no additional visual impacts would be created. Additionally, one launcher/receiver site would be removed and the landscape restored, reducing the visual impact in the area.

4.9.10.3 Pipe/Contractor Yards and Staging Areas

With the exception of 1.1 acre, pipe/contractor yards and staging areas would be located on lands classified as agricultural, open, and industrial/commercial. With the possible exception of minor grading activities and surfacing (e.g., gravelling), soils at the pipe/contractor yards and staging areas would not be disturbed. As a result, there would be no permanent impacts on visual resources associated with the use of these sites. The only impacts at the sites would be temporary when trailers, vehicles, pipe, and other construction-related materials are stored at these sites during construction.

4.9.10.4 Access Roads

The NGT Project would require use of 115 roads for access to the pipeline rights-of-way and associated facilities during construction, of which 26 would be for access to the permanent right-of-way and aboveground facilities during operation. Of the access roads, 68 are existing roads that are currently paved, graveled, or have dirt surfaces; would require minor improvements; and would not have a significant impact on visual resources. Alternatively, 51 temporary access roads and 22 permanent access roads would be newly constructed. Construction of these roads would require some tree clearing in addition to grading and graveling, impacting 68.9 acres. After construction, temporary access roads would be returned to pre-construction conditions unless another arrangement is mutually agreed upon with the landowner. The permanent access roads retained for operation would result in the creation of 4.0 acres of roadway.

Similarly, the TEAL Project would require use of six roads for access to the pipeline rights-of-way and associated facilities during construction, of which two would be for maintained for access to the permanent right-of-way and aboveground facilities during operation. These are existing roads that are currently paved, graveled, or have dirt surfaces; would require minor improvements; and would not have a significant impact on visual resources. Modification of these roads would require some tree clearing in addition to grading and graveling, impacting 4.9 acres. The permanent access roads retained for operation would also result in the creation of 4.9 acres of roadway.

4.9.10.5 Agricultural Lands and Open Land

About 44 percent of the NGT Project and 100 percent of the TEAL Project would be collocated or adjacent to existing rights-of-way for pipelines, electric transmission lines, or railroads. Approximately 89 percent of the NGT and TEAL Projects would affect agricultural and open land uses. Visual impacts associated with pipeline construction in agricultural and open land areas along the route would be temporary and would result from the presence of construction equipment and post-construction visual scarring. In agricultural land, any visual scarring would remain within the right-of-way until new crops are planted. After replanting crops, any remaining visual impact from pipeline construction would be minor, but visual evidence of construction may last for a few years.

4.9.10.6 Forested Land

Approximately 8 percent of The NGT and TEAL Projects would affect forested land during construction. Trees within the construction right-of-way would be cleared but allowed to re-grow following construction; however, larger trees likely would not grow to maturity within the construction right-of-way for many decades. The permanent right-of-way would be periodically mowed thereby preventing

regeneration of trees for the life of the NGT and TEAL Projects. Removal of trees along both the permanent and construction rights-of-way in otherwise forested areas would leave a corridor that would persist for the duration of pipeline operation and that would be visible from some vantage points in the NGT and TEAL Projects area. As identified by scoping comments, the removal of trees related to pipeline construction may result in visual impacts to residences from adjacent non-pipeline sources (e.g., such as roads, buildings). Overall, the visual impacts related to the construction right-of-way would be long term, but minor and localized, while the visual impact related to the permanent right-of-way would be permanent, but relatively minor and localized.

4.9.10.7 Scenic Byways

At MP 47.9, the NGT Project would cross the Ohio & Erie Canalway America's Byway, which is administered by the DOT Federal Highway Administration. This Scenic Byway is discussed in further detail in section 4.9.7.1. Land use on either side of the byway crossing consists of open land, agricultural land, and residential land. NEXUS proposes to use the HDD crossing method at this location. During construction, byway travelers may experience temporary visual impacts associated with personnel, equipment, and HDD activities. As a result of using the HDD crossing method, tree clearing and vegetation maintenance within the permanent right-of-way on either side of the crossing would not be necessary, thus avoiding permanent visual impacts on recreational uses of the byway.

The NGT Project would cross the Ohio-designated Lincoln Highway Historic Byway at MP 2.0. This ODOT-managed byway is discussed in more detail in section 4.9.7.2. The byway would be crossed using the bore method. At this crossing, the byway is a two-lane divided paved road and land use on either side consists of open land and open water. Direct impacts on the byway would be avoided through use of the bore method and traffic would continue during construction; however, scenic travelers may experience temporary visual impacts associated with construction personnel and equipment, as well as bore activities. Following construction, recreational uses of the byway would not be affected by operations.

The NGT Project would also cross the Maumee Valley Scenic Byway in two locations: MPs 181.2 and 181.8. Both crossings of the byway would be completed using the HDD crossing method. Direct impacts would be avoided; however, scenic travelers may experience temporary visual and noise impacts associated with construction personnel and equipment, as well as HDD activities. Also, as a result of the HDD method, tree clearing and vegetation maintenance within the permanent right-of-way on either side of the crossing would not be necessary, thus avoiding permanent visual impacts on scenic travelers. Recreational uses of the byway would not be affected by operations. The access road associated with the HDD crossing would require minor and temporary tree removal along West River Road.

4.9.10.8 North Country National Scenic Trail

The NGT Project would cross the NCNST at three locations. The crossings at MP 3.5 and 190.0 would be constructed using the open-cut method, and the crossing at MP 195.9 would be constructed using the bore method. Visual impacts associated with pipeline construction at these crossing locations would be temporary and would include construction vehicles and workers. The crossing at MP 190 would affect open and agricultural land uses, resulting in minor visual impacts after construction, until the right-of-way is revegetated to pre-construction conditions. The crossings at MPs 3.5 and 190.0 would occur through forested land use. Clearing and tree removal would be required during construction, and routine vegetation maintenance of forest/woodland within the permanent right-of-way would be required during pipeline operations. This would result in moderate and permanent visual impacts. To reduce impacts on the scenic trail, the NGT Project would cross an existing electric transmission line right-of-way at MP 190.0.

4.9.10.9 Maumee State Scenic River

The Maumee State Scenic River is located in Henry, Wood, and Lucas Counties. Ohio's Scenic Rivers Act provides three categories for river classification: wild, scenic, and recreational (ODNR Division of Watercraft, 2016). The ODNR Division of Watercraft administers the state scenic rivers program. The NGT Project would cross the Maumee State Scenic River at two locations between MPs 181.4 and 181.8 using the HDD method. The Maumee State Scenic River is designated as a "recreational river" at this crossing. A recreational river includes those rivers or sections of rivers that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past (State of Ohio, 2016). The HDD entry and exit points would be located in agricultural areas on either side of the river. Impacts to scenic travelers would be temporary. Also, as a result of the HDD method, tree clearing and vegetation maintenance within the permanent right-of-way on either side of the crossing would not be necessary, thus avoiding permanent visual impacts on scenic travelers.

4.9.10.10 Cuyahoga Valley Scenic Railroad

The CVSR operates on 51 miles of track from Independence south through Cuyahoga Valley National Park to Akron and Canton on the Sandyville Line. The NGT Project would cross the scenic railroad at MP 34.3 using the bore crossing method. Land use at this crossing consists of open land and forest/woodland. Tree clearing associated with the bore method would primarily be limited to the ATWS needed to complete the crossing. Direct impacts on the railroad would be avoided through use of the bore method and use would continue during construction; however, rail users may experience temporary visual impacts associated with construction personnel and equipment, as well as bore activities.

4.9.10.11 The Abbott Page House

The Abbott-Page House is located in Huron, Ohio. This historic place is located approximately 330 feet south of the proposed permanent right-of-way for the NGT Project. The Abbott-Page House is currently under NRHP review for an amendment to expand the site from a listed property to a historic district. Fries' Landing was located on the Page property along the Huron River in the 1870s and was the center of shipbuilding and shipping local goods to markets via the Milan Canal. NEXUS proposes to install the NGT pipeline via an HDD that would extend from the west side of Mudbrook Road to the east side of the Huron River. As a result of the HDD method, tree clearing and vegetation maintenance within the permanent right-of-way on either side of the crossing would not be necessary, thus avoiding permanent visual impacts on scenic resources associated with the Abbott Page House.

4.9.10.12 Conclusion

Based on our review of the potential impacts on visual resources as described in this section, we conclude that visual impacts would be greatest where the pipeline route parallels or crosses roads and the construction right-of-way may be seen by passing motorists, from residences where vegetation used for visual screening or for ornamental value is removed, and where the pipeline is routed through forested areas. The duration of visual impacts would depend on the type of vegetation cleared or altered and would be shortest in open areas where the re-establishment of vegetation following construction would be relatively rapid (i.e., generally less than 5 years). The duration would be greater in forested land, which would take many years or decades to regenerate. The greatest potential visual impact would result from the removal of large specimen trees, which would take longer than other vegetation to regenerate and would be prevented from re-establishing within the permanent right-of-way. Construction and operation of aboveground facilities would result in adjacent residents and motorists impacted by a view of construction

equipment and personnel during the construction phase, as well as view some of the facilities while in operation.

NEXUS proposes to use the HDD crossing method for the America's Byway, Maumee Valley Scenic Byway, Maumee State Scenic River, and Abbott Page House. During construction, users may experience temporary visual impacts associated with personnel, equipment, and HDD activities. As a result of using the HDD crossing method, tree clearing and vegetation maintenance within the permanent right-of-way at these crossings would not be necessary, thus avoiding permanent visual impacts on recreational uses. The Lincoln Highway Historic Byway, CVSR, and NCNST would be crossed using the bore method. Use of the features would continue during construction; however, scenic travelers may experience temporary visual impacts associated with construction personnel and equipment. Depending upon land use adjacent to the crossings, tree clearing in the permanent right-of-way may result in minor but permanent visual impacts.

4.10 SOCIOECONOMICS

Several socioeconomic effects could occur in the region of influence during construction of the NGT and TEAL Projects. These include fluctuations of population levels or local demographics, increased employment opportunities, increased demand for housing and public services, transportation impacts, and an increase in government revenue associated with sales and payroll taxes. Potential socioeconomic effects associated with operation of the NGT and TEAL Projects could include ongoing local expenditures by the operating company and an increased tax base. Section 4.10.10 contains the environmental justice review.

The socioeconomic study area that we considered for this analysis includes counties containing project facilities. We have also identified communities within a 10-mile radius centered on the pipeline centerline and major aboveground project facilities, which we have determined to be a reasonable driving distance to neighboring communities where services and goods may need to be obtained because many parts of the NGT and TEAL Projects are located in rural areas. We also recognize that some workers may have a greater threshold for commuting, which we have identified as 100 miles, due to the temporary nature of the construction phase. However, this analysis focuses on the counties where project facilities are located and the economic impacts would be concentrated.

4.10.1 NGT Project Study Area

The NGT Project area is comprised of 13 counties in Ohio and 3 counties in Michigan, including several communities within a 10-mile radius, which would contain project facilities and therefore make up the socioeconomic study area. A detailed project description can be found in section 2.1.1. Table 4.10.1-1 identifies the counties crossed by and communities within 10 miles of the NGT Project.

TABLE 4.10.1-1

Counties Crossed and Communities within 10 Miles of the NGT Project

Facility, State, Site ^a	Milepost	County	Communities within 10 Miles of the NGT Project ^b	
PIPELINES				
Ohio				
Mainline	0.0 - 12.5	Columbiana	Butler, Center, Elkrun, Franklin, Hanover, Knox, Madison, Perry, Salem, Washington, Wayne, West	
	12.5 - 34.2	Stark	Alliance, Canton (City and Township), Jackson, Lake, Lawrence, Lexington, Louisville, Marlboro, Massillon, Nimishillen, Osnauburg, Paris, Perry, Plain, Tuscarawas, Washington	
	34.2 - 50.4	Summit	Akron, Barberton, Bath, Clinton, Copley, Coventry, Fairlawn, Green, Lakemore, Mogadore (Village), New Franklin, Norton, Springfield, Tallmadge	
	50.4 - 56.5, 57.3 - 57.7	Wayne	Baughman, Canaan, Chippewa, Congress, Green, Milton, Norton, Rittman, Sugar Creek, Wayne	
	56.5 - 57.3, 57.7 - 80.5	Medina	Brunswick, Brunswick Hills, Canaan, Chatham, Chippewa Lake, Gloria Glens Park, Granger, Guilford, Harrisville, Hinckley, Homer, Lafayette, Litchfield, Liverpool, Lodi, Medina, Medina City, Montville, Rittman, Seville Village, Sharon, Spencer (Village and Township), Wadsworth (City and Township), Westfield, Westfield Center, York	
	80.5 - 101.3	Lorain	Amherst (City and Township), Brighton, Brownhelm, Camden, Carlisle, Columbia, Eaton, Elyria (City and Township), Grafton (Village and Township), Henrietta, Huntington, LaGrange, Lorain, New Russia, North Ridgeville, Oberlin, Penfield, Pittsfield, Rochester, Wellington	
	101.3 - 104.7	Huron	Bellevue (City), Bronson, Clarksfield, Fitchville, Hartland, Lyme, New London, Norwalk (City and Township), Peru, Ridgefield, Sherman, Townsend, Wakeman	
	104.7 - 131.5	Erie	Bellevue, Berlin, Florence, Groton, Huron, Margaretta, Milan, Oxford, Perkins, Sandusky, Vermilion (City and Township)	
	131.5 - 163.7	Sandusky	Ballville, Bellevue, Clyde, Fremont, Green Creek, Green Springs, Jackson, Madison, Rice, Riley, Sandusky, Scott, Townsend, Washington, Woodville, York	
	163.7 - 181.4	Wood	Bowling Green, Center, Freedom, Grand Rapids, Lake, Liberty, Middleton, Milton, Montgomery, Northwood, Perrysburg (City and Township), Plain, Portage, Rossford, Troy, Washington, Webster, Weston	
	181.4 - 189.3	Lucas	Harding, Maumee, Monclova, Oregon, Providence, Richfield, Spencer, Springfield, Swanton, Sylvania, Toledo, Waterville	
	189.3 - 190.2	Henry	Damascus, Harrison, Liberty, Richfield, Washington	
	190.2 - 208.3	Fulton	Amboy, Chesterfield, Clinton, Dover, Fulton, Pike, Royalton, Swan Creek, York	
		NA	Jefferson ^c	Brush Creek
		NA	Carroll ^c	Augusta, Brown, East, Fox, Harrison, and Washington
		NA	Mahoning ^c	Goshen, Sebring, and Smith
		NA	Portage ^c	Atwater, Brimfield, Deerfield, Mogadore, Randolph, Rootstown, Suffield, and Tallmadge
	NA	Cuyahoga ^c	North Olmsted, Olmsted, Olmsted Falls, and Strongsville	
	NA	Seneca ^c	Adams, Green Springs, Liberty, Pleasant, and Thompson	
	NA	Ottawa ^c	Allen, Bay, Benton, Carroll, Clay, Danbury, Erie, Harris, Portage, Port Clinton, and Salem	
Interconnecting Pipeline	0.0 - 0.9	Columbiana	Butler, Center, Elkrun, Franklin, Hanover, Knox, Madison, Perry, Salem, Washington, Wayne, West	

TABLE 4.10.1-1 (cont'd)

Counties Crossed and Communities within 10 Miles of the NGT Project			
Facility, State, Site ^a	Milepost	County	Communities within 10 Miles of the NGT Project ^b
Michigan			
Mainline	208.3 - 230.4	Lenawee	Adrian (City and Township), Blissfield, Clinton, Deerfield, Fairfield, Franklin, Macon, Madison, Ogden, Palmyra, Raisin, Ridgeway, Riga, Tecumseh (City and Township)
	230.4 - 236.9	Monroe	Ash, Dundee, Exeter, Ida, London, Milan (City and Township), Petersburg, Raisinville, Summerfield, Whiteford
	236.9 - 254.5, 255.1 - 255.2	Washtenaw	Ann Arbor (City and Charter Township), Augusta, Bridgewater, Lodi, Milan, Northfield, Pittsfield, Salem, Saline (City and Township), Superior, York, Ypsilanti (City and Charter Township)
ABOVEGROUND FACILITIES			
Ohio			
TGP M&R Station (MR01)	TGP 0.0	Columbiana	Butler, Center, Elkrun, Franklin, Hanover, Knox, Madison, Salem, Washington, Wayne, West
Kensington M&R Station (MR02)	0.0	Columbiana	Butler, Center, Elkrun, Franklin, Hanover, Knox, Madison, Perry, Salem, Washington, Wayne, West
Texas Eastern M&R Station (MR03)	TGP 0.9	Columbiana	Butler, Center, Elkrun, Franklin, Hanover, Knox, Madison, Perry, Salem, Washington, Wayne, West
Hanoverton Compressor Station (CS1)	1.4	Columbiana	Butler, Center, Franklin, Hanover, Knox, Perry, Salem, Washington, Wayne, West
Wadsworth Compressor Station (CS2)	63.5	Medina	Canaan, Chatham, Chippewa Lake, Gloria Glens Park, Granger, Guilford, Harrisville, Lafayette, Lodi, Medina, Medina City, Montville, Rittman, Seville Village, Sharon, Wadsworth (City and Township), Westfield, Westfield Center, York
Dominion East Ohio M&R Station (MR05)	128.8	Erie	Bellevue, Groton, Huron, Margaretta, Milan, Oxford, Perkins, Sandusky
Clyde Compressor Station (CS3)	134.0	Sandusky	Ballville, Bellevue, Clyde, Fremont, Green Creek, Green Springs, Rice, Riley, Sandusky, Townsend, York
Waterville Compressor Station (CS4)	183.5	Lucas	Harding, Maumee, Monclova, Providence, Spencer, Springfield, Swanton, Toledo, Waterville
Michigan			
Willow Run M&R Station (MR04)	255.2	Washtenaw	Ann Arbor (City and Charter Township), Augusta, Northfield, Pittsfield, Salem, Superior, York, and Ypsilanti (City and Charter Township)
a	Unless noted, other Project-related facilities, such as MLVs, pig launchers/receivers, pipe/contractor yards, staging areas, and access roads, would be within the same socioeconomic study area as the counties and communities listed for the pipeline.		
b	Communities within 10 miles of the NGT Project were provided by NEXUS in its FERC application.		
c	County is not directly affected by project facilities but contains communities within 10 miles of the NGT Project and are therefore included in the area of analysis.		

4.10.2 TEAL Project Study Area

The TEAL Project would cross Columbiana, Monroe, and Belmont Counties in Ohio. Table 4.10.2-1 identifies the portions of pipeline by milepost and facilities proposed for construction in relation to the counties crossed by and communities within 10 miles of the TEAL Project.

TABLE 4.10.2-1

Counties Crossed and Communities within 10 Miles of the TEAL Project

Facility, Site ^a	Milepost	County	Communities within 10 Miles of TEAL Project ^b
PIPELINES			
Connecting Pipeline	0.0 – 0.3	Columbiana	Butler, Center, Elkrun, Franklin, Hanover, Knox, Madison, Perry, Salem, Washington, Wayne, West
Proposed Pipeline Loop	0.0 – 4.4	Monroe	Adams, Center, Green, Lee, Malaga, Ohio, Perry, Salem, Sunsbury, Switzerland, Wayne
ABOVEGROUND FACILITIES			
Salineville Compressor Station	5.9	Columbiana	Butler, Center, Elkrun, Franklin, Hanover, Madison, Salem, Washington, Wayne, West, Yellow Creek
Colerain Compressor Station (additional compression and flow reversal)	49.9	Belmont	Colerain, Pease, Pultney, Richland, Smith, Wheeling
	NA	Carroll ^c	Augusta, Brown, East, Fox, Lee, and Washington
	NA	Jefferson ^c	Brush Creek, Ross, Saline, and Springfield
	NA	Harrison ^c	Athens, Green, Short Creek, Mount Pleasant, Smithfield, Warren, and Wells
	NA	Stark ^c	Paris
^a	Counties and communities within close proximity to proposed piping modifications that are exclusively part of flow reversal work are not included in the socioeconomics analysis due to the limited scope of the modifications.		
^b	Communities within 10 miles of the TEAL Project were provided by Texas Eastern in its application.		
^c	County is not directly affected by project facilities but contains communities within 10 miles of the TEAL Project and, therefore, included in the area of analysis.		

4.10.3 Population and Employment

Construction activities associated with the NGT and TEAL Projects would occur in rural areas generally, which the U.S. Census Bureau classifies as an area with a population less than 50,000 (2015). The 2010¹ population and population density of the 13 Ohio counties within the study area for the NGT Project range from 28,215 people in Henry County with a population of 67.8 people per square mile to 541,781 people in Summit County (where the Akron metropolitan area is located) with a population of 1,312.6 people per square mile (U.S. Census Bureau, 2010). The total estimated 2013 population of all 13 counties is 2,447,483 people or about 21 percent of the state population. The 2010 population and population densities for the Michigan counties within the study area range from 99,892 people in Lenawee County with 133.3 persons per square mile to 344,791 people in Washtenaw County with 488.4 persons per square mile.

Most of the counties within the NGT study area in Ohio saw a population decrease between 2000 and 2013 as well as between 2010 and 2013. Columbiana County, with a 2013 estimated population of 107,078, experienced the greatest population decrease (-4.5 percent) between 2000 and 2013. Other counties with population decreases between those years include Erie, Henry, Huron, Lucas, Sandusky, Stark, and Summit. Medina County, with a 2013 estimated population of 173,252, experienced the greatest population increase (14.7 percent) during the same time period. Other counties in the study area with population increases during this time period were Fulton, Lorain, Wayne, and Wood.

Between 2010 and 2013, Columbiana County again saw the greatest population decrease at -0.7 percent. Other counties in the study area with population decreases during this time include Erie, Fulton, Henry, Huron Lucas, Sandusky, and Stark. Wood County, with a 2013 estimated population of 127,325,

¹ The 2010 U.S. census data is presented here because the census is conducted every 10 years, which provides the official count of the population. Population counts provided by the ACS in between the decennial censuses are estimates. Both the 2010 census and ACS population estimates are appropriate to use to identify population trends.

experienced the greatest population increase between 2010 and 2013 at 1.5 percent. Other counties in the study area that experienced population increases during this time period were Lorain, Medina, and Wayne. Summit County experienced less than -0.1 percent (effectively 0 percent) population growth between 2010 and 2013.

All three of the counties within the study area in Michigan saw a population increase between 2000 and 2013, except between 2010 and 2013 when Lenawee and Washtenaw Counties in Michigan experienced a minor population decrease of -0.4 percent. Washtenaw County, with a 2013 estimated population of 348,560, was the only county in the study area to experience a small population increase (1.1 percent) between 2010 and 2013. Table 4.10.3-1 presents existing population levels and trends for counties in the study area for the NGT Project.

The 2010 population and population density of the Ohioan counties in the TEAL Project area range from 14,642 people in Monroe County with a population density of 32.1 people per square mile to 107,841 people in Columbiana County with a population density of 202.7 people per square mile. All counties in the TEAL Project area experienced a population decrease between 2000 and 2013 ranging from -0.3 percent to -4.5 percent, and two of the three (i.e., Belmont and Columbiana Counties) declined in population between 2010 and 2013 (-0.6 percent and -0.7 percent, respectively). Monroe County recorded no population change between 2010 and 2013. Table 4.10.3-1 presents existing populations and trends for the counties in the TEAL Project area.

Location	2000 Population ^a	2010 Population ^b	2013 Population Estimate ^c	2010 Population Density (persons/sq. mi.) ^b	2000-2013 Population Change (%)	2010-2013 Population Change (%)
FEDERAL						
U.S.	281,421,906	308,746,065	311,536,594	87.4	10.7	0.9
STATE						
Ohio	11,353,140	11,536,504	11,549,590	282.3	1.7	0.1
Michigan	9,938,444	9,883,706	9,886,095	174.8	-0.5	0.0
COUNTY						
Belmont, OH	70,226	70,400	69,990	132.3	-0.3	-0.6
Columbiana, OH	112,075	107,841	107,078	202.7	-4.5	-0.7
Erie, OH	79,551	77,079	76,634	306.4	-3.7	-0.6
Fulton, OH	42,084	42,698	42,601	105.3	1.2	-0.2
Henry, OH	29,210	28,215	28,164	67.8	-3.6	-0.2
Huron, OH	59,487	59,626	58,889	121.3	-1.0	-1.2
Lorain, OH	284,664	301,356	301,720	613.6	6.0	0.1
Lucas, OH	455,054	441,815	439,511	1,296.2	-3.4	-0.5
Medina, OH	151,095	172,332	173,252	409.0	14.7	0.5
Monroe, OH	15,180	14,642	14,646	32.1	-3.5	0.0
Sandusky, OH	61,792	60,944	60,619	149.2	-1.9	-0.5
Stark, OH	378,098	375,586	375,348	652.9	-0.7	-0.1
Summit, OH	542,899	541,781	541,592	1,312.6	-0.2	0.0
Wayne, OH	111,564	114,520	114,750	206.4	2.9	0.2
Wood, OH	121,065	125,488	127,325	203.3	5.2	1.5
Lenawee, MI	98,890	99,892	99,505	133.3	0.6	-0.4
Monroe, MI	145,945	152,021	151,408	276.7	3.7	-0.4
Washtenaw, MI	322,895	344,791	348,560	488.4	7.9	1.1
a	U.S. Census Bureau, 2000					
b	U.S. Census Bureau, 2010					
c	U.S. Census Bureau, 2013a					

Table 4.10.3-2 presents civilian workforce numbers, per capita incomes, unemployment rates, and the leading three industries for the United States, Ohio, Michigan, and the counties crossed by the NGT and TEAL Projects.

Major industries in the states of Ohio and Michigan and the counties within the NGT Project area include educational, health, and social services; manufacturing; retail trade; and professional, scientific, management, administrative, and waste management services. According to 2013 American Community Survey (ACS) data, the civilian workforce in the Ohio counties within the NGT Project area is 1,253,831 people. The unemployment rate is 10.0 percent in Ohio, which is 0.3 percent higher than the national average. Unemployment rates within the Ohio counties in the NGT Project area vary between a high of 13.8 in Lucas County and low of 6.3 percent in Medina County. The civilian workforce in the Michigan counties within the NGT Project area is 311,293 people. The unemployment rate is 12.7 percent in Michigan, which is 3.0 percent higher than the national average. Unemployment rates within the Michigan counties in the NGT Project area vary between a high of 11.9 in Lenawee County and low of 9.1 percent in Washtenaw County.

Based on 2013 ACS data, the primary industries in the Ohio counties the TEAL Project would cross are arts, entertainment, and recreation, and accommodation and food services; construction; educational, health, and social services; manufacturing; and retail trade. The total civilian workforce in these counties is 89,720 people. Unemployment rates within the counties in the TEAL Project area vary between a high of 10.8 percent in Columbiana County and low of 6.7 percent in Monroe County.

TABLE 4.10.3-2				
Estimated Populations and Employment of Counties in the NGT and TEAL Projects Area				
Location	Civilian Labor Force ^a	Per Capita Income (\$) ^a	Unemployment Rate (%) ^b	Top Three Industries ^{a, c}
FEDERAL				
U.S.	157,113,886	28,155	9.7	E, R, P
STATE				
Ohio	5,849,339	26,046	10.0	E, M, R
Michigan	4,859,417	25,681	12.7	E, M, R
COUNTY				
Belmont, OH	32,528	22,380	9.0	E, R, A
Erie, OH	38,918	26,135	8.8	E, M, A
Fulton, OH	22,349	24,771	9.9	E, M, R
Henry, OH	14,487	23,347	9.4	M, E, R
Huron, OH	29,493	22,257	9.7	M, E, R
Lorain, OH	152,340	26,030	10.3	E, M, R
Lucas, OH	221,879	23,885	13.8	E, M, R
Medina, OH	92,664	30,707	6.3	E, M, R
Monroe, OH	6,074	21,487	6.7	E, R, C
Stark, OH	189,391	24,453	10.6	E, M, R
Summit, OH	283,418	27,818	10.3	E, M, R
Wayne, OH	57,592	23,061	6.8	E, M, R
Wood, OH	69,392	26,326	10.3	E, M, R
Lenawee, MI	48,056	22,395	11.9	E, M, R
Monroe, MI	75,223	25,939	11.4	E, P, M
Washtenaw, MI	188,014	33,231	9.1	E, M, R
a	U.S. Census Bureau, 2013a			
b	U.S. Census Bureau, 2013b			
c	A = arts, entertainment, and recreation, and accommodation and food services; E = educational, health and social services; M = manufacturing; P = professional, scientific, management, administrative and waste management services; R = retail trade.			

Ohio counties in the NGT Project area record the estimated per capita income in 2013 as ranging from \$21,575 in Columbiana County to \$30,707 in Medina County (U.S. Census Bureau, 2013b). Nine of the Ohio counties in the NGT Project area have lower per capita incomes than the state average of \$26,046.

Michigan counties in the NGT Project area record the estimated per capita income in 2013 as ranging from \$22,395 in Lenawee County to \$33,231 in Washtenaw County (U.S. Census Bureau, 2013b). Lenawee County has a lower per capita income than the state average of \$25,681. Average worker wages during construction of the NGT Project are estimated at approximately \$275 per day or about \$71,500 annually, thus overall wage rates for the counties in both Ohio and Michigan would be temporarily increased (Bowen et al., 2015).

The estimated per capita income in 2013 in Ohio counties in the TEAL Project area range from \$21,487 in Monroe County to \$22,380 in Belmont County. All three counties in the TEAL Project area have per capita incomes that are below the state per capita income of \$26,046.

Construction of the NGT Project would take place between February and May 2017 and would require a total peak workforce of 3,360 construction workers with 2,770 in Ohio and 590 in Michigan. On average NEXUS anticipates using 60 percent local workforce in Ohio (1,660 workers) and 75 percent local workforce in Michigan (440 workers). Population impacts as a result of construction of the NGT Project are expected to be temporary and, given the existing populations of counties in the study area, minor. The effect on population would include the influx of non-local construction workers and any family members accompanying them. Pipeline construction is mobile, of a short duration, and in our experience most non-local workers would not travel with their families to the NGT Project study area, thus minimizing temporary impacts on the local populations. Based on the county populations within the NGT Project area, in the event some construction workers do temporarily relocate to the area, the increase in population would not be significant. In addition, any temporary increase in population would be distributed throughout the NGT Project area and would not have a permanent impact on any one population.

During the operations and maintenance phase of the NGT Project, NEXUS estimates that 36 permanent employees would be employed in Ohio, of which 22 to 60 percent would be hired from the local area. As such, 8 to 22 people would be employed locally, with the remaining employment needs filled by non-local employees. Based on the county populations within the NGT Project study area and the limited number of new permanent employees required, we expect that the permanent population effects as a result of operation of the NGT Project would be minor even with non-local employees relocating with their families.

Construction of the TEAL Project would require a total direct workforce of 320 to 470 construction workers, of which Texas Eastern estimates 40 to 60 percent would be local hires (i.e., 128 to 282 local employees). Construction supervisory personnel and inspectors are positions that may need to be hired non-locally and those workers would temporarily relocate to the TEAL Project area. Temporary small increases to population levels in the TEAL Project area would be experienced. As a result of the relatively short length and construction period (4.4 miles total, over 5 to 6 months in 2017), non-local workers would likely not travel with their families to the TEAL Project area, thus minimizing some impacts on local populations. Monroe County has no facilities that would be constructed, thus any population increases would be experienced for approximately 6 months or less in 2017 only.

Construction of the new compressor station and upgrades to the existing compressor station in the TEAL Project area would take place in 2018 over 8 to 10 months. Slight population increases could be noticed in the counties, particularly in communities closest to the sites. Some impacts on affected counties or communities are unavoidable; however, they would be temporary and limited to the period of

construction. Five employees are estimated to be hired locally for operation of the TEAL Project and, therefore, no effects on the population is anticipated and employment effects would be negligible.

We reasonably expect a temporary decrease in unemployment resulting from local hiring of construction workers and temporary increased needs for services. Indirect employment, including hiring additional staff in the retail and service industries to accommodate the influx of people to the area, as well as purchases made by non-local workers on food, clothing, lodging, gasoline, and entertainment, would have a temporary stimulating effect on local economies. These jobs would represent a temporary, minor increase in employment opportunities within the NGT and TEAL Projects area, as discussed in section 4.10.9.

4.10.4 Housing

Housing statistics for the NGT and TEAL Projects study area are listed in table 4.10.4-1. At least 284 hotels, motels, and campgrounds are available within the NGT Project study area and at least 455 hotels, motels, and campgrounds are available within the TEAL Project study area, along with thousands of rental housing units located in the affected counties. While the study area is concentrated to a 10-mile radius around the NGT and TEAL Projects, we expect some construction workers would commute up to 100 miles. Major metropolitan (metro) areas within 100 miles of the NGT Project include Detroit, Toledo, Sandusky, Akron, and Canton. These metro areas provide many options for hotels and motels if options are not available in smaller communities in the study area and would be sufficient to accommodate the estimated non-local construction workforce and non-local operations workforce.

Location	Total Housing Units ^a	Owner Occupied ^a	Renter Occupied ^a	Median Gross Rent ^a (\$)	Rental Vacancy Rate ^a (%)	Vacant Housing Units	Hotels and Motels ^b	Campgrounds ^c
STATE								
Ohio	5,124,221	3,074,792	1,482,863	718	7.8	N/A	N/A	N/A
Michigan	4,529,311	2,757,062	1,066,218	768	7.8	N/A	N/A	N/A
COUNTY								
Belmont	32,327	21,143	7,186	533	6.0	3,998	0	0
Columbiana, OH	46,882	30,560	11,535	589	5.3	4,787	1	2
Erie, OH	37,767	22,063	9,909	696	5.7	5,795	>50	9
Fulton, OH	17,370	13,041	3,244	668	7.0	1,085	3	0
Henry, OH	11,918	8,738	2,268	673	3.1	912	2	0
Huron, OH	25,127	16,293	6,068	619	12.2	2,766	6	2
Lorain, OH	127,282	83,523	33,182	733	5.6	10,577	13	4
Lucas, OH	202,196	110,797	67,304	649	8.7	24,095	>100	0
Medina, OH	69,494	52,107	13,392	821	4.4	3,955	14	8
Monroe	7,523	4,830	1,281	506	10.4	1,412	0	0
Sandusky, OH	26,305	18,110	5,796	613	10.4	2,399	>50	4
Stark, OH	165,036	104,991	45,012	666	6.8	15,033	>100	2
Summit, OH	244,910	149,549	70,826	741	8.6	24,535	>100	1
Wayne, OH	45,781	31,103	11,384	665	4.1	3,294	0	0
Wood, OH	53,419	33,171	15,915	718	6.6	4,333	21	2
Lenawee, MI	43,390	29,336	8,388	710	5.0	5,636	7	2
Monroe, MI	63,089	46,471	12,231	777	9.8	4,387	5	2
Washtenaw, MI	147,978	82,851	53,219	910	4.9	12,178	33	0
LOCAL ^d								
Canton-Massillon, OH Metro Area	178,664	113,744	47,366	663	6.4	N/A	223	N/A

TABLE 4.10.4-1 (cont'd)

Available Housing in the NGT and TEAL Projects Area									
Location	Total Housing Units ^a	Owner Occupied ^a	Renter Occupied ^a	Median Gross Rent ^a (\$)	Rental Vacancy Rate ^a (%)	Vacant Housing Units	Hotels and Motels ^b	Campgrounds ^c	
Weirton-Steubenville, WV-OH Metro Area	58,111	37,956	13,228	582	5.0	N/A	144	N/A	
Wheeling, WV-OH Metro Area	69,311	44,903	16,021	530	7.0	N/A	87	N/A	
a	U.S. Census Bureau, 2013a								
b	www.hotels.com , 2015								
c	Ohio.Camper.com 2015; RV Park Reviews, 2015								
d	Metropolitan Statistical Areas within approximately 50 miles of TEAL Project facilities								
Note:	Inventory of hotels, motels, and campgrounds was collected for only those counties where facilities are located and the pipeline crosses. Data was not collected for states.								
N/A = Not applicable									

A comment was received during scoping stating that www.hotels.com should not be considered a valid source for identifying the number of hotels in the NGT Project area. Housing data identified in this section such as total housing units, owner- and renter-occupied housing, median gross rent, and vacancy rates were identified using the 2013 5-year ACS data, which is a widely accepted and regularly used U.S. Census Bureau source. No such government-sponsored survey or data source exists maintaining a consistent inventory of hotels, motels, and campgrounds at a local level. Thus, we used www.hotels.com to compile a reasonable inventory in the NGT Project area, as it is a publicly available and reliable source that would be used to identify accommodations when traveling. The FERC acknowledges the number of hotels, motels, and campgrounds may vary from what is presented in table 4.10.4-1; however, we believe the table provides a reasonable indication of the temporary accommodations in the NGT Project area. In addition, other available temporary housing options such as bed and breakfasts, lodges, and seasonal or vacation properties available in these or neighboring counties within a reasonable commuting distance are not included. Thus, the actual availability of temporary housing is greater than what is presented in the table.

The availability of housing may vary and fluctuate during tourist seasons or local events, or as a result of demand for housing by other industries. Huron County, Ohio and Monroe County, Michigan have the highest rental vacancy rates (i.e., 12.2 percent and 9.8 percent, respectively) for each state, and Henry County, Ohio and Washtenaw County, Michigan have the lowest rates (i.e., 3.1 percent and 4.9 percent, respectively). The average vacancy rate is 6.7 percent throughout the NGT Project area. The counties included in the TEAL Project area have rental vacancy ranging from 10.4 percent in Monroe County to 5.3 percent in Columbiana County. See table 4.10.4-1 for the rental vacancy rates of each county in the NGT and TEAL Projects area.

NEXUS estimates that approximately 40 percent of the Ohio construction workforce and 25 percent of the Michigan construction workforce would be non-local. That equates to roughly 1,108 non-local workers in Ohio and 148 in Michigan, which would represent a demand for temporary housing from 1,256 non-local workers in the NGT Project study area. Using a conservative estimate of 25 units per hotel, motel, or campground, of which there are approximately 284 shown in table 4.10.4-1, we estimate that there are at least 7,100 rooms or sites available. Based on rental vacancy rates in the affected counties (3.1 percent to 12.2 percent), there were over 125,000 vacant rental units in the NGT Project area in 2013. Therefore, in counties where the number of hotels, motels, and campgrounds do not cover the estimated demand for 1,256 rooms or sites, there are sufficient vacant housing units.

Between 128 and 282 non-local construction personnel would use temporary housing. While there are very few identified hotels and motels in the TEAL Project area (i.e., two in Columbiana County), there are a substantial number in the three metro areas within approximately 50 miles of the TEAL Project facilities. There are approximately 454 hotels and motels in the three metro areas and, using a conservative estimate of 25 units per hotel/motel, we estimate there would be at least 11,350 rooms at the time of construction. In addition, based on 2013 Census data and rental vacancy rates of the affected counties, there were over 10,000 vacant housing units in the TEAL Project area in 2013 (U.S. Census Bureau, 2013a).

In the event that non-local workers prefer to house in a hotel, motel, or campground and the number identified in this analysis does not meet the need for that county, it can be reasonably expected that construction workers would house in nearby larger populated or metro areas. For instance, the Canton metro area can support non-local employees working in Columbiana County; Swanton in Lucas and Fulton Counties or the Toledo metro area are within reasonable commuting distances (i.e., 100 miles or less) for non-local employees working in Henry County; both Akron and Canton are within reasonable commuting distances for Wayne and Medina Counties; the Cleveland metro area (in Cuyahoga County, which is not crossed by the pipeline) can reasonably serve employees working in Medina and Lorain Counties; and the Toledo metro area can reasonably serve employees working in Wood, Lucas, and Fulton Counties. In Michigan, the Ann Arbor and Detroit metro areas can reasonably serve non-local employees working in Lenawee, Monroe, and Washtaw Counties.

The influx of non-local construction workers to both the NGT and TEAL Projects area could result in a temporary increase in demand for rental housing, hotel and motel rooms, and campground sites. While this would benefit the proprietors of the local motels, hotels, and other rental units through increased revenue, it could increase competition for units (and cost) and could decrease housing availability for tourists, recreationalists, and local renters or residents. While some construction activity would be conducted during the peak tourism season, sufficient temporary housing is still likely to be available; however, it may be more difficult to find (particularly on short notice) or more expensive to secure.

Based on the large number of accommodations in the NGT and TEAL Projects study area, we determined the housing accommodations along with hotels, motels, and campgrounds, would be sufficient to house the construction workforce without significantly displacing tourists, recreationalists, or local workers. The incremental housing, hotel, motel, and campground demand from construction workers during the NGT and TEAL Projects would be temporary and minor to moderate. In addition, we conclude that the estimated 14 to 28 non-local employees and 5 non-local employees needed for NGT and TEAL Projects operations, respectively, would not have a noticeable impact on housing availability in the area.

4.10.5 Public Services

Public services and facilities in the NGT and TEAL Projects study area include law enforcement, fire departments, medical facilities (e.g., hospitals and emergency services), and schools (see table 4.10.5-1). All counties in the NGT and TEAL Projects' study area have police or sheriff departments and fire stations. Nine (9) of the 13 counties in the NGT study area in Ohio, all of the counties in the study area in Michigan, and 1 of the 3 counties in the TEAL study area have a hospital or major medical facility.

In Ohio, 62 police or sheriff departments are located within 10 miles of the NGT Project, with the greatest number occurring in Lorain and Stark Counties, and the least in Henry and Fulton Counties. Approximately 231 fire stations are within the NGT Project study area, with Stark County having the most and Henry County the least (49 and 1, respectively). Stark and Summit Counties also contain the greatest number of hospitals or medical facilities within the NGT Project study area, while there are none within the study area in Henry, Columbiana, Wayne, and Fulton Counties. However, the NGT Project crosses a relatively small portion of these counties (typically along the edge or across a corner of the county) and

personnel would be able to access nearby hospitals in neighboring counties. There are more than 750 public schools in the NGT Project study area, located primarily in Wayne and Summit Counties, with the least amount in Henry County.

In Michigan, 14 police or sheriff departments are within the NGT Project study area, with the greatest number occurring in Washtenaw County and the least in Monroe County. The number of local fire stations ranges from 19 in Washtenaw County to 4 in Monroe County, for a total of 33 within the NGT Project study area in Michigan. There are 11 medical facilities in Michigan in the NGT Project study area, primarily in Washtenaw County. The greatest number of public schools in the vicinity are in Washtenaw County and the least number in Lenawee County.

There are seven police or sheriff departments within 10 miles of the TEAL Project area, with the greatest number occurring in Belmont County and only one in Monroe County. Twenty-two (22) fire stations are located in the counties within the TEAL Project area, ranging from 14 in Belmont County to one in Monroe County. There are 71 public schools in the counties within the TEAL Project area, with the most in Belmont and Columbiana Counties and the fewest in Monroe County.

TABLE 4.10.5-1
Public Services Available within 10 Miles of the NGT and TEAL Projects

Location	No. of Police & Sheriff Dept. ^a	Dist. to Nearest Police or Sheriff Dept.	No. of Fire Stations ^b	Dist. to Nearest Fire Station	No. of Hospitals and Medical Facilities ^c	Distance to Nearest Hospital or Medical Facility	Number of Public Schools ^d
Belmont County, OH	4	5.3	14	1.3	3	5.4	23
Columbiana County, OH	2	8.2	7	0.5	0	N/A	39
Erie County, OH	4	0.4	16	0.3	2	6.5	26
Fulton County, OH	1	2.2	11	0.8	0	N/A	21
Henry County, OH	1	8.1	1	6.6	0	N/A	14
Huron County, OH	4	1.8	3	2.0	2	7.6	23
Lorain County, OH	8	1	20	0.3	3	1.4	94
Lucas County, OH	5	0.9	34	0.5	1	5.5	136
Medina County, OH	5	1.7	23	0.6	3	2.0	43
Monroe County, OH	1	8.4	1	3.8	0	N/A	9
Sandusky County, OH	5	1.5	11	1.2	3	4.0	23
Stark County, OH	8	2.8	49	0.1	5	2.8	108
Summit County, OH	7	1.6	30	1.0	5	3.5	144
Wayne County, OH	3	1.3	8	0.2	0	N/A	43
Wood County, OH	9	1.0	18	1.0	1	6.8	40
Lenawee County, MI	3	2.1	10	1.8	2	6.8	45
Monroe County, MI	1	1.3	4	1.3	1	6.3	49
Washtenaw County, MI	4	2.9	19	1.0	8	2.0	88

^a PoliceOne, 2015; USGS, 2015
^b FireDepartment.net, 2015; U.S. Fire Administration, 2015; USGS, 2015
^c American Hospital Directory, 2015; USGS 2015
^d National Center for Education Statistics, 2015
 NA = Not Applicable

Primary care Health Professional Shortage Areas (HPSA) and Medically Underserved Areas or Populations (MUA/P) are designated by the U.S. Department of Health and Human Services (DHHS). A HPSA is a geographic area, population group, or health care facility that has been designated by the federal government as having a shortage of health professionals. An MUA/P is an area or population designated by the federal government as having shortages of primary medical care, dental, or mental health providers.

HPSAs and MUA/As are designated by geographic areas (e.g., census tracts, counties). One hundred MUA/P-designated census tracts are located within the NGT Project area in Columbiana, Erie, Lorain, Lucas, Medina, Sandusky, Stark, Summit, and Wood Counties in Ohio. Washtenaw and Monroe Counties in Michigan have 13 MUA/P-designated census tracts in the NGT Project area (DHHS, 2016a). There are four MUA/Ps within the TEAL Project area (DHHS, 2016a).

The HPSA database identified several primary care HPSA-designated areas in 8 of the 13 counties in the NGT Project area in Ohio, including Columbiana, Erie, Lorain, Lucas, Medina, Stark, Summit, and Wood Counties. None of the HPSA-designated census tracts are within the NGT Project area in Ohio. Within the NGT Project area in Michigan, five HPSAs for primary care were identified in Lenawee County, Michigan (DHHS, 2016b). Monroe County and one comprehensive health center are HPSAs in the TEAL Project area (DHHS, 2016b).

Access to medical services in the NGT Project study area is available in all counties except in Columbiana, Fulton, Henry, and Wayne Counties, Ohio and Monroe County, Michigan. Should a medical emergency occur during construction in these counties, we anticipate that medical services would be sought in communities in neighboring counties (e.g., Lucas, Wood, Medina, Summit, Stark, and Carroll Counties in Ohio, or Lenawee and Washtenaw Counties in Michigan, respectively). Belmont County is the only county that has hospitals or medical facilities in the TEAL Project area.

Based on the number and location of police departments, fire stations, hospitals, and schools, there is adequate public service infrastructure in the NGT and TEAL Projects study area to meet the temporary needs of non-local construction and long-term needs of non-local operations and maintenance workers. Further, NEXUS and Texas Eastern would require each of its contractors to have a health and safety plan, covering location- or work-specific requirements to minimize the potential for on-the-job accidents. Contractors and NEXUS' and Texas Eastern's site safety staff are responsible for monitoring compliance with the plans. In the event of an accident, police, fire, and/or medical services would be necessary; however, the anticipated demand for these services is not expected to exceed existing capabilities in the NGT and TEAL Projects study area.

Temporary increased demand on local public services may occur because police may be required to direct traffic during construction at road crossings or respond to emergencies associated with pipeline construction. Fire departments may have to respond to project-related fires or other emergencies, and medical services may be necessary for workforce personnel illnesses or injuries. NEXUS and Texas Eastern would work with local law enforcement, fire departments, and emergency medical services prior to construction to coordinate for effective emergency response. Due to the relatively short duration of project construction and workforce dispersion across multiple counties and states, significant effects on public services in the affected counties or communities would not be anticipated.

Most non-local construction workers are not expected to relocate their families temporarily during the construction period, and as such we do not anticipate that the NGT or TEAL Projects would increase demand for school-related services. As indicated previously, a small number (i.e., 14 to 28 for the NGT Project and 5 for the TEAL Project) of non-local permanent operations employees and potentially their families would relocate to areas in Ohio. We conclude there would not be significant increased demand for school-related services resulting from non-local operations employees relocating to the NGT and TEAL Projects area.

We received several comments about the safety of a high-pressure pipeline in or near population centers and/or near schools and child daycare and elderly facilities. As further discussed in section 4.13 (Reliability and Safety), NEXUS and Texas Eastern would construct, operate, maintain, and inspect the

proposed facilities to meet or exceed PHMSA’s safety requirements, which have pipeline design requirements that are dependent on the population levels and facilities crossed.

We received several comments where residents in Whitehouse and Waterville, Ohio (Lucas County) expressed concerns about the costs and ability for emergency public services to respond in the event of a catastrophic accident at the proposed Waterville Compressor Station or along the pipeline in Lucas County. As discussed in section 4.13, a catastrophic accident is unlikely based on statistical data. NEXUS would develop, maintain, and implement emergency response plans as required by applicable DOT regulations. NEXUS would also communicate regularly with the public who live and work near the pipelines and facilities about pipeline safety and emergency response plans. NEXUS employees would join local emergency response personnel for emergency drills to test staff readiness and identify improvement opportunities.

Concerning costs for improving local emergency services, NEXUS estimates \$2.1 billion in property tax revenues would be generated in the first 60 years of service on the greenfield portion of the NGT Project. We expect government officials would allocate appropriate tax revenues to address community priorities.

4.10.6 Tourism

Tourism is defined as federal, state, and local special interest areas as well as businesses that depend on year-round or seasonal tourists. Both Ohio and Michigan offer year-round tourism attractions; however, the peak season is typically from the spring through fall (April through September) (Smartertravel.com, 2016). Tourism is not listed as a major economic industry for any of the counties in Ohio or Michigan within the NGT and TEAL Projects area. The counties within the NGT and TEAL Projects area generally offer similar tourist attractions, including recreational activities such as parks, golfing, and kayaking; shopping and eateries; various museums and historical attractions; winery, farm, and orchard tours; amusement and waterparks; and festivals. Notable major tourist attractions in the NGT Project area include the following:

- Pro Football Hall of Fame in Canton, Stark County (Stark County Convention and Visitor’s Bureau, 2016);
- 33,000-acre Cuyahoga Valley National Park near Akron, which had over 2.2 million recreation visitors in 2015 in Summit County (National Park Service, 2015);
- Amish Country in Wayne County (Wayne County Convention and Visitors Bureau, 2016);
- Cedar Point Amusement Park in Erie County on the Lake Erie shore, which is the second oldest amusement park in North America and known as the Roller Coaster Capital of the World (Cedar Point, 2016);
- Toledo Zoo in Lucas County is recognized as one of the 10 best zoos in the United States (Toledo.com, 2016); and
- Lake Erie, offering a number of beaches and marinas, ferries and cruises, sightseeing and fishing charters, and recreational activities such as sailing, kayaking, boating, swimming, and fishing (Lake Erie Shores and Islands, 2016).

Notable major tourist attractions in the TEAL Project area include the following:

- Official state byways – Drovers’ Trail, Historic National Road, and the Ohio River Scenic Byway;
- Shaeffer/Campbell Covered Bridge, the Underground Railroad Museum, and the Barkcamp State Park;
- Wheeling, West Virginia (6 miles southeast of the Colerain Compressor Station) offers many tourist attractions such as museums, a zoo, racetrack, casino, many parks, markets, and a year-round resort (Wheeling Convention and Visitors Bureau, 2016); and
- Weirton-Steubenville Metro Area is another nearby metro area to the Colerain Compressor Station that has historical sites, museums, a casino resort, recreation such as golf courses and parks, and wineries (Top of West Virginia Convention and Visitor’s Bureau, 2016; Steubenville Visitor Center, 2016).

No major tourist attractions would experience restricted or denied access resulting from NGT or TEAL Project construction. There may be some recreational areas such as parks that experience temporary impacts on access resulting from construction, which is discussed in section 4.9.

Tables 4.10.6-1 and 4.10.6-2 summarize the tourism economies in the NGT and TEAL Projects area.

TABLE 4.10.6-1		
Tourism Economy in the NGT Project Area ^a		
County	Sales (\$ million)	Wages (\$ million)
Columbiana, OH	193.6	42.6
Stark, OH	1,600	280.5
Summit, OH	2,100	478.2
Wayne, OH	224.5	57.8
Medina, OH	486.2	123.6
Lorain, OH	499.4	154.1
Huron, OH	100.1	28.5
Erie, OH	1,500	255.2
Sandusky, OH	136	34.3
Wood, OH	446.5	129.2
Lucas, OH	1,800	421.8
Henry, OH	21.8	8.4
Fulton, OH	111.7	28.8
Lenawee, MI	114.7	52.9
Monroe, MI	212.9	88.6
Washtenaw, MI	684.5	391.0
NGT Project Area Total	10,095.9	2,541.2

^a Tourism Economics, 2014a; 2014b; 2014c; 2014d; 2014e; 2014f; 2014g; 2014i.

TABLE 4.10.6-2

Tourism Economy in the TEAL Project Area ^a				
County	Sales (\$ million)	Employment	Personal Income (\$ million)	Tax Revenue (\$ million)
Belmont, OH	187.2	2,376	49.3	24.8
Columbiana, OH	193.6	2,391	42.6	24.5
Monroe, OH	7.3	154	2.2	1.0
TEAL Project Area Total	388.1	4,921	94.1	50.3

a Tourism Economics, 2014h

The influx of construction workers would be limited to the time of construction and dispersed across the NGT Project area throughout the relatively short construction period of February through May. The demand for temporary housing by non-local workers would not exceed the available number of hotels, motels, and campground units in the NGT Project area, but accommodations could experience some minor limited availability at the end of the planned construction in spring and early summer, which is the front end of the time period considered the peak tourism season in Ohio. These strains would be most likely experienced in the Lake Erie region, specifically in Erie and Sandusky Counties; however, sufficient temporary housing accommodations exist in these counties and in the metro areas where major tourism activities exist. Affected land uses would be restored and activities allowed to continue following construction and, depending on easement negotiations, landowners could be compensated for losses resulting from construction.

Effects on tourism resulting from the TEAL Project are unlikely as there are no tourist attractions that would experience restricted access as a result of project construction. Major tourist attractions are located in surrounding metro areas, which are 15 or more miles from the pipeline route and facilities locations; therefore, we do not expect construction activities would disrupt visitor experiences at tourist locations resulting from restricted access or safety concerns. Impacts on public enjoyment of the tourist attractions outside the TEAL Project area would be negligible and limited to the potential for the temporary non-local workforce contributing to increased demand for accommodations such as hotels, motels, and campgrounds; however, as discussed in section 4.10.4 and based on the number of hotels, motels, campgrounds, and vacant rental units in the TEAL Project area, the demand for temporary housing from non-local workers required for project construction would not exceed available supply.

Commenters voiced concerns during scoping that any negative effects on water quality in Lake Erie would negatively affect tourism in Ohio and Michigan. Specific water quality and fisheries and aquatic resources effects and mitigation are discussed in sections 4.3 and section 4.7. Effects to tourism on Lake Erie would likely not occur as a result of the NGT Project because there would not be restricted access to Lake Erie attractions, nor would temporary construction disrupt the visitor experience associated with tourism activities taking place on Lake Erie as the NGT Project is about 3 miles from the shoreline at its closest point.

In summary, construction and operation of the Projects is not expected to result in any significant impacts on tourism.

4.10.7 Transportation

A daily total of 1,311 commuter vehicles (875 in Ohio and 436 in Michigan) is estimated to be used to transport the construction workforce to NGT Project sites. NEXUS also anticipates a daily total of 414 material and equipment delivery vehicles (275 in Ohio and 139 in Michigan) would make two round trips per day between pipe/contractor yards and the right-of-way. Vehicles would include stringing trucks,

welding rigs, water trucks, fuel trucks, mechanic trucks, flatbed and lowboy trailer trucks, motor graders, hydrostatic equipment trucks, and contractor buses, as well as inspector, foreman, contractor, environmental monitor, and cultural monitor vehicles. NEXUS anticipates that some personnel would carpool to the construction area, thereby reducing passenger vehicle traffic on local roads. Vehicle use would primarily be confined to just before, during, and just after construction hours (i.e., typically 7:00 a.m. to 6:00 p.m., 6 days a week), with exceptions made for specific activities such as HDDs or hydrostatic testing. During construction, vehicles would be distributed across the NGT Project according to the specific construction method used. See appendix L-1 for average daily traffic counts on roads in the NGT Project area.

The daily total for material and equipment delivery vehicles is estimated to be 152 at peak construction with an estimated daily maximum total of 375 commuter vehicles, to be used to transport the construction workforce to TEAL Project sites. Construction activities would be scheduled for transportation in a manner similar to the NGT Project, as discussed above. See appendix L-2 for average daily traffic counts on roads in the TEAL Project area.

Construction activities would result in temporary effects on local transportation infrastructure and vehicle traffic, including disruptions from increased transportation of construction equipment, materials, and crew members; disruptions from construction of pipeline facilities at or across existing roads; and damage to local roads caused by heavy machinery and materials.

Public roads used by construction vehicles to travel to and from workspaces could experience increased sediment tracking/build-up and surface damage. Paved roads are the most durable and generally stand up well to periodic surges in traffic and heavy use; unpaved roads, on the other hand, are much less durable. Most states fund road repairs with motor fuel taxes, motor vehicle registration fees, and compensatory fees paid by commercial carriers. Commercial carriers need registrations to operate in each state and may need special permits for oversize and overweight vehicles, temporary trip permits within the state, or to haul hazardous materials. NEXUS and Texas Eastern would coordinate with state and local departments of transportation and land-managing agencies to obtain the required permits to operate trucks on public roads.

To minimize and mitigate these potential impacts, NEXUS and Texas Eastern would limit construction activities to daylight hours to the extent practicable; therefore, workers would travel to and from the site earlier and later in the day, outside of peak traffic hours thus minimizing their contribution to traffic congestion. NEXUS and Texas Eastern would also encourage its workforce to carpool. Some construction activities (e.g., hydrostatic testing, directional drilling, and tie-ins) could occur at unspecified times and/or outside of normal construction hours; however, NEXUS and Texas Eastern would attempt to schedule these activities to minimize impacts on local traffic.

During scoping, we received a comment that expressed concern over costs to local governments due to the effects of heavy equipment on local roads and bridges. The NGT and TEAL Projects would cross larger, typically paved roads (e.g., county roads, interstate highways) via the bore or HDD method (described in section 2.3.2.1), which would result in little to no disruption to traffic or road impacts. Smaller roads would be crossed using the open-cut method, which usually requires temporary road closures and/or detours. Where detours are infeasible, crews would leave at least one road lane open to maintain traffic flow, except when installing the pipeline, and use the necessary signage and traffic control measures, or install steel plate bridges over the open-cut area to ensure continued traffic flow during construction. Most open-cut crossings take 1 to 2 days to complete, but final road resurfacing following backfill could take weeks to allow for settling and compaction. NEXUS and Texas Eastern would coordinate with local police departments in areas of high traffic volume to avoid traffic flow interruptions and ensure the safety of pedestrians and vehicles and passing emergency vehicles. NEXUS and Texas Eastern would also employ traffic control measures, such as flagmen and signs, as necessary to ensure safety of local traffic.

Additionally, NEXUS and Texas Eastern would be responsible for restoring roads in accordance with permit conditions and as requested by landowners or agencies. NEXUS and Texas Eastern would periodically inspect roads near crossings and make repair as necessary to damages caused by construction activities. NEXUS and Texas Eastern would coordinate with local officials to avoid traffic interruptions and ensure the safety of pedestrians, motorists, and emergency vehicles in the NGT and TEAL Projects area. Road crossings and proposed crossings methods for the NGT and TEAL Projects are listed in table 4.9.6-1.

NEXUS would improve or modify 141 existing roads and Texas Eastern would improve or modify 6 existing roads to accommodate construction vehicle traffic. Traffic disruptions similar to those previously described could occur and NEXUS and Texas Eastern would employ similar minimization and mitigation techniques to maintain traffic flow.

As a result of measures and methods described in this section, we anticipate that construction activities related to the NGT and TEAL Projects would result in minor and temporary to short-term impacts on transportation infrastructure. These impacts would not be expected to be significant.

4.10.8 Property Values

We received numerous comments from stakeholders voicing concern that the NGT and TEAL Projects would have negative effects on property values, potentially decreasing values from 25 percent to 100 percent and that local governments would lose tax revenue because of decreased property values. Typically, an easement would be used to convey both temporary (construction-related) and permanent rights-of-way to NEXUS or Texas Eastern. As further discussed in section 4.9, the easement would give NEXUS or Texas Eastern the right to access, construct, operate, and maintain their respective pipelines. In return, NEXUS or Texas Eastern would compensate the landowner. If the NGT and/or TEAL Projects are issued a Certificate, an easement could be obtained by use of eminent domain. In that case, the property owner would still be compensated by NEXUS or Texas Eastern but the amount of compensation would be determined by the courts.

The effect that a pipeline easement may have on property value is a damage-related issue that would be negotiated between the parties during the easement acquisition process, which is designed to provide fair compensation to the landowner for the right to use the property for pipeline construction and operation. Appraisal methods used to value land are typically based on objective characteristics of the property and any improvements. The impact a pipeline could have on a property's value would depend on many factors including the size of the tract, the values of adjacent properties, the presence of other utilities, the current value of the land, and the current land use. Subjective valuation is generally not considered in appraisals. A potential purchaser of property may make a decision to purchase land based on his or her planned use. An industrial user might find the pipeline (i.e., a potential source of energy for an industrial plant) preferable; a farmer looking for land for grazing or cropland may or may not find it objectionable. If the presence of a pipeline renders a planned use infeasible, it is possible that a potential purchaser would decide not to purchase the property; however, each potential purchaser has different criteria and differing capabilities to purchase land.

Property taxes for a piece of property are generally based on the actual use of the land. Construction of the pipeline would not change the general use of the land but would preclude construction of aboveground structures on the permanent right-of-way. If a landowner believes that the presence of a pipeline easement impacts the value of his or her land, resulting in an overpayment of property taxes, he or she could appeal the issue of the assessment and subsequent property taxation to the local property tax agency.

Several studies examined the effects of pipeline easements on sales and property values, and evaluated the impact of natural gas pipelines on real estate. The first study, *Pipeline Impact Study: Study of a Williams Natural Gas Pipeline on Residential Real Estate: Saddle Ride Subdivision, Dallas Township, Luzerne County, Pennsylvania* prepared by the firm of Allen, Williford & Seale, Inc., assessed the impact on the sale price of undeveloped lots and single-family residences that have a natural gas transmission line easement on the property (Allen, Williford & Seale, Inc., 2014). The report compared units in a subdivision in Luzerne County that had an existing natural gas transmission line located within it. Differences between the sale prices of undeveloped lots and houses with the pipeline easement and those that did not have an easement were analyzed. The report found that, when the sales prices of the encumbered residences were compared with the sales prices of the unencumbered residences, there was no indication that the pipeline easement had any effect on the sales prices of homes in Saddle Ridge. Likewise, when the sales prices of encumbered lots were compared with the sales prices of unencumbered lots, the differential in price could be explained by the reduction in lot size associated with the easement area.

One study, Diskin et al. in 2011, looked at the effects of natural gas transmission pipelines on residential values in Arizona. The study concluded that there was no identifiable systemic relationship between proximity to a pipeline and residential sale price or value.

Studies conducted in 2008 by PGP Valuation Inc. (PGP, 2008) for Palomar Gas Transmission, Inc. and by Ecowest for the Oregon LNG Project reached similar conclusions. Both studies evaluated the potential effect on property values of a natural gas pipeline that was constructed in 2003/2004 in northwestern Oregon, including along the western edge of the Portland metro area. The PGP study found that:

- there was no measurable long-term impact on property values resulting from natural gas pipelines for the particular pipeline project studied;
- interviews with buyers and brokers indicated no measurable impact on value or price; and
- there was no trend in the data to suggest an extension of marketing periods (i.e., time while the property is on sale) for properties with gas pipeline easements.

The Ecowest study concluded that the pipeline had no statistically significant or economically significant impact on residential properties. The study also concluded that there was no relationship between proximity to the pipeline and sale price (Fruits, 2008).

Another study (Hansen et al., 2006) analyzed property sales near a pipeline accident location in Washington State, using methodologies that considered proximity and persistence over time. This study noted a decline in property values following the incident; however, the effect was very localized and declined as the distance from the affected pipeline increased. The effect also diminished over time in the years following the incident.

For the purposes of another EIS analysis the FERC published in 2014 (with a project area in Pennsylvania and New York), several appraisers were contacted about the potential impacts on property values due to the presence of a natural gas pipeline (FERC, 2014). One appraiser who teaches seminars for appraisers and realtors, including discussions of mineral rights and pipeline easements, provided information on the subject. According to the appraiser, “the empirical evidence indicates no difference in value attributable to the existence of the pipeline easement.” The appraiser further noted that he was not aware of appraisers making adjustments in the appraiser reports for the existence of a pipeline easement. He stated that the large number of variables that impact home values make it difficult to determine the incremental effect that any one variable may have on a home’s value. Regardless, it is possible that the

perceived safety issues or the limitations on land use within the permanent easement could reduce the number of potential buyers for a property, which may extend the number of days a property is on the market.

Based on the research we have reviewed, we find no conclusive evidence indicating that natural gas pipeline easements would have a negative impact on property values.

We also received comments voicing concern that insurance premiums would increase and/or insurance companies would not insure properties. The FERC has examined these concerns on other projects by contacting insurance offices to pose the question. We asked whether the presence of a utility crossing would change the terms of an existing or new residential insurance policy, which types of utilities may cause a change, how a policy might change, and what factors would influence a change in the policy terms, including the potential for a policy to be dropped completely. Results of this initial investigation suggested that the potential for a residential insurance policy to be affected could exist, but the extent of any action and corresponding corrective action would depend upon several factors, including the terms of the individual landowner's policy and the terms of the applicant's own policy. Insurance company contacts were not able to speak directly to the potential factors that could cause a change in a policy (e.g., type of utility, proximity of residence to utility), or provide quantitative information on the potential change in a policy premium (in dollars or percent). As such, there is no conclusive evidence indicating that insurance premiums would be affected by the presence of a natural gas pipeline easement.

In summary, construction and operation of the Projects is not expected to result in any significant impacts on property values or insurance premiums.

4.10.9 Economy and Tax Revenues

4.10.9.1 NGT Project

During scoping, many commenters voiced concerns that the economic effects on the NGT Project area would be fiscally devastating because people would not want to move to and live in the area. We also heard that no long-term benefits would be realized and that the NGT Project would not produce significant local employment in Medina County. Additionally, we received comments that the economic impact studies commissioned by NEXUS did not accurately the economic impacts of the construction and operation of the NGT Project on the City of Green. One of these comments included a study conducted by Cleveland State University, College of Urban Affairs, Center for Economic Development on behalf of the City of Green, titled *Fiscal and Economic Impact Analysis of Proposed Nexus Natural Gas Pipeline on the City of Green, Ohio* (Simons et. al, 2015). The study, focused on the City of Green and identified the economic impacts the NGT project would have on the city including impacts to property values, commercial growth, and tax revenues. We did not find the study particularly compelling for the reasons stated in section 3.3.3. Also, as discussed in section 4.10.8, we find no conclusive evidence indicating that natural gas pipeline easements would have a negative impact on property values. Additionally, the counties and cities where Project facilities are located will receive positive economic impacts in the form of direct, indirect, and induced spending during construction of the NGT Project.

An economic analysis commissioned by NEXUS was completed by Economic and Policy Resources in May 2015. The scope of the analysis covered 11 of the 13 counties that are in the NGT Project area in Ohio.² The economic analysis commissioned by NEXUS for the NGT Project's economic effects in Michigan was completed in April 2015 by the Michigan State University Land Policy Institute and Center

² The economic analysis completed by Economic and Policy Resources did not include Henry and Huron Counties in Ohio. These counties are crossed by the NGT Project for approximately 0.9 and 3.4 miles, respectively, and there are no major aboveground facilities located in these counties.

for Economic Analysis. The scope of this analysis covered the three counties in the NGT Project area in Michigan, as well as the entire state of Michigan for the greenfield activity.

Construction and operation of the NGT Project would have a beneficial, short-term impact on local sales tax revenues. Payroll taxes would also be collected from workers employed on the NGT Project, resulting in additional beneficial, short-term effects. NEXUS anticipates that its total payroll would be approximately \$668 million during the construction phase and an estimated total annual payroll of \$3.1 million during operation. Economic effects resulting from construction and operation of the NGT Project would be beneficial at the local and county levels in the form of increased sales and payroll taxes. Direct payroll and materials expenditures related to the NGT Project would have an immediate impact on local economies. NEXUS would purchase goods, materials, and services locally when possible. Workers would also most likely spend a portion of their pay in local communities on items such as housing, food, automobile expenses, entertainment, and miscellaneous other items. NEXUS estimates that about 5.0 to 7.5 percent of the total construction cost would be spent on locally purchased consumables (e.g., fuel, tires, concrete, sand, gravel, office supplies) in Ohio and Michigan, respectively. These direct impacts would stimulate indirect impacts within the region as inventories are restocked and new workers are hired to meet demands. NEXUS estimates that over \$449.6 million would be spent toward direct construction labor income with approximately \$400.6 million in Ohio and approximately \$49 million in Michigan. Operations employees would not be required for the Michigan portion of the NGT Project.

Though installation of the underground pipeline would have temporary surface impacts on roads, project-related damages would be repaired. Once installed, the pipeline would not impede normal surface traffic or access to businesses, and most pre-construction property uses would be allowed to continue.

The long-term positive economic impacts from the NGT Project include an increase in property taxes that would benefit local governments and their annual budgets for the life of the NGT Project. When broken down by construction and operation, the direct,³ indirect,⁴ and induced⁵ economic benefits in Ohio include 5,325 jobs with \$565 million in labor income and \$697 million in value added for construction, and 59 jobs with \$3.8 million in labor income and \$5 million in value added for operation.

Table 4.10.9-1 presents the estimated total annual economic effects (i.e., the sum of the direct, indirect, and induced economic impacts) of the NGT Project during operation in Ohio. Economic impacts during operations would be focused to four counties that would have compressor stations.

³ Direct effects are the initial economic changes resulting from the activity or policy that takes place associated with the industry immediately affected.

⁴ Indirect effects are secondary economic changes associated with the purchase of materials and supplies and services for production of the NGT Project.

⁵ Induced effects are economic changes associated with the disposable income that new workers with the NGT Project and linked businesses spend on household goods and services.

TABLE 4.10.9-1

Estimated Economic Effects for Operations for the NGT Project in Ohio^a

County	Jobs	Labor Income (\$)	Value Added (\$)	Annual Estimated Property Tax (\$)
Columbiana	21	1,313,600	1,699,600	97,300
Lucas	14	883,500	1,145,400	65,600
Medina	12	825,800	1,053,500	60,300
Sandusky	12	825,800	1,053,500	60,300
Total	59	3,848,700	4,952,000	283,500

a Economic & Policy Resources, 2015

Another indicator of the economic impacts of a project is to calculate the total project output. Output is calculated by applying a multiplier⁶ to the total expenditures on goods and services directly related to construction of the NGT Project. The purpose of calculating output is to capture the indirect impact that these expenditures could have on the local economy beyond their direct effect (e.g., purchases). For example, the total output of the NGT Project in Michigan is estimated to be \$254 million in the state and \$183 million in the southeast Michigan region (i.e., Lenawee, Monroe, and Washtenaw Counties). Statewide, the jobs that would be created resulting from the NGT Project are estimated at 1,533 with a total labor income of approximately \$97 million. For the three-county southeast region, jobs created are estimated at 1,189 with projected labor income of \$71 million for the duration of the NGT Project.

Tax impacts would also be generated by *ad valorem* taxes, which are property taxes that would be assessed per year, resulting in additional long-term benefits to the local and regional economy. The *ad valorem* experienced would depend on the length and amount of project facilities in a county. The total estimated *ad valorem* tax associated with the NGT Project would generate approximately \$2.1 billion in the first 60 years of service, with approximately \$1.9 billion distributed in Ohio and approximately \$0.2 billion in Michigan.

Overall, the NGT Project would result in beneficial economic effects on the state and local economies by creating a short-term stimulus to the affected areas through payroll expenditures, local purchases of consumables and project-specific materials, and sales tax. Furthermore, operation of the NGT Project would result in long-term *ad valorem* property tax benefits for the counties in the NGT Project area. No significant adverse impacts are expected.

4.10.9.2 TEAL Project

Construction and operation of the TEAL Project would have a beneficial economic effect on local sales tax revenue. Texas Eastern estimates that during construction, over \$45 million in direct construction labor would be spent. Additional economic effects would be realized through the local purchase of construction materials. Texas Eastern estimates that a total of \$47.5 million would be spent on construction materials, of which about \$4.7 million would be spent locally. Although most construction materials would be purchased from outside vendors, common supplies (e.g., stone and concrete) would likely be purchased from local and state vendors. Economic effects would be realized through payroll and sales taxes, which may be beneficial at the local, county, and state levels; however, these effects would be limited to the duration of the construction period.

⁶ Output is calculated using Regional Input-Output Modeling System multipliers developed by the U.S. Department of Commerce's Bureau of Economic Analysis. Regional Input-Output Modeling System multipliers are available by state, region, county, and metropolitan area throughout the United States: www.bea.gov/index.htm.

During operations and maintenance, Texas Eastern estimates five employees would be needed and the total annual income would be approximately \$400,000. Approximately \$981,000 is estimated in annual expenditure during operations, although the local proportion has not yet been determined. Property taxes for the first 60 years of the TEAL Project are estimated to generate \$184 million.

As with the NGT Project, no significant negative economic effects are expected. Any damage to local infrastructure would be repaired and most pre-construction property uses would be allowed.

4.10.10 Environmental Justice

Executive Order 12898 *Federal Action to Address Environmental Justice in Minority Populations and Low-Income Populations* requires federal agencies to consider if impacts on human health or the environment (including social and economic aspects) would be disproportionately high and adverse for minority and low-income populations and appreciably exceed impacts on the general population or other comparison group. Consistent with Executive Order 12898, the CEQ called on federal agencies to actively scrutinize the following issues with respect to environmental justice (CEQ, 1997a):

- The racial and economic composition of affected communities;
- Health-related issues that may amplify project effects on minority or low-income individuals; and
- Public participation strategies, including community or tribal participation in the process.

The EPA's Environmental Justice Policies focus on enhancing opportunities for residents to participate in decision making. The EPA states that Environmental Justice involves meaningful involvement so that:

(1) potentially affected community residents have an appropriate opportunity to participate in decisions about a proposed activity that would affect their environment and/or health; (2) the public's contributions can influence the regulatory agency's decision; (3) the concerns of all participants involved would be considered in the decision-making process; and (4) the decision-makers seek out and facilitate the involvement of those potentially affected (EPA, 2011).

As described in section 1.3, there have been many opportunities for the public to comment on and provide input about the Projects. All public documents, notices, and meetings were made readily available to the public during our review of the Project. NEXUS and Texas Eastern met with many different stakeholders during the initial development of the route including local residents and affected landowners. These efforts included NEXUS and Texas Eastern holding a number of open houses in the Projects area for the affected communities and local authorities. NEXUS and Texas Eastern also established, and are maintaining, a website to share information about the Projects with the public.

NEXUS and Texas Eastern also used the FERC's pre-filing process (see section 1.3). One of the major goals of this process is to increase public awareness and encourage public input regarding every aspect of a project before an application is filed. As part of this process, FERC staff participated in all of NEXUS' and Texas Eastern's open houses to receive input from the public about the Projects and to explain FERC's review process and the opportunities it provides for public input. Interested parties have had, and will continue to be given, opportunities to participate in the NEPA review process. To date, this has included the opportunity to participate in FERC's public scoping meetings to identify concerns and issues that should be covered in the EIS, as well as the opportunity to submit written comments about the Projects to FERC. Interested parties will also be invited to comment on the draft EIS either electronically, in writing,

or at the draft EIS comment meetings, which will be held in the Projects area several weeks after the issuance of the draft EIS. All comments on the draft EIS will be responded to in the final EIS.

Based on published EPA guidance concerning environmental justice reviews (1998), we used a three-step approach to conduct our review. These steps are:

1. Determine the existence of minority and low-income populations.
2. Determine if resource impacts are high and adverse.
3. Determine if the impacts fall disproportionately on environmental justice populations.

In this review, a low-income population exists when the percentage of all persons living below the poverty level is more than the percentage for the state where the census tract is located. For the purposes of this review, a minority population exists when the:

1. total racial minorities in a U.S. Census Bureau-defined census tract (U.S. Census Bureau, 2013a) are more than 50 percent of the tract's population;
2. percentage of a racial minority in a census tract is "meaningfully greater"⁷ than in the comparison group;
3. total ethnic minorities in a census tract are more than 50 percent of tract's population; or
4. percentage of ethnic minorities in a census tract is meaningfully greater than in the comparison group.

Racial and ethnic minorities include: African American/Black, Native American or Alaska Native, Asian, Native Hawaiian and Other Pacific Islander, two or more races, and other races, as well as the Hispanic or Latino ethnicity.

The tables in appendices L-3 to L-5 provide an overview of the racial and economic characteristics of the population in the census tracts within a 1-mile radius of NGT and TEAL Projects facilities. In Ohio, minorities comprise 17.1 percent of the total population. The percentage of minorities in the Ohio census tracts that would be crossed by NGT Project facilities ranges from 0.9 to 36.1 percent. In 1 of the 64 census tracts, the minority population is meaningfully greater than that of the state. In Michigan, minorities comprise 20.7 percent of the total population. The percentage of minorities in the Michigan census tracts that would be crossed by NGT Project facilities ranges from 0.0 to 77.6 percent. In 12 of the 28 census tracts, the minority population is meaningfully greater than that of the state. No census tract within 1 mile of TEAL Project facilities have minority populations that meet the thresholds discussed in this section.

As stated previously, for the purpose of this analysis, a low-income population exists when the percentage of all persons living below the poverty level is greater than the percentage for the state where the census tract is located. In Ohio, 15.8 percent of all persons live below the poverty level. Four (4) of the 64 census tracts in Ohio within a 1-mile radius of NGT Project facilities have a higher percentage of persons living below the poverty level when compared to the state. In Michigan, 16.8 percent of all persons live below the poverty level. Eight (8) of the 28 census tracts in Michigan within a 1-mile radius of NGT Project facilities have a higher percentage of persons living below poverty-level when compared to the

⁷ "Meaningfully greater" is defined in this analysis as minority or ethnic populations that are at least 10 percentage points more than in the comparison group, which was the population of the county where the census tract was located.

state. Two census tracts in Ohio within 1 mile of TEAL Project facilities have a higher percentage of persons living below poverty-level when compared to the state.

Section 4.12 describes the localized risks to public safety that could result from a pipeline failure and describes how applicable safety regulations and standards would minimize the potential for these risks. Because the Projects would generally traverse rural areas, the number of persons who would be at risk of injury due to a pipeline failure would be low, and there is no evidence that such risks would be disproportionately borne by any racial, ethnic, or socioeconomic group.

NEXUS and Texas Eastern would implement a series of measures that would minimize potential impacts on the nearby communities, including environmental justice communities located near Project facilities. For instance, NEXUS and Texas Eastern propose to employ proven construction-related practices to control fugitive dust, such as application of water or other commercially available dust control agents on unpaved areas subject to frequent vehicle traffic. Similarly, noise control measures would be implemented by NEXUS and Texas Eastern during construction and operation of the Projects. Additionally, NEXUS and Texas Eastern would ensure that the noise attributable to the compressor stations would be less than 55 dBA L_{dn} at nearby NSAs, and the increase in the overall noise due to the new stations would be well below the threshold considered perceptible to the human ear.

Based on the estimated emissions from operation of the proposed Projects facilities and our review of NEXUS' and Texas Eastern's modeling analysis, we have determined that the Projects would comply with NAAQS, which are protective of human health, including children, the elderly, and sensitive populations (see section 4.12.1.1). The Projects facilities would also be designed, constructed, operated, and maintained in accordance with or to exceed PHMSA's minimum federal safety standards in 49 CFR 192. These regulations, which are intended to protect the public and to prevent natural gas facility accidents and failures, apply to all areas along the proposed pipeline routes regardless of the presence or absence of minority or low income populations.

The impacts on the natural and human environment from constructing and operating the NGT and TEAL Projects are identified and discussed throughout the environmental analysis section of this document. As discussed throughout this EIS, potentially adverse environmental effects associated with the NGT and TEAL Projects would be minimized and/or mitigated, as applicable, and are not characterized as high and adverse. Although the racial and economic composition of the counties and census tracts that would be crossed by Projects facilities have racial, ethnic, and economic deviations from state-level statistics, there is no evidence that the Projects would cause a disproportionate share of high and adverse environmental or socioeconomic impacts on any racial, ethnic, or socioeconomic group.

Construction of the Projects would result in minor positive impacts on the local economy due to increases in payroll taxes, purchases made by the workforce, and expenses associated with the acquisition of material goods and equipment. Operation of the Projects would also have a minor to moderate positive effect on the counties and local communities due to the increase to property taxes that would be collected.

4.11 CULTURAL RESOURCES

Section 106 of the NHPA, as amended, requires the FERC to take into account the effects of its undertakings on properties listed or eligible for listing on the NRHP and to afford the Advisory Council on Historic Preservation (ACHP) an opportunity to comment on the undertaking. NEXUS and Texas Eastern, as non-federal parties, are assisting the FERC in meeting our obligations under Section 106 by preparing the necessary information, analyses, and recommendations, as allowed by the ACHP's regulations for implementing Section 106 at 36 CFR 800.2(a)(3).

4.11.1 Cultural Resources Surveys

4.11.1.1 NGT Project

NEXUS identified the archaeological area of potential effect (APE) for direct project effects as the right-of-way for construction of the pipeline and the footprint of off-corridor facilities and extra workspaces. To ensure full coverage of the APE, NEXUS surveyed a 300-foot-wide corridor with expansions of the corridor as needed for crossing waterbodies or manmade features. NEXUS surveyed a 50-foot-wide corridor centered on proposed access roads and the entire footprint of compressor stations and ancillary facilities. The APE for indirect project effects includes the APE for direct effects, plus those properties immediately adjacent to the pipeline corridor, off-corridor facilities, and access roads. NEXUS has completed Phase I cultural resources surveys of 97 percent of the archaeological APE in Michigan and 94 percent of the archaeological APE in Ohio. NEXUS would survey the remaining mainline route and ancillary facilities and submit the results of surveys in future survey reports.

The APE for historic architectural properties consists of the 300-foot-wide study corridor, plus any areas where changes to the landscape (through removal of vegetation or modifications of surface topography, for example) lie within view of a historic resource, which is defined as any building or structure at least 50 years of age. Viewsheds to and from the NGT Project corridor(s) were terminated where vegetation and/or topography obstructed lines-of-sight, up to 0.8 kilometer (0.5 mile) on each side of the study corridor. The architectural APE also includes a distance of up to 0.8 kilometer (0.5 mile) surrounding the proposed aboveground facilities, including the compressor station and M&R station sites, MLVs, access roads, and proposed communication towers. NEXUS has completed 100 percent of the surveys of the historic architectural properties APEs in Michigan and Ohio.

NEXUS submitted a Phase I Cultural Resources Survey report covering both archaeological resources and historic architectural properties for Michigan to the FERC and Michigan State Historic Preservation Office (SHPO). Subsequently, NEXUS submitted two Addendum Phase I reports to the FERC and the Michigan SHPO. NEXUS submitted a Phase I Archaeological Survey report and an Historic Architectural Survey report for Ohio to the FERC and the Ohio SHPO. Subsequently, NEXUS submitted two Addendum Phase I reports and a research design for Phase II testing of six sites to the FERC and the Ohio SHPO.

Michigan Archaeological Resources

Six cultural resources were newly identified during the archaeological surveys in Michigan, including three associated with the pre-contact period (20WA478, 20WA479, and 20WA481) and three associated with the post-contact period (20LE392, 20LE394, and 20WA480). Site 20WA480 is associated with the 1930-1940s Camp Willow Run and the Martha and Mary Chapel developed by Henry Ford. The area was converted for use during World War II as the 3509th Army Airbase. Avoidance or additional evaluation testing of this site was recommended in order to assess its NRHP-eligibility. NEXUS has not yet indicated whether it would avoid or test the site. The remaining five sites have been recommended as not eligible for the NRHP, and no further work was recommended. The Michigan SHPO, in a letter dated April 29, 2016, concurred with the recommendations for 20WA478, 20WA479, 20LE392, and 20WA480. NEXUS has not yet filed the Michigan SHPO's comments for 20LE394 and 20WA481.

One previously recorded pre-contact site, 20LE258, was located within the mainline route corridor; however, survey of the site area did not recover evidence of that the site extended into the Project area. No additional work was recommended. NEXUS has not yet filed the Michigan SHPO's comments on the archaeological aspects of the Addendum II report.

Michigan Historic Architectural Properties

A total of 66 historic architectural properties and 1 cemetery were identified during the architectural survey in Michigan. Five additional resources were identified prior to a realignment of the pipeline survey corridor that resulted in removal of these properties from the APE; as such, they were not assessed.

Sixty-four of the historic architectural properties identified were recommended as not eligible for the NRHP, and no additional evaluation was recommended. Of these, CAN-070 represents a saddle dam associated with archaeological site 20WA480, discussed above; the NGT Project would avoid the dam. The remaining 63 historic architectural properties represent 1 cemetery, 22 farmsteads, 33 residences or residential complexes, 2 silos, 3 commercial/industrial properties, and 2 barns. Though recommended as not eligible for the NRHP, fencing of the construction workspace was recommended as an additional protective measure for the cemetery. NEXUS has not yet confirmed it would fence the cemetery. Three historic architectural properties were recommended as eligible for the NRHP.

The Willow Run Tri-Level Grade Separation Historic District (CAN-071), listed on the NRHP, encompasses the Willow Run Expressway that was built to provide direct access to the Willow Run airport and now razed industrial complex (associated with newly identified site 20WA480). Two discontinuous interchanges include tri-level grade separation structures that allow three layers of traffic over and under U.S. Highway 12. The eastern tri-level bridge interchange is between 100 and 270 feet east of the NGT Project survey corridor, and thus would be avoided. In addition, NEXUS proposes to utilize the HDD technique to cross U.S. Highway 12. The western tri-level bridge interchange is over 700 feet west of the survey corridor and was therefore not surveyed or assessed. In its April 29, 2016 letter, the Michigan SHPO did not specifically address this property but recommended avoidance or additional evaluation testing of the associated archaeological site 20WA480.

The remaining two historic architectural properties (CAN-022 and CAN-026) were recommended as eligible for the NRHP. Both properties were characterized as farmstead complexes dating from the turn of the 19th century. The NGT Project centerline is 460 feet east of CAN-022 and 475 feet southwest (due to a project alignment modification) of CAN-026 within open agricultural fields; as such, both properties would be avoided. In addition, due to the alignment modification, NEXUS no longer plans to cross the row of trees northwest of the CAN-026 building complex. The Michigan SHPO, in its letter dated April 29, 2016, concurred that the CAN-022 farmstead and the main residence at CAN-026 were eligible for listing on the NRHP; however, the Michigan SHPO disagreed that the remaining farm buildings associated with CAN-026 were eligible. NEXUS has not yet submitted an effects assessment for these properties.

In a letter dated October 28, 2015, the Washtenaw County Office of Community and Economic Development responded to our NOI. They confirmed that the NGT Project does not cross any designated NRHP-eligible or state-listed properties or historic districts within Washtenaw County. However, they requested additional consideration of three properties on Tuttle Hill Road and Judd Road that were adjacent to the NGT Project corridor. NEXUS' historic architectural properties survey reviewed each property and its proximity to the NGT Project APE. All three properties are situated outside of the architectural APE for the pipeline corridor and the viewsheds of each property are obstructed by either trees or distance; as a result, these properties were not further assessed for eligibility for the NRHP. In addition, NEXUS contacted the Washtenaw County Office of Community and Economic Development requesting information about any historic structures, sacred sites, archaeological sites, or other areas of sensitivity. NEXUS has not received a response.

Ohio Archaeological Resources

Archaeological surveys in Ohio resulted in the identification of 203 archaeological resources: 157 pre-contact archaeological sites or isolated finds; 31 post-contact archaeological sites (including one site identified by two broken headstones [33ER586]) or isolated finds; and 15 pre- and post-contact archaeological sites or isolated finds. NEXUS recommended 10 archaeological sites in Ohio as potentially eligible for the NRHP; 190 of the archaeological sites or isolated finds as not eligible for the NRHP; and 3 resources (33ME416, 33SU614, and 33SU621) have not been assessed for NRHP-eligibility as they extend into abutting parcels where landowners have denied survey permission. Site 33ER586, associated with the Squire family, was identified within the mainline route study corridor; however, it is not located within the permanent easement or construction workspace and would be avoided and preserved in place.

Of the ten archaeological sites in Ohio recommended as potentially eligible for the NRHP, seven sites (33SA618, 33SA626, 33SA627, 33ST766, 33ST1095, 33CO975, and 33CO976) have been avoided through route modifications or restricting workspace and would be preserved in place. The Ohio SHPO, in a letter dated September 2, 2016, concurred that no further work would be needed at these sites. Mainline construction would avoid site 33ER600 by utilizing HDD beneath the adjacent Huron River. NEXUS indicated that two sites (33ER613 and 33SU617) could not be avoided by the NGT Project and Phase II testing and evaluation was recommended. NEXUS has submitted a research design plan for conducting Phase II investigations at 33ER613 and 33SU617; the Ohio SHPO provided concurrence with this plan on September 16, 2016.

In a letter dated February 1, 2016, the Ohio SHPO commented on the Phase I Archaeological Survey report and concurred with the majority of eligibility and further work recommendations, but recommended Phase II testing and evaluation of two additional sites, 33ER609 and 33LN325, as well as a re-assessment of NRHP-eligibility and recommendations for 12 sites (33CO971, 33ER621, 33FU193, 33FU198, 33FU204, 33FU207, 33LN316, 33ME402, 33SA63, 33SA405, 33SA622, and 33ST1096). NEXUS provided documentation that addressed the remaining Ohio SHPO comments on September 23, 2016; comments on the documentation have not yet been received from the Ohio SHPO. The Ohio SHPO also requested avoidance plans and additional information for sites 33ER608, 33ER610, and 33ER612. NEXUS's Addendum I report indicated that 33ER608 has been avoided by route changes; the Ohio SHPO concurred on September 2, 2016. NEXUS has submitted a research design plan for conducting Phase II investigations at 33ER609, 33ER610, 33ER612, and 33LN325; the Ohio SHPO provided comments on, and agreed with, this plan on September 16, 2016. Ohio SHPO comments have not been received for NEXUS's Addendum II report.

During the scoping period, we received comments related to known archaeological sites and cultural resources that may be affected by the NGT Project. Specifically, commenters were concerned about several locations in Ohio with unique resources that may be affected by the NGT Project, including:

- NRHP-listed Dodge Site (33WO09/NRHP 87000693);
- Roche De Boeuf and the Interurban Bridge;
- Fallen Timber Battlefield;
- Missionary Island; and
- the City of Green's Ariss Park area.

The NRHP-listed Dodge Site is located approximately 0.3 mile north of the NGT Project area; Roche de Boeuf and the Interurban Bridge are approximately 0.4 mile north of the NGT Project Mainline Route; and the Fallen Timbers Battlefield is located approximately 5.5 miles from the Waterville Compressor Station and 4.9 miles north of the location where the NGT Project crosses the Maumee River. Neither the NGT Project's Mainline Route nor its proposed ancillary facilities cross the Dodge Site, Roche De Boeuf, or the Fallen Timber Battlefield properties. As such, these resources would not be directly or indirectly impacted by construction of the NGT Project. NEXUS proposes to utilize the HDD technique to cross the Maumee River and Missionary Island. Utilization of the HDD technique would avoid any direct or indirect impacts on the surface of Missionary Island and its unique resources.

We received several comments regarding the unique resources within the City of Green's Ariss Park area (i.e., archaeological sites and areas with religious significance to Native Americans, and old growth forests within the park area and near the Mucklow properties). Section 4.9.5.2 discusses impacts associated with tree clearing. At this time, NEXUS has not conducted an archaeological survey of this property. If cultural resources are identified as a result of the archaeological survey, NEXUS would avoid or mitigate impacts on any significant cultural resources. In the absence of more specific information, it is not possible to determine what culturally significant resources are being referenced by commenters.

A commenter indicated a potential 1870- to 1890-era petroleum exploration and extraction site may be located on private farmland that would be crossed by the NGT Project. At this time, NEXUS has not conducted an archaeological survey of this property because landowner permission for survey is pending; however, the Ohio SHPO has no record of an archaeological site being recorded on the property. If cultural resources are identified as a result of the archaeological survey, NEXUS would avoid or mitigate impacts on any significant cultural resources.

A commenter expressed concern regarding potential impacts on six archaeological sites located on private property in Fulton County, Ohio (33FU189-33FU194) that were previously excavated by the University of Toledo in conjunction with the Fulton County Historical Society. Archaeological surveys conducted by NEXUS relocated site 33FU193 within the APE and recommended the site as not eligible for the NRHP. The Ohio SHPO, in its letter of February 1, 2016, requested additional discussion of the site's significance and integrity. NEXUS submitted documentation that addressed the Ohio SHPO's comments on September 23, 2016 and indicated the site would be avoided; the Ohio SHPO has not yet provided a response. The remaining sites are located outside of the APE and, as such, would not be directly or indirectly affected by the NGT Project.

Ohio Historic Architectural Properties

NEXUS identified 147 historic architectural properties within the NGT Project study areas in Ohio. Of these 147 historic architectural properties, 2 are NRHP-listed historic districts; 3 properties have been determined as eligible for the NRHP; and 37 properties (including 2 cemeteries) have been recommended as potentially eligible for the NRHP. One resource (STA0381408) could not be assessed for NRHP-eligibility due to lack of access to the property. The remaining 104 historic architectural resources identified represent 49 farmstead complexes or outbuildings, 50 private residences, 2 cemeteries, 1 school/church, 1 abandoned railroad, and a segment of Neapolis-Waterville Road. All were recommended as not eligible for the NRHP, and no further work is recommended.

The Valley Railroad Historic District (NR85001123) and the John Isham Farmstead Historic District (NR92001159) are currently listed on the NRHP. The Valley Railroad Historic District represents an active railroad segment of the Valley Railway, currently operated by Conrail, whose NRHP-listed boundaries are currently over 11 miles northwest of the NGT Project pipeline crossing. While the NGT Project would have no direct or indirect impacts on the District itself, NEXUS proposes to use the boring

method to install the proposed pipeline below a rail segment that is recommended as eligible for the NRHP for its association with the District. The John Isham Farmstead Historic District was listed for its significance in the area of exploration and settlement by New England settlers in the 19th century. NEXUS proposes to install the pipeline via open trench and HDD. All activity would be within an active agricultural field, with no proposed impacts on the contributing wooded lots surrounding the farmstead. Therefore, it was recommended that neither of these properties would be adversely affected by the NGT Project.

Two properties have been previously determined as eligible for, but not currently listed on, the NRHP. These include the St. Joseph School (STA0019208) and Archner Farmhouse (SAN0007402). The St. Joseph School and the associated parish house (STA0380808) that was recommended as potentially eligible contribute to the history of early French Catholic settlement in Maximo, Ohio. The Archner Farmhouse is significant for its Pre-Classic I-house type. As no permanent effects to the viewshed would occur because the pipeline would be installed underground within cultivated fields, it was recommended that none of these structures would be adversely affected by the NGT Project.

Three farmstead complexes (STA0380908, STA0380105, and MED0068812), one barn (FUL0037512), and the Mountain of Faith Hope Church (SUM0370119) have been recommended as eligible or potentially eligible for the NRHP. Because no permanent effects to the viewshed would occur as the pipeline would be installed underground within cultivated fields that are visually obstructed from the structures by distance or vegetative screens, it was recommended that none of these structures would be adversely affected by the NGT Project. An additional potentially eligible farmstead (ERI0264607) would be located along a proposed access road. Because the road is existing, no adverse effect was recommended.

A total of 15 active historic railroad segments have been identified by NEXUS and recommended as potentially eligible for the NRHP. These segments represent the Baltimore and Ohio Railroad (WOO0092912), Akron Barberton Cluster Railway (MED0067918), Conrail Railroad (COL0099501 and STA0381211), CSX Railroad (LOR0231514, SUM0370619, WOO0093118, and WOO0094010), Northern Ohio & Western Railroad (SAN0059502), Norfolk Southern Railroad (ERI0265302, ERI0265507, FUL0044710, and SAN0059707), and the Wheeling & Lake Erie Railway (MED0067710 and STA0381111). NEXUS plans to construct the pipeline by boring or HDD beneath these active railroad segments. Therefore, it was recommended that there would be no adverse effect to these railroad resources.

Twelve aboveground resources characterized as inactive or abandoned railroads have been recommended as potentially eligible for the NRHP. Of these, four inactive railroad segments (ERI0265406, LUC0470615, SAN0059807, and WOO0093910) and three abandoned railroads that have been repurposed as recreational trails (STA0381308 HEN0065003, and SAN0059607) would be crossed by the open-cut trenching method. Each segment would be restored to its pre-existing condition and, if applicable, returned to operation as a recreational trail upon NGT Project completion. MED0067810 is characterized as both an active railroad line with a cut-off segment converted to a trail; NEXUS proposes to install the pipeline via HDD and open trench, respectively. The remaining four railroad segments would be avoided during construction by directionally boring under each property. Of these, ERI0265607 and LOR0231413 are inactive rail lines, while LOR0231320 and FUL0044109 represent railroad segments that have been converted to recreational trails. Therefore, it was recommended that there would be no adverse effect for these abandoned railroad or rail/trail segments.

Two additional transportation-related properties would be crossed by the NGT Project. The Ohio and Erie Canal and Towpath (SUM0249119) has been determined eligible for, but not currently listed on, the NRHP, while the Milan Canal and Towpath (ERI0264807) has been recommended as potentially eligible for the NRHP. NEXUS plans to construct the pipeline by boring or HDD beneath these features. Therefore, it was recommended there would be no adverse effect.

Four resources are historic/modern Euro-American cemeteries (STA0380205, STA0380608, MED0069010, and SUM0369619). Of these, the St. Joseph's Cemetery (STA0380608) and Spitzer Cemetery (MED0069010) are recommended as potentially eligible for the NRHP. All four would be avoided by the construction workspace. Due to the proximity of the pipeline corridor to each cemetery (from 60 to 460 feet, depending on the surrounding conditions), NEXUS would institute a buffer zone between the cemeteries and the construction workspace to prohibit inadvertent encroachment on these properties.

In its letter of February 1, 2016, the Ohio SHPO concurred with most of the recommendations and conclusions in the Historic Architectural Survey report, but requested additional information and assessment of 13 properties (STA0380908, STA0381408, STA0380105, STA0380505, ERI0265108, ERI0265008, ERI0264908, ERI0264607, SAN0007402, LUC0337318, MED0019710, NR75001383 [Abbott-Page House], and NR92001159 [John Isham Farmstead Historic District]). The SHPO also requested additional information regarding canal crossings and an avoidance plan for the identified cemeteries. NEXUS provided documentation addressing the SHPO's comments on September 23, 2016; the Ohio SHPO has not yet provided a response. NEXUS has not yet filed the Ohio SHPO's comments on the Addendum II report.

During the scoping period, we received comments related to known historic architectural resources that may be affected by the NGT Project. Specifically, commenters were concerned about several locations in Ohio with unique resources that may be affected by the NGT Project:

- Dunlap Farmstead (33WO41);
- Abbott-Page House (NR75001383) and Fries' Landing; and
- Overmyer-Waggoner-Roush Farm Historic District (Creek Bend Farm Park) (NR83002055).

Neither NGT Project's Mainline Route nor its proposed ancillary facilities cross the Dunlap Farmstead property; therefore, this resource would not be impacted by construction of the NGT Project.

The NRHP-listed Abbott-Page House is located approximately 330 feet south of the proposed permanent right-of-way for the NGT Project. The Abbott-Page House is currently under NRHP review for an amendment to expand the site from a listed property to a historic district. Fries' Landing was located on the Page property along the Huron River in the 1870s and was the center of shipbuilding and shipping local goods to markets via the Milan Canal. In this area, NEXUS proposes to install the NGT Project pipeline via conventional bore that would extend from the west side of Mudbrook Road to the east side of the Huron River. The bore would extend below potential archaeological deposits associated with Fries' Landing and would minimize viewshed impacts on the Abbott-Page House. The survey determined that viewshed from the pipeline to the Abbott-Page House is obstructed by mature trees, dense vegetation, and two existing overhead transmission line corridors situated between the proposed pipeline and the resource, therefore the property was identified as outside of the APE (see section 4.11.1.1). NEXUS submitted a second addendum report to the Ohio SHPO on October 10, 2016 reporting no archaeological sites were identified during survey of this property. NEXUS has not provided the Ohio SHPO's comments on the addendum report.

The commenter/owner who was concerned about the Abbott-Page House also requested consulting party status under Section 106 of the NHPA. As noted above, the Abbot-Page house would be avoided and no archaeological sites would be impacted. In accordance with our project review process, we solicit comments from the public, and consider all comments regarding cultural resources in our analysis, regardless of the party's status under the NHPA. Therefore, we believe our existing procedures provide the

commenter with sufficient opportunities to both comment and provide cultural resources information for the project without consulting party status.

As currently proposed, the permanent right-of-way of the NGT Project's Mainline Route is located approximately 430 feet south of the NRHP-listed Overmyer-Waggoner-Roush Farm Historic District (also known as the Creek Bend Farm Park), and the main house and associated outbuildings and the Nature Center are located approximately 0.7 mile north of the proposed right-of-way. NEXUS proposes to cross Muddy Creek using the open-cut method during construction and would reduce the width of the construction workspace to minimize impacts on the riparian corridor. Following completion of construction, the crossing of Muddy Creek would be restored to preconstruction conditions in accordance with NEXUS' *E&SCP*.

During the scoping period, we received comments that there may be an abandoned graveyard on a parcel impacted by the NGT Project. The lot referenced by the commenter is located in Middletown Township, Wood County, Ohio and is approximately 2.25 miles north of the NGT Project APE. As such, there would be no impacts by the NGT Project to potential burials on this property.

4.11.1.2 TEAL Project

Texas Eastern identified the APE for direct effects on cultural resources as a 300-foot-wide survey corridor for the pipeline with expansions of the corridor as needed for crossing waterbodies or manmade features, a 50-foot-wide corridor for access roads, and the actual footprint of all aboveground facilities. The APE for indirect project effects includes the APE for direct effects, plus those properties immediately adjacent to the pipeline corridor, off-corridor facilities, and access roads.

Following background research, Texas Eastern conducted a pedestrian walkover and systematic shovel testing for those areas without sufficient surface visibility and the potential for subsurface cultural material. Texas Eastern followed Phase I cultural resources survey methods mandated in the Ohio state guidelines using a standard 15-meter survey transect, conducting pedestrian survey for those areas with greater than 50 percent ground visibility, and systematic shovel testing in areas with less than 50 percent ground visibility. Texas Eastern has completed surveys for 100 percent of the archaeological APE in Ohio.

The APE for effects on architectural resources was defined as the APE for direct effects, plus areas where land use may change and any locations from which the TEAL Project may be visible up to 0.5 mile surrounding the aboveground facility. Texas Eastern has completed 100 percent of the surveys for the architectural properties APE.

Texas Eastern submitted a Phase I Cultural Resource Survey report covering both archaeological resources and architectural properties to the FERC and Ohio SHPO. Subsequently, Texas Eastern submitted a revised Phase I report to the FERC and the Ohio SHPO.

Ohio Archaeological Resources

Two pre-contact isolated finds (33CO965 and 33CO966) were identified during the archaeological surveys for the TEAL Project, both near the Salineville Compressor Station. No other archaeological resources were identified at any of the other TEAL Project components. Both isolated finds have been recommended as not eligible for the NRHP, and no further work was recommended. The Ohio SHPO, in an email dated August 11, 2016, requested additional information on the identified structures. Texas Eastern submitted a revised Phase I report that addressed the Ohio SHPO's comments. On September 29, 2016 the Ohio SHPO concurred with all recommendations, and that there would be no effect to historic properties. We agree.

Ohio Historic Architectural Properties

Texas Eastern identified 16 historic architectural properties within the TEAL Project study area. The 16 identified properties are characterized as previously recorded residences (BEL0165703, MOE0027104, MOE0048203, and MOE0050004); previously recorded farmsteads (JEF0097615, JEF0097715, MOE0028804, MOE0047204, MOE0049704, MOE0049904, and MOE0050104); and newly recorded private residences (COL0099312, COL0099612, COL0099712, MOE0053804, and MOE0053904). All 16 properties were recommended as not eligible for the NRHP, and no further work was recommended. The Ohio SHPO, in an email dated August 11, 2016, requested additional information on the identified structures. Texas Eastern submitted a revised Phase I report that addressed the SHPO's comments. On September 29, 2016, the Ohio SHPO concurred with all recommendations, and that there would be no effect to historic properties. We agree.

4.11.2 Native American Consultations

4.11.2.1 NGT Project

On April 8, 2015 and between February 22 and 24, 2016, we sent our NOI and follow-up letters, respectively, to the 42 federally recognized Native American tribes identified on table 4.11.2-1. The Leech Lake Band of the Minnesota Chippewa Tribe, Saginaw Chippewa Indian Tribe of Michigan, and Seneca Nation of Indians responded that there are no known sites of religious or cultural importance in these areas, or had no issues; however, they requested notification if unanticipated discoveries are encountered during construction. The Bois Forte Band of the Minnesota Chippewa Tribe indicated they were not interested in consulting on the NGT Project. No further responses have been received to date.

In addition to our contacts with the tribes, NEXUS contacted the same 42 tribes to provide them an opportunity to identify any concerns related to properties of traditional religious or cultural significance that may be affected by the NGT Project. A summary of correspondence with the tribes is provided in table 4.11.2-1.

Of the 42 contacted tribes, the Bay Mills Indian Community, the Delaware Tribe of Indians, Lac Vieux Desert Band of Lake Superior Chippewa Indians of Wisconsin, Nottawaseppi Huron Band of the Potawatomi, and Pokagon Band of Potawatomi Indians requested additional information including a copy of the technical report to enable an evaluation of the NGT Project and its potential impacts on properties of traditional and cultural significance. NEXUS provided additional NGT Project information to the Pokagon Band of Potawatomi Indians on March 3, 2015, and to the Chippewa-Cree Indians of the Rocky Boy's Reservation on February 2, 2015. The Chippewa-Cree Tribe responded with a request to be consulted on the NGT Project due to the potential to affect properties of traditional and cultural significance. NEXUS provided the Phase I report to the Chippewa-Cree Indians of the Rocky Boy's Reservation, Delaware Tribe of Indians, Nottawaseppi Huron Band of the Potawatomi, and Pokagon Band of Potawatomi Indians on February 8, 2016. The Delaware Nation, Miami Tribe of Oklahoma, and Peoria Tribe of Indians of Oklahoma responded that no known sites of religious or cultural importance are located in the NGT Project area; however, they requested notification if unanticipated discoveries are encountered during construction. The White Earth Band of Minnesota Chippewa Tribe responded that no known sites of religious or cultural importance to their tribe are located in the NGT Project area. NEXUS provided the Ohio Addendum I report and the Ohio SHPO comments to the Chippewa-Cree Indians of the Rocky Boy's Reservation, Delaware Tribe of Indians, Nottawaseppi Huron Band of the Potawatomi, and Pokagon Band of Potawatomi Indians on August 19, 2016. The Delaware Tribe of Indians requested that the archaeological site be avoided or tested if it could not be avoided and requested to review the results of that work. Nottawaseppi Huron Band of the Potawatomi Oklahoma responded that no known sites of religious or cultural importance are located in the NGT Project area. Both tribes requested notification if unanticipated

discoveries are encountered during construction. No response has been received from the 29 other Native American tribes.

TABLE 4.11.2-1

Consultation with Federally Recognized Native American Tribes for the NGT Project

Tribe Name	Date(s) Correspondence Sent	Date(s) Response Received
Absentee-Shawnee Tribe of Oklahoma	10/28/2014; 4/8/2015; 2/22/2016	No response received to date.
Bad River Band of the Lake Superior Tribe of Chippewa Indians of the Bad River Reservation	12/11/2014; 4/8/2015; 2/22/2016	No response received to date.
Bay Mills Indian Community	12/11/2014; 4/8/2015; 2/22/2016	2/25/2015; 3/12/2015
Bois Forte Band (Nett Lake) of the Minnesota Chippewa Tribe	12/11/2014; 4/8/2015; 2/22/2016	2/29/2016
Chippewa-Cree Indians of the Rocky Boy's Reservation	12/11/2014; 4/8/2015; 2/8/2016; 2/22/2016; 8/19/2016	2/2/2015; 3/25/2015
Citizen Potawatomi Nation	10/28/2014; 4/8/2015; 2/22/2016	No response received to date.
Delaware Nation	10/28/2014; 1/27/2015; 4/8/2015; 2/22/2016	1/6/2015; 2/10/2015; 2/11/2015
Delaware Tribe of Indians	10/28/2014; 11/6/2014; 4/8/2015; 2/8/2016; 2/22/2016; 8/19/2016	11/17/2014; 1/28/2015; 3/16/16; 8/30/16
Eastern Shawnee Tribe of Oklahoma	10/28/2014; 4/8/2015; 2/22/2016	No response received to date.
Fond du Lac Band of the Minnesota Chippewa Tribe	12/11/2014; 4/8/2015; 2/22/2016	No response received to date.
Forest County Potawatomi	10/28/2014; 4/8/2015; 2/22/2016	No response received to date.
Grand Portage Band of the Minnesota Chippewa Tribe	12/11/2014; 4/8/2015; 2/22/2016	No response received to date.
Grand Traverse Band of Ottawa and Chippewa Indians	12/11/2014; 2/4/2015; 4/8/2015; 2/22/2016	No response received to date.
Hannahville Indian Community	10/28/2014; 4/8/2015; 2/22/2016	No response received to date.
Keweenaw Bay Indian Community	12/11/2014; 4/8/2015; 2/22/2016	No response received to date.
Lac Courte Oreilles Band of Lake Superior Chippewa Indians of Wisconsin	12/11/2014; 4/8/2015; 2/23/2016	No response received to date.
Lac du Flambeau Band of Lake Superior Chippewa Indians of the Lac du Flambeau Reservation of Wisconsin	12/11/2014; 4/8/2015; 2/23/2016	No response received to date.
Lac Vieux Desert Band of Lake Superior Chippewa Indians	12/11/2014; 4/8/2015; 2/23/2016	12/29/2014
Leech Lake Band of the Minnesota Chippewa Tribe	12/11/2014; 4/8/2015; 2/23/2016	2/13/2015
Match-e-be-nash-she-wish Band of Potawatomi Indians of Michigan	12/11/2014; 4/8/2015; 2/23/2016	No response received to date.
Miami Tribe of Oklahoma	10/28/2014; 4/8/2015; 2/23/2016	3/17/2016
Mille Lacs Band of the Minnesota Chippewa Tribe	12/11/2014; 4/8/2015; 2/23/2016	No response received to date.
Minnesota Chippewa Tribe	12/11/2014; 4/8/2015; 2/23/2016	No response received to date.
Nottawaseppi Huron Band of the Potawatomi	12/11/2014; 12/16/2014; 4/8/2015; 2/8/2016; 2/23/2016; 8/19/2016	12/4/2014; 9/12/2016
Ottawa Tribe of Oklahoma	10/28/2014; 4/8/2015; 2/23/2016	No response received to date.
Peoria Tribe of Indians of Oklahoma	10/28/2014; 4/8/2015; 2/23/2016	11/7/2014
Pokagon Band of Potawatomi Indians	10/28/2014; 3/3/2015; 4/8/2015; 2/8/2016; 2/23/2016; 8/19/2016	11/26/2014; 2/25/2015; 2/26/2015; 3/2/2015
Prairie Band of Potawatomi Nation	10/28/2014; 4/8/2015; 2/22/2016	No response received to date.
Quechan Tribe of the Fort Yuma Indian Reservation	12/11/2014; 4/8/2015; 2/23/2016	No response received to date.
Red Cliff Band of Lake Superior Chippewa Indians of Wisconsin	12/11/2014; 4/8/2015; 2/23/2016	No response received to date.
Red Lake Band of Chippewa Indians	12/11/2014; 4/8/2015; 2/23/2016	No response received to date.
Saginaw Chippewa Indian Tribe of Michigan	10/28/2014; 12/11/2014; 4/8/2015; 2/24/2016	3/3/2015
Sault Ste. Marie Tribe of Chippewa Indians of Michigan	12/11/2014; 4/8/2015; 2/24/2016	No response received to date.

TABLE 4.11.2-1 (cont'd)

Consultation with Federally Recognized Native American Tribes for the NGT Project		
Tribe Name	Date(s) Correspondence Sent	Date(s) Response Received
Seneca-Cayuga Tribe of Oklahoma	10/28/2014; 4/8/2015; 2/24/2016	No response received to date.
Seneca Nation of Indians	10/28/2014; 11/12/2014; 4/8/2015; 2/24/2016	3/8/2016
Shawnee Tribe	10/28/2014; 4/8/2015; 2/24/2016	No response received to date.
Sokaogon Chippewa Community	12/11/2014; 4/8/2015; 2/24/2016	No response received to date.
St. Croix Chippewa Indians of Wisconsin	12/11/2014; 4/8/2015; 2/24/2016	No response received to date.
Tonawanda Band of Seneca Indians of New York	10/28/2014; 4/8/2015; 2/24/2016	No response received to date.
Turtle Mountain Band of Chippewa Indians of North Dakota	12/11/2014; 4/8/2015; 2/24/2016	No response received to date.
White Earth Band of Minnesota Chippewa Tribe	12/11/2015; 4/8/2015; 2/24/2016	1/5/2015
Wyandotte Nation	10/28/2014; 4/8/2015; 2/24/2016	No response received to date.

4.11.2.2 TEAL Project

We sent our NOI for the TEAL Project to tribes in April 2015, and between February 22 and 24, 2016 we sent follow-up letters to the same 42 federally recognized tribes listed in table 4.11.2-1. The Bois Forte Band of the Minnesota Chippewa Tribe indicated they were not interested in consulting on the TEAL Project. No further responses have been received to date.

In addition to our contacts with the tribes, Texas Eastern provided information about the TEAL Project to eight federally recognized Native American tribes and offered an opportunity to identify traditional properties or provide comments about the TEAL Project. Tribes contacted included the Absentee-Shawnee Tribe of Oklahoma, Delaware Tribe of Indians, Delaware Nation, Eastern Shawnee Tribe of Oklahoma, Seneca-Cayuga Tribe of Oklahoma, Seneca Nation of Indians, Shawnee Tribe, and the Tonawanda Band of Seneca Indians of New York. The Delaware Tribe of Indians requested initiation of consultation on January 28, 2015, and they requested a copy of the technical report on February 20, 2015, to enable a reevaluation of the TEAL Project and its potential impacts on archaeological and human remains. The Phase I report was submitted to the tribe on February 8, 2016. No additional responses from Native American tribes have been received.

Table 4.11.2-2 provides the details regarding consultation with Native American tribes for the TEAL Project.

TABLE 4.11.2-2

Consultation with Federally Recognized Native American Tribes for the TEAL Project		
Tribe Name	Date(s) Correspondence Sent	Date(s) Responses Received
Absentee-Shawnee Tribe of Oklahoma	1/20/2015; 2/22/2016	No response received to date.
Delaware Nation	1/20/2015; 2/22/2016	No response received to date.
Delaware Tribe of Indians	1/20/2015; 2/8/2016; 2/22/2016	1/28/2015; 2/20/2015
Eastern Shawnee Tribe of Oklahoma	1/20/2015; 2/22/2016	No response received to date.
Seneca-Cayuga Tribe of Oklahoma	1/20/2015; 2/22/2016	No response received to date.
Seneca Nation of Indians	1/20/2015; 2/22/2016	No response received to date.
Shawnee Tribe	1/20/2015; 2/22/2016	No response received to date.
Tonawanda Band of Seneca Indians of New York	1/20/2015; 2/22/2016	No response received to date.

4.11.3 Unanticipated Discovery Plans

The applicants provided plans for unanticipated discoveries addressing measures that would be implemented in the event that cultural resources or human remains are encountered during construction, and providing for the notification of interested parties, including Native American tribes, in the event of any discovery. NEXUS submitted the *Procedures Guiding the Discovery of Unanticipated Cultural Resources and Human Remains* to the FERC and Michigan and Ohio SHPOs. We requested revisions to the plan, and NEXUS resubmitted a revised plan. Subsequently, the SHPOs have provided comments and each requested additional revisions to the plan; NEXUS has resubmitted a revised plan. The Ohio SHPO agreed with the plan in its September 16, 2016 letter. Texas Eastern submitted the *Procedures Guiding the Discovery of Unanticipated Cultural Resources and Human Remains* to the FERC and Ohio SHPO. We requested revisions to the plan, and Texas Eastern resubmitted a revised plan. The Ohio SHPO has not commented on the plan to date. We find the revised plans to be acceptable.

4.11.4 General Impacts and Mitigation

The TEAL project would have no effect on historic properties.

Construction and operation of the NGT Project could potentially affect historic properties (i.e., cultural resources listed on or eligible for the NRHP). These historic properties could include prehistoric or historic archaeological sites, districts, buildings, structures, and objects, as well as locations with traditional value to Native Americans or other groups. Direct effects could include destruction or damage to all, or a portion, of an historic property. Indirect effects could include the introduction of visual, atmospheric, or audible elements that affect the setting or character of an historic property.

If NRHP-eligible resources are identified that cannot be avoided, the applicants would prepare treatment plans. Implementation of a treatment plan would only occur after certification of the project(s) and after the FERC provides written notification to proceed.

Compliance with Section 106 of the NHPA has not been completed for the NGT Project. NEXUS has not completed cultural resources surveys and/or NRHP evaluations, and consultation with the SHPOs is not yet complete. To ensure that the FERC's responsibilities under the NHPA and its implementing regulations are met, **we recommend that:**

- **NEXUS should not begin implementation of any treatment plans/measures (including archaeological data recovery); construction of facilities; or use staging, storage, or temporary work areas and new or to-be-improved access roads until:**
 - a. **NEXUS files with the Secretary:**
 - i. **the Michigan SHPO's comments on the Michigan Addendum II report, and the Ohio SHPO's comments on the Ohio supplemental information dated September 23, 2016 and Addendum II report;**
 - ii. **all outstanding survey reports, special studies, evaluation reports, and avoidance/treatment plans; and**
 - iii. **comments on survey reports, special studies, evaluation reports, and avoidance/treatment plans from the Michigan and Ohio SHPOs, as applicable, as well as any comments from federally recognized Indian tribes;**

- b. the ACHP is afforded an opportunity to comment on the undertaking if historic properties would be adversely affected; and
- c. the FERC staff reviews and the Director of OEP approves all cultural resources reports and plans, and notifies NEXUS in writing that treatment plans/mitigation measures may be implemented and/or construction may proceed.

All material filed with the Commission that contains location, character, and ownership information about cultural resources must have the cover and any relevant pages therein clearly labeled in bold lettering “CONTAINS PRIVILEGED INFORMATION – DO NOT RELEASE.”

4.12 AIR QUALITY AND NOISE

4.12.1 Air Quality

Temporary air emissions would be generated during project construction, which would occur over a period of 2 years and across two states; however, most air emissions associated with the NGT and TEAL Projects would result from the long-term operation of the new and modified compressor stations. Construction and operation air emissions and mitigation measures are discussed in section 4.12.1.3.

4.12.1.1 Existing Air Quality

Regional Climate

The NGT and TEAL Projects would be constructed in the continental Midwest portion of the United States. This region has four distinct seasons, each of which can produce potentially dangerous storms. Large temperature and precipitation extremes are common in the region, although precipitation is generally distributed evenly throughout the year. The mean annual precipitation averages about 40 inches annually, with between 17 and 37 inches of snowfall. Average daily temperatures are generally lowest in January and highest in July. Summers are warm and humid, with temperatures in excess 90 °F, and tend to be the rainiest season. During winter months, the average temperatures range from 8 °F to 35 °F, with occurrences of temperatures below 0 °F. Snowstorms and blizzards occur during winter months and droughts, tornadoes, and thunderstorms are characteristic of the region during the other seasons (NOAA, 2016).

Ambient Air Quality Standards

Ambient air quality is protected by federal and state regulations. The EPA has established NAAQS to protect human health and welfare. The NAAQS include primary standards that are designed to protect human health, including the health of "sensitive" individuals such as children, the elderly, and those with chronic respiratory problems. The NAAQS also include secondary standards designed to protect public welfare, including visibility, vegetation, animal species, economic interests, and other concerns not related to human health.

Standards have been set for seven principal pollutants that are called “criteria pollutants.” These criteria pollutants are ground-level ozone, carbon monoxide (CO), nitrogen oxides (NO_x), sulfur dioxide (SO₂), fine particulate matter (inhalable particulate matter with an aerodynamic diameter less than or equal to 10 microns [PM₁₀] and less than or equal to 2.5 microns [PM_{2.5}]), and airborne lead (Pb). Ozone is not emitted into the atmosphere from an emissions source; it develops as a result of a chemical reaction between NO_x and VOCs in the presence of sunlight. Therefore, NO_x and VOCs are often referred to as ozone

precursors and are regulated to control the potential for ozone formation. The current NAAQS are listed on the EPA's website at www.epa.gov/criteria-air-pollutants/naaqs-table (EPA, 2015e).

Air quality control regions (AQCR) are areas established by the EPA and local agencies for air quality planning purposes, in which State Implementation Plans describe how the NAAQS would be achieved and maintained. The AQCRs are intra- and interstate regions such as large metropolitan areas where improvement of the air quality in one portion of the AQCR requires emission reductions throughout the AQCR. Each AQCR, or smaller portion within an AQCR (such as a county or multiple counties), is designated, based on compliance with the NAAQS, as attainment, unclassifiable, maintenance, or nonattainment, on a pollutant-by-pollutant basis. Areas in compliance, or below the NAAQS, are designated as attainment, while areas not in compliance, or above the NAAQS, are designated as nonattainment. Areas previously designated as nonattainment that have since demonstrated compliance with the NAAQS are designated as maintenance for that pollutant. Maintenance areas may be subject to more stringent regulatory requirements similar to nonattainment areas to ensure continued attainment of the NAAQS. Areas that lack sufficient data are considered unclassifiable and are treated as attainment areas.

The MDEQ and the OEPA have adopted the NAAQS. Counties designated as nonattainment and maintenance with the NAAQS are shown in table 4.12.1-1 (EPA, 2015f). All other counties are in attainment with the NAAQS. All counties affected by the TEAL Project are in attainment with the NAAQS.

The EPA now defines air pollution to include the mix of six long-lived and directly emitted greenhouse gases (GHG), finding that the presence of the following GHGs in the atmosphere may endanger public health and welfare through climate change: CO₂, methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. As with any fossil-fuel fired project or activity, the Projects would contribute GHG emissions. The principle GHGs that would be produced by the Projects are CO₂, CH₄, and N₂O. No fluorinated gases would be emitted by the Projects. GHG emissions are quantified and regulated in units of carbon dioxide equivalents (CO₂e). The CO₂e takes into account the global warming potential (GWP) of each GHG. The GWP is a ratio relative to CO₂ of a particular GHG's ability to absorb solar radiation as well its residence time within the atmosphere. Thus, CO₂ has a GWP of 1, CH₄ has a GWP of 25, and N₂O has a GWP of 298 (EPA, 2016)⁸. We received comments on the amount and impacts of GHG emission the Projects would contribute. In compliance with EPA's definition of air pollution to include GHGs, we have provided estimates of GHG emissions for construction and operation, as discussed throughout this section. Impacts from GHG emissions (i.e., climate change) are discussed in more detail in section 4.14.8.9.

⁸ These GWPs are based on a 100-year time period. We have selected their use over other published GWPs for other timeframes because these are the GWPs that the EPA has established for reporting of GHG emissions and air permitting requirements. This allows for a consistent comparison with these regulatory requirements.

TABLE 4.12.1-1

Attainment Status of NGT and TEAL Projects Counties				
Control Region	Facility	County	Nonattainment	Maintenance
OHIO				
Canton-Massillon, OH	NGT Mainline Route	Stark		PM _{2.5}
Cleveland-Akron-Lorain, OH	NGT Mainline Route	Summit	2008 Ozone	PM _{2.5}
	NGT Mainline Route	Medina		
	NGT Wadsworth Compressor Station Mainline Route	Lorain	2012 PM _{2.5} 2008 Ozone	
Wheeling, WV-OH	Colerain Compressor Station	Belmont		PM _{2.5}
MICHIGAN				
Detroit-Ann Arbor, MI	NGT Mainline Route	Monroe		PM _{2.5}
	NGT Mainline Route	Washtenaw		
	NGT NEXUS/Willow Run M&R Station			
	NGT Mainline Route	Wayne	2010 SO ₂ ^a	PM _{2.5} CO ^b
a	Wayne County, Michigan is in partial nonattainment with the 2010 SO ₂ standard. No portion of the mainline would go through the designated SO ₂ nonattainment area.			
b	Wayne County, Michigan is in partial maintenance with the CO standard. No portion of the mainline goes through the designated CO maintenance area.			

Air Quality Monitoring and Existing Air Quality

The majority of operational emissions from the Projects would result from the compressor stations. The EPA, state, and local agencies have established a network of ambient air quality monitoring stations to measure and track the background concentrations of criteria pollutants across the United States. The Lucas County Health Department requested monitoring and disclosure of existing concentrations of pollutants. Data were obtained from representative air quality monitoring stations to characterize the background air quality for each compressor station and are presented in tables 4.12.1-10 and 4.12.1-11 in combination with the Projects’ impact for comparison with the NAAQS.

4.12.1.2 Regulatory Requirements for Air Quality

New Source Review

New Source Review (NSR) is a pre-construction permitting program designed to protect air quality when air pollutant emissions are increased either through the modification of existing sources or through the construction of a new source of air pollution. In areas with good air quality, NSR ensures that the new emissions do not degrade the air quality, which is achieved through the implementation of the Prevention of Significant Deterioration (PSD) permitting program or state minor permit programs. In areas with poor air quality, Nonattainment NSR (NNSR) ensures that the new emissions do not inhibit progress toward cleaner air. In addition, NSR ensures that any large, new, or modified industrial source uses air pollution control technology. Air permitting of stationary sources has been delegated to each state. Based on the operating emissions presented in tables 4.12.1-4 through 4.12.1-9, an NSR permit would not be required for any of NEXUS’ or Texas Eastern’s compressor stations.

Commenters requested that all compressor stations associated with the NGT Project be considered a single source with respect to federal air quality permitting. Most states, including Michigan and Ohio, have been delegated authority by the EPA to implement federal air quality regulations. NEXUS and Texas Eastern submitted air quality applications to MDEQ and OEPA in accordance with federal and state

requirements. Each state permitting agency is responsible for determining the facilities applicable under each permit.

Title V Operating Permits

Title V is an operating permit program run by each state. Texas Eastern's Colerain Compressor Station is an existing Title V minor source and would remain a minor source upon completion of the TEAL Project. The potential to emit (PTE) at the new NGT and TEAL Project compressor stations and the new M&R stations would not be subject to Title V.

The EPA issued the Title V GHG Tailoring Rule, which established permitting requirements and thresholds for GHGs. On June 23, 2014, the U.S. Supreme Court ruled that a facility may not be required to obtain a Title V permit based solely on GHG emissions; however, if a facility is a major stationary source based on the PTE of other regulated pollutants, a Title V permit may include permit requirements for GHGs.

New Source Performance Standards

The EPA promulgates New Source Performance Standards (NSPS) that establish emission limits and fuel, monitoring, notification, reporting, and recordkeeping requirements for new or significantly modified stationary source types or categories. NSPS Subpart JJJJ (*Standards of Performance for Stationary Spark Ignition Internal Combustion Engines*) sets emission standards for NO_x, CO, and VOC. Subpart JJJJ would apply to the emergency generators at each of the new NGT and TEAL compressor and M&R stations. NEXUS and Texas Eastern would comply with all applicable requirements of Subpart JJJJ. Subpart KKKK, *Standards of Performance for Stationary Combustion Turbines*, regulates emissions of NO_x and SO₂. This subpart would apply to the new and modified compressor units installed at the NGT and TEAL Projects compressor stations. NEXUS and Texas Eastern would be required to comply with applicable emission limits and monitoring, reporting, and testing requirements of this subpart.

National Emission Standards for Hazardous Air Pollutants

The CAA Amendments established a list of 189 hazardous air pollutants (HAP), resulting in the promulgation of National Emission Standards for Hazardous Air Pollutants for Source Categories (NESHAP). NESHAPs regulate HAP emissions from stationary sources by setting emission limits, monitoring, testing, recordkeeping, and notification requirements. Subpart ZZZZ (*National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines*) would apply to the emergency electrical power generators at each compressor station. NEXUS and Texas Eastern would be subject to all applicable Subpart ZZZZ monitoring, recordkeeping, and reporting requirements and/or would comply with NESHAPs Subpart ZZZZ by complying with NSPS Subpart JJJJ requirements.

General Conformity

The General Conformity Rule was developed to ensure that federal actions in nonattainment and maintenance areas do not impede states' attainment of the NAAQS. A conformity determination must be conducted by the lead federal agency if a federal action's construction and operation activities are likely to result in generating direct and indirect emissions that would exceed the conformity applicability threshold level of the pollutant(s) for which an air basin is designated as nonattainment or maintenance. Conforming activities or actions should not, through additional air pollutant emissions:

- cause or contribute to new violations of the NAAQS in any area;
- increase the frequency or severity of any existing violation of any NAAQS; or
- delay timely attainment of any NAAQS or interim emission reductions.

The General Conformity Rule entails both an applicability analysis and a subsequent conformity determination, if applicable. According to the conformity regulations, emissions from sources that are subject to any NNSR or PSD permitting/licensing (major or minor) are exempt and are deemed to have conformed. A General Conformity Determination must be completed when the total direct and indirect emissions of a project would equal or exceed the specified pollutant thresholds on a calendar year basis for each nonattainment or maintenance area.

All non-permitted emissions that would occur within a nonattainment area were considered in the general conformity applicability analysis. Table 4.12.1-2 provides the results of the general conformity applicability review for the NGT and TEAL Projects. Based on the results in table 4.12.1-2, the emissions that would occur in nonattainment or maintenance areas would not exceed the general conformity applicability thresholds for any criteria pollutant in a single calendar year. Therefore, general conformity would not apply to the NGT and TEAL Projects.

Designated Pollutant	Designated Area	Threshold (tpy)	Pollutant or Precursor	2017 Total Non-Exempt Emissions	2018 Total Non-Exempt Emissions	Ongoing Non-Exempt Operational Emissions
Ozone ^b	Cleveland-Akron-Lorain, OH	100	VOC	8.2	1.8	1.8
		100	NO _x	32.8	0.0	0.0
PM _{2.5} ^c	Wheeling, WV-OH	100	PM _{2.5}	2.9	0.2	0.0
		100	SO ₂	0.1	<0.1	0.0
		100	NO _x	32.3	1.4	0.0
	Cleveland-Akron-Lorain, OH	100	PM _{2.5}	45.1	0.0	0.0
		100	SO ₂	0.06	0.0	0.0
		100	NO _x	32.8	0.0	0.0
	Canton-Massillon, OH	100	PM _{2.5}	12.8	0.0	0.0
		100	SO ₂	0.02	0.0	0.0
		100	NO _x	7.5	0.0	0.0
	Detroit-Ann Arbor, MI	100	PM _{2.5}	24.1	<0.1	<0.1
100		SO ₂	0.03	<0.1	<0.1	
		100	NO _x	19.5	3.0	3.0
a	This table presents a summary of emission estimates. Detailed calculations may be found in Appendix 9B of Resource Report 9 in NEXUS' November 2015 Application, updated in the March 3 Response to Staff Environmental Data Requests.					
b	NO _x and VOC are ozone precursors.					
c	PM, SO ₂ , and NO _x are PM _{2.5} precursors.					

Mandatory Greenhouse Gas Reporting Rule

The EPA established the final Mandatory Greenhouse Gas Reporting Rule, requiring the reporting of operational GHG emissions from applicable sources that emit greater than or equal to 25,000 metric tons of CO₂e in 1 year. Recent additions to the Mandatory Reporting Rule effective for calendar year 2016 require reporting of GHG emissions generated during operation of natural gas pipeline transmission system, which would include blowdown emissions, equipment leaks, and vent emissions at compressor stations, as well as blowdown emissions between compressor stations. The applicability of the reporting rule would apply to the entire NEXUS or Texas Eastern system.

Although the rule does not apply to construction emissions, we have provided GHG construction emission estimates, as CO₂e, for accounting and disclosure purposes in section 4.12.1.3 and table 4.12.1-3. Operational GHG emission estimates for the Projects are presented, as CO₂e, in section 4.12.1.3. Based on the emission estimates presented, actual GHG emissions from operation of each NGT or TEAL Project compressor station, each considered as a separate stationary source, has the potential to exceed the 25,000-metric tons per year (tpy) reporting threshold for the Mandatory Reporting Rule. Therefore, if the actual operational emissions from any compressor station or the NEXUS or Texas Eastern system are greater than 25,000 metric tpy, NEXUS and/or Texas Eastern would be required to report GHG emissions.

State Regulations

NEXUS and Texas Eastern would be required to obtain an air quality permit from the applicable air permitting authority for each of the new and modified compressor stations. The process of obtaining the air permit would involve the review and implementation of state regulations. Air quality rules in Ohio and Michigan are outlined in the OAC and the Michigan Administrative Code (MAC), respectively. State air quality regulations that would establish emission limits or other restrictions that may be in addition to those required under federal regulations are summarized below.

In addition to PSD and NNSR permitting requirements, Ohio administers its own construction permitting requirements within Chapter 3745-31 of the OAC. At a minimum, new or modified stationary sources with potential emissions of any air pollutant that exceed the *de minimis* permitting thresholds of 10 pounds per day from a single source or 25 tpy from a group of sources at the same facility, or 1 tpy of HAP, are required to obtain a Permit-to-Install or Permit-to-Install-and-Operate (PTIO).

The emissions from the compressor stations and three of the M&R stations to be constructed in Ohio indicate that each facility would be required to obtain a PTIO. Launcher/receiver facilities located at the Wadsworth and Waterville Compressor Stations would be incorporated into the PTIO for the respective stations. The potential air emissions from the MLV sites in Ohio would not require air permits. Based on NEXUS' initial design, the NEXUS/Dominion East Ohio M&R Station and the remaining launcher/receiver facilities would not require a permit. However, if the final design results in air emissions above the *de minimis* levels, NEXUS would obtain the required PTIO.

Ohio Air Quality Rules

The Ohio facilities would also be subject to Ohio state regulations including, but not limited to, the following (OEPA, 2010):

- OAC 3745-15 (General Provisions on Air Pollution Control) contains definitions, purpose, submission of emission information, measurement of emission of air contaminants, exemptions, malfunction, maintenance and reporting requirements, prohibitions, and circumvention requirements;
- OAC 3745-16 (Stack Height Requirements) establishes good engineering practice stack height requirements;
- OAC 3745-17 (Particulate Matter Standards) establishes particulate matter definitions, measurement methods and procedures, compliance time schedules, control of visible emissions, and restricts fugitive dust;

- OAC 3745-18 (Sulfur Dioxide Regulations) establishes sulfur dioxide definitions, compliance time schedules, measurement methods and procedures, ambient monitoring requirements, and emission limits by county;
- OAC 3745-19 (Open Burning Standards) establishes open burning standards including definitions, open burning requirement in restricted and unrestricted areas, and relationship to other prohibitions;
- OAC 3745-21 (Carbon Monoxide, Ozone, Hydrocarbon Air Quality Standards, and Related Emissions Standards) establishes ambient air emission standards, measurement methods, compliance time schedules, region classifications, and control methods;
- OAC 3745-23 (Nitrogen Oxide Standards) establishes measurement methods for NO_x;
- OAC 3745-24 (Nitrogen Oxide Emission Statements) established applicability, deadlines, and emission standard requirements for NO_x emission statements;
- OAC 3745-21 (VOC Emission Standards) establishes standards for storage of volatile organic liquids in fixed and floating roof tanks; and
- OAC 3745-113 (Standards for Architectural and Industrial Maintenance Coatings) establishes VOC content limits for coatings.

Michigan Air Quality Rules

The Michigan facilities would also be subject to MDEQ regulations including, but not limited to, the following (MDEQ, 2016):

- MAC Rule 336.201 – 336.205 (Annual Reporting) establishes requirements for annual emissions reports;
- MAC Rule 336.1224 (T-BACT Requirements [Air Toxics]) establishes emissions limits and exemptions for air toxics;
- MAC Rule 336.1371 and 336.1372 (Fugitive Dust Control Program) establishes requirements for a fugitive dust control program, including record keeping, and describes acceptable control methods that may be implemented;
- MAC Rule 336.1310 (Open Burning Standards) establishes requirements and exceptions for open burning;
- MAC Rule 301 (Opacity Standards) establishes density/visibility limits for emissions; and
- MAC Rule 702 (VOC Emission Standards) establishes VOC emission rates for new sources.

4.12.1.3 Air Quality Impacts and Mitigation

Construction Emissions

Construction of the NGT and TEAL Projects would result in temporary increases of pollutant emissions from the use of diesel- and gas-fueled equipment, blowdown and purging activities, open burning, as well as temporary increases in fugitive dust emissions from earth/roadway surface disturbance. Indirect emissions would be generated from vehicles associated with construction workers traveling to and from work sites. The volume of fugitive dust generated would be dependent upon the area disturbed and the type of construction activity, along with the soil's silt and moisture content, wind speed, and the nature of vehicular/equipment traffic. Fugitive particulate emissions of PM₁₀ and PM_{2.5} were calculated using the EPA AP-42 recommended emission factors for heavy construction equipment, combined with estimates of the extent and duration of active surface disturbance during construction. These emission factors tend to be conservative and can overestimate potential fugitive dust generated by the Projects. Combustion emissions from construction equipment operation were estimated using emission factors generated by USEPA's NONROAD2008a model. Combustion emissions from on-road delivery and material removal vehicles were estimated using the USEP Motor Vehicle Emission Simulator (MOVES) model. Construction emissions are shown in table 4.12.1-3 below.⁹

NEXUS and Texas Eastern would implement measures to control fugitive dust emissions. Each company has prepared separate project-specific *Fugitive Dust Control Plans*. NEXUS and Texas Eastern would implement emission reduction measures such as water suppression, covering truckloads during transit, limiting on-site vehicle speed, stabilizing exposed soil, and removing track-out on public roads. We have reviewed the *Fugitive Dust Control Plans* and found them acceptable. Further, NEXUS, Texas Eastern, and their contractors would ensure that construction equipment would be properly tuned and operated only on an as-needed basis to minimize the combustion emissions from diesel and gasoline engines.

Both NEXUS and Texas Eastern may utilize open burning to dispose of construction debris. Ohio and Michigan each regulate open burning, and NEXUS and Texas Eastern would comply with applicable regulations. Open burning emissions are estimated for the NGT and TEAL Projects in table 4.12.1-3.

Year/Activity	Emissions (tpy)						
	SO ₂	PM ₁₀	PM _{2.5}	NO _x	CO	VOC	CO _{2e}
OHIO 2017							
NGT Project							
Non-road and On-road Construction Vehicle Equipment and Commuting Vehicles	0.6	6.6	6.4	115.7	334.6	16.9	32,783.2
Fugitive Dust	N/A	1,203.2	126.6	N/A	N/A	N/A	N/A
Blowdown and Purge	N/A	N/A	N/A	N/A	N/A	8.9	17,235.4
Open Burning	N/A	19.6	19.6	5.6	202.6	4.9	-
NGT Project Total	0.6	1,222.8	152.6	121.3	537.2	30.7	50,018.6

⁹ Detailed emission calculations were provided in NEXUS' and Texas Eastern's applications each filed on November 20, 2015, and NEXUS' supplemental filing dated March 21, 2016. Detailed emissions calculations can be found on the FERC eLibrary website using Accession Numbers 20151120-5253 and 20151201-5125 (NGT Project) and 20151120-5254 (TEAL Project).

TABLE 4.12.1-3 (cont'd)

Estimated Construction Emissions for the NGT and TEAL Projects							
Year/Activity	Emissions (tpy)						
	SO ₂	PM ₁₀	PM _{2.5}	NO _x	CO	VOC	CO _{2e}
TEAL Project							
Fugitive Dust	N/A	62.8	6.5	1.4	N/A	N/A	N/A
Non-road and On-road Construction vehicle Equipment	0.2	N/A	5.5	106.2	185.2	13.0	24,345
Commuting Vehicles	0.02	^a	0.1	2.7	28.1	1.0	2,429
Open Burning	N/A	^a	4.8	1.4	48.8	1.2	N/A
NGT Project Total	0.22	62.8	16.9	111.7	262.1	15.2	26,774
Ohio 2017 Grand Total	0.82	1,285.6	169.5	233.0	799.3	45.9	76,792.6
MICHIGAN 2017							
NGT Project							
Non-road and On-road Construction Vehicle Equipment and Commuting Vehicles	0.048	1.3	1.3	24.8	46.1	3.1	6,914.5
Fugitive Dust	N/A	230.7	24.6	N/A	N/A	N/A	N/A
Blowdown and Purge	N/A	N/A	N/A	N/A	N/A	2.4	5,775.1
Open Burning	N/A	10.1	10.1	5.17	104.1	2.5	N/A
Michigan 2017 Grand Total	0.048	242.1	36.0	30.0	150.2	8.0	12,689.9
OHIO 2018							
TEAL Project							
Fugitive Dust	N/A	1.0	0.1	N/A	N/A	N/A	N/A
Non-road and On-road Construction vehicle Equipment	<0.1	^a	0.1	2.3	7.6	0.4	498
Commuting Vehicles	<0.1	^a	<0.1	0.1	0.6	0.02	53
Ohio 2018 Grand Total	<0.1	1.0	0.2	2.4	8.2	0.4	551
Grand Total (2017 and 2018)	0.84	1,528.7	205.7	2,65.4	957.7	54.3	90,033.5
^a Emissions for PM ₁₀ and PM _{2.5} have been combined. N/A = Not applicable							

Construction of the NGT Project would take place over several months in 2017, while the TEAL Project would be phased over 2 years (2017 and 2018). However, pipeline construction at any given location would generally last from 6 to 10 weeks. Construction at aboveground facilities and the use of construction support areas would occur over a longer period of time but at specific locations. Therefore, most construction related emissions would be temporary and localized, and would dissipate with time and distance from areas of active construction. Further, construction emissions along the pipelines would subside once construction is complete. Following construction at the compressor stations, emissions would transition to operating emissions. Based on the mitigation measures outlined in NEXUS' and Texas Eastern's *Fugitive Dust Control Plans* and the temporary nature of construction, we conclude that construction of the NGT and TEAL Projects would not have a significant impact on air quality.

Operations Emissions

Operation of the project facilities at the Hanoverton, Wadsworth, Clyde, Waterville, Salineville, and Colerain Compressor Stations and the new and modified M&R Stations would result in air emission increases over existing emissions levels.¹⁰ The turbines at the NGT and TEAL Projects compressor stations would incorporate SoLoNO_x (i.e., dry low NO_x or lean pre-mix) combustors to control NO_x emissions.

¹⁰ Each of the new M&R Stations would include an emergency generator with a natural gas-fired heater.

Air pollutant emissions from operation of NEXUS' proposed compressor stations were calculated using emissions factors from vendor data, the EPA's *Compilation of Air Pollutant Emission Factors (AP-42)* and 40 CFR 98. The PTE emissions resulting from the NGT and TEAL Projects' compressor stations are summarized in tables 4.12.1-4 through 4.12.1-9.

TABLE 4.12.1-4

Proposed Hanoverton Compressor Station Emissions Summary (tpy)

Description	Maximum Potential Emissions							
	NO _x	CO	VOC	SO ₂	PM / PM ₁₀ /		Hexane ^a	Total HAP
					PM _{2.5}	CO _{2e}		
Combustion Turbine #1	31.1	7.8	3.3	3.2	6.3	112,281	N/A	0.6
Combustion Turbine #2	31.1	7.8	3.3	3.2	6.3	112,281	N/A	0.6
Emergency Generator	1.3	2.6	1.2	0.0	0.0	576	0.0	0.7
Gas Releases	N/A	N/A	24.6	N/A	N/A	19,114	0.7	2.0
Equipment Leaks	N/A	N/A	10.1	N/A	N/A	1,419	0.2	1.2
Separator Vessel #1	N/A	N/A	0.1	N/A	N/A	7	0.0	0.0
Separator Vessel #2	N/A	N/A	0.1	N/A	N/A	7	0.0	0.0
Separator Vessel #3	N/A	N/A	0.1	N/A	N/A	6	0.0	0.0
Separator Vessel #4	N/A	N/A	0.6	N/A	N/A	18	0.0	0.0
Separator Vessel #5	N/A	N/A	0.0	N/A	N/A	1	0.0	0.0
Storage Tank #1	N/A	N/A	0.3	N/A	N/A	14	0.0	0.0
Storage Tank #2	N/A	N/A	0.0	N/A	N/A	N/A	N/A	N/A
Storage Tank #3	N/A	N/A	0.0	N/A	N/A	N/A	N/A	N/A
Storage Tank #4	N/A	N/A	0.0	N/A	N/A	N/A	N/A	N/A
Process Heater #1	0.7	0.4	0.2	0.0	0.0	554	0.0	0.0
Process Heater #2	0.7	0.4	0.2	0.0	0.0	554	0.0	0.0
Parts Washer	N/A	N/A	0.4	N/A	N/A	N/A	N/A	N/A
Loading Operation	N/A	N/A	0.0	N/A	N/A	N/A	0.0	0.0
Total	65.0	19.1	44.5	6.4	12.6	246,832	1.0	5.3

a Hexane (n-) emissions are presented for worst-case Individual HAP
N/A = Not applicable

TABLE 4.12.1-5

Proposed Wadsworth Compressor Station Emissions Summary (tpy)

Description	Maximum Potential Emissions							
	NO _x	CO	VOC	SO ₂	PM / PM ₁₀ /		Hexane ^a	Total HAP
					PM _{2.5}	CO _{2e}		
Combustion Turbine	31.0	7.8	3.3	3.2	6.2	112,925	N/A	0.6
Emergency Generator	1.0	1.9	0.9	0.0	0.0	432	0.0	0.5
Gas Releases	N/A	N/A	19.8	N/A	N/A	15,401	0.6	1.6
Equipment Leaks	N/A	N/A	6.3	N/A	N/A	997	0.1	0.8
Separator Vessel #1	N/A	N/A	0.1	N/A	N/A	8	0.0	0.0
Separator Vessel #2	N/A	N/A	0.1	N/A	N/A	8	0.0	0.0
Separator Vessel #3	N/A	N/A	0.1	N/A	N/A	6	0.0	0.0
Separator Vessel #4	N/A	N/A	0.6	N/A	N/A	18	0.0	0.0
Separator Vessel #5	N/A	N/A	0.0	N/A	N/A	1	0.0	0.0
Storage Tank #1	N/A	N/A	0.3	N/A	N/A	15	0.0	0.0
Storage Tank #2	N/A	N/A	0.0	N/A	N/A	N/A	N/A	N/A
Storage Tank #3	N/A	N/A	0.0	N/A	N/A	N/A	N/A	N/A
Process Heater	0.7	0.4	0.2	0.0	0.0	554	0.0	0.0
Parts Washer	N/A	N/A	0.4	N/A	N/A	N/A	N/A	N/A
Loading Operation	N/A	N/A	0.0	N/A	N/A	1	0.0	0.0

TABLE 4.12.1-5 (cont'd)

Proposed Wadsworth Compressor Station Emissions Summary (tpy)								
Description	Maximum Potential Emissions							Total HAP
	NO _x	CO	VOC	SO ₂	PM / PM ₁₀ / PM _{2.5}	CO _{2e}	Hexane ^a	
Total	32.7	10.2	32.2	3.2	6.3	129,365	0.8	3.6

a Hexane(n-) emissions are presented for worst-case Individual HAP
N/A = Not applicable

TABLE 4.12.1-6

Proposed Clyde Compressor Station Emissions Summary (tpy)								
Description	Maximum Potential Emissions							Total HAP
	NO _x	CO	VOC	SO ₂	PM / PM ₁₀ / PM _{2.5}	CO _{2e}	Hexane ^a	
Combustion Turbine	31.1	7.8	3.3	3.2	6.3	112,238	N/A	0.6
Emergency Generator	1.0	1.9	0.9	0.0	0.0	432	0.0	0.5
Gas Releases	N/A	N/A	19.8	N/A	N/A	15,401	0.6	1.6
Equipment Leaks	N/A	N/A	6.3	N/A	N/A	997	0.1	0.8
Separator Vessel #1	N/A	N/A	0.1	N/A	N/A	8	0.0	0.0
Separator Vessel #2	N/A	N/A	0.1	N/A	N/A	8	0.0	0.0
Separator Vessel #3	N/A	N/A	0.1	N/A	N/A	6	0.0	0.0
Separator Vessel #4	N/A	N/A	0.6	N/A	N/A	18	0.0	0.0
Separator Vessel #5	N/A	N/A	0.0	N/A	N/A	1	0.0	0.0
Storage Tank #1	N/A	N/A	0.3	N/A	N/A	15	0.0	0.0
Storage Tank #2	N/A	N/A	0.0	N/A	N/A	N/A	N/A	N/A
Storage Tank #3	N/A	N/A	0.0	N/A	N/A	N/A	N/A	N/A
Process Heater	0.7	0.4	0.2	0.0	0.0	554	0.0	0.0
Parts Washer	N/A	N/A	0.4	N/A	N/A	N/A	N/A	N/A
Loading Operation	N/A	N/A	0.0	N/A	N/A	1	0.0	0.0
Total	32.8	10.2	32.2	3.2	6.3	129,678	0.8	3.6

a Hexane(n-) emissions are presented for worst-case Individual HAP
N/A = Not applicable

TABLE 4.12.1-7

Proposed Waterville Compressor Station Emissions Summary (tpy)								
Description	Maximum Potential Emissions							Total HAP
	NO _x	CO	VOC	SO ₂	PM / PM ₁₀ / PM _{2.5}	CO _{2e}	Hexane ^a	
Combustion Turbine	31.1	7.8	3.3	3.2	6.3	112,240	N/A	0.6
Emergency Generator	1.0	1.9	0.9	0.0	0.0	432	0.0	0.5
Gas Releases	N/A	N/A	19.8	N/A	N/A	15,401	0.6	1.6
Equipment Leaks	N/A	N/A	6.3	N/A	N/A	997	0.1	0.8
Separator Vessel #1	N/A	N/A	0.1	N/A	N/A	8	0.0	0.0
Separator Vessel #2	N/A	N/A	0.1	N/A	N/A	8	0.0	0.0
Separator Vessel #3	N/A	N/A	0.1	N/A	N/A	6	0.0	0.0
Separator Vessel #4	N/A	N/A	0.6	N/A	N/A	18	0.0	0.0
Separator Vessel #5	N/A	N/A	0.0	N/A	N/A	1	0.0	0.0
Storage Tank #1	N/A	N/A	0.3	N/A	N/A	15	0.0	0.0
Storage Tank #2	N/A	N/A	0.0	N/A	N/A	N/A	N/A	N/A
Storage Tank #3	N/A	N/A	0.0	N/A	N/A	N/A	N/A	N/A

TABLE 4.12.1-7 (cont'd)

Proposed Waterville Compressor Station Emissions Summary (tpy)								
Description	Maximum Potential Emissions							
	NO _x	CO	VOC	SO ₂	PM / PM ₁₀ / PM _{2.5}	CO _{2e}	Hexane ^a	Total HAP
Process Heater	0.7	0.4	0.2	0.0	0.0	554	0.0	0.0
Parts Washer	N/A	N/A	0.4	N/A	N/A	N/A	N/A	N/A
Loading Operation	N/A	N/A	0.0	N/A	N/A	1	0.0	0.0
Total	32.8	10.2	32.2	3.2	6.3	129,680	0.8	3.6

a Hexane(n-) emissions are presented for worst-case Individual HAP
N/A = Not applicable

TABLE 4.12.1-8

Proposed Salineville Compressor Station Emissions Summary (tpy)								
Description	Maximum Potential Emissions							
	NO _x	CO	VOC	SO ₂	PM / PM ₁₀ / PM _{2.5}	CO _{2e}	Toluene ^a	Total HAP
Combustion Turbine #1	20.7	13.3	1.5	1.3	2.5	42,250	0.1	0.3
Combustion Turbine #2	20.7	13.3	1.5	1.3	2.5	42,250	0.1	0.3
Emergency Generator	1.0	1.9	0.9	0.0	0.0	432	0.0	0.5
Gas Releases	N/A	N/A	24.6	N/A	N/A	19,114	0.5	2.0
Equipment Leaks	N/A	N/A	10.1	N/A	N/A	1,419	0.4	1.2
Separator Vessel #1	N/A	N/A	0.3	N/A	N/A	16	0.0	0.0
Separator Vessel #2	N/A	N/A	0.3	N/A	N/A	16	0.0	0.0
Separator Vessel #3	N/A	N/A	0.1	N/A	N/A	4	0.0	0.0
Separator Vessel #4	N/A	N/A	0.1	N/A	N/A	4	0.0	0.0
Separator Vessel #5	N/A	N/A	0.7	N/A	N/A	23	0.0	0.0
Separator Vessel #6	N/A	N/A	0.1	N/A	N/A	8	0.0	0.0
Storage Tank #1	N/A	N/A	0.3	N/A	N/A	17	0.0	0.0
Storage Tank #2	N/A	N/A	0.0	N/A	N/A	N/A	N/A	N/A
Storage Tank #3	N/A	N/A	0.0	N/A	N/A	N/A	N/A	N/A
Storage Tank #4	N/A	N/A	0.0	N/A	N/A	N/A	N/A	N/A
Parts Washer	N/A	N/A	0.4	N/A	N/A	N/A	N/A	N/A
Loading Operation	N/A	N/A	0.0	N/A	N/A	1	0.0	0.0
Total	42.5	28.6	41.0	2.6	5.1	111,553	1.0	4.5

a Toluene emissions are presented for worst-case Individual HAP
N/A = Not applicable

TABLE 4.12.1-9

Proposed Colerain Compressor Station Modification Emissions Summary (tpy)								
Description	Maximum Potential Emissions							
	NO _x	CO	VOC	SO ₂	PM / PM ₁₀ / PM _{2.5}	CO _{2e}	Toluene ^a	Total HAP
Combustion Turbine #1	20.8	10.9	1.5	1.3	2.5	45,255	0.1	0.3
Combustion Turbine #2	20.8	10.9	1.5	1.3	2.5	45,255	0.1	0.3
Emergency Generator	1.0	1.9	0.9	0.0	0.0	432	0.0	0.5
Separator Vessel #1	N/A	N/A	0.3	N/A	N/A	16	0.0	0.0
Separator Vessel #2	N/A	N/A	0.3	N/A	N/A	16	0.0	0.0
Separator Vessel #3	N/A	N/A	0.1	N/A	N/A	4	0.0	0.0

TABLE 4.12.1-9 (cont'd)

Proposed Colerain Compressor Station Modification Emissions Summary (tpy)								
Description	Maximum Potential Emissions							
	NO _x	CO	VOC	SO ₂	PM / PM ₁₀ / PM _{2.5}	CO ₂ e	Toluene ^a	Total HAP
Separator Vessel #4S	N/A	N/A	0.1	N/A	N/A	4	0.0	0.0
Separator Vessel #4D	N/A	N/A	0.7	N/A	N/A	23	0.0	0.0
Separator Vessel #6	N/A	N/A	0.1	N/A	N/A	8	0.0	0.0
Storage Tank #1	N/A	N/A	0.3	N/A	N/A	17	0.0	0.0
Storage Tank #2	N/A	N/A	0.0	N/A	N/A	N/A	N/A	N/A
Storage Tank #3	N/A	N/A	0.0	N/A	N/A	N/A	N/A	N/A
Parts Washer	N/A	N/A	0.4	N/A	N/A	N/A	N/A	N/A
MAXIMUM POST-PROJECT POTENTIAL EMISSIONS – MODIFIED SOURCES								
Gas Releases	N/A	N/A	29.4	N/A	N/A	22,827	0.5	2.4
Equipment Leaks	N/A	N/A	14.0	N/A	N/A	1,841	0.5	1.7
Loading Operation	N/A	N/A	0.0	N/A	N/A	1	0.0	0.0
Combustion Turbine #3	20.8	10.9	1.5	1.3	2.5	45,255	0.1	0.3
Separator Vessel #7	N/A	N/A	0.1	N/A	N/A	4	0.0	0.0
Storage Tank #4	N/A	N/A	0.0	N/A	N/A	N/A	N/A	N/A
Total	63.3	34.6	51.1	3.9	7.6	160,956	1.4	5.6

a Toluene emissions are presented for worst-case Individual HAP.
N/A = Not applicable

Air Quality Modeling

NEXUS and Texas Eastern performed air quality screening analyses for each of the compressor stations using the EPA approved AERSCREEN Model. AERSCREEN provides results based on 1-hour, 3-hour, 8-hour, 24-hour, and annual averaging periods. AERSCREEN is a screening level modeling tool that provides “worst case” impact estimates and often presents conservative results that overestimate impacts. NEXUS and Texas Eastern modeled the operational emissions from the compressor stations and compared the result for each pollutant and averaging period to the NAAQS. Tables 4.12.1-10 and 4.12.1-11 present the results of the modeling analyses for the compressor stations associated with the NGT and TEAL Projects, respectively, including the current ambient monitored data, the compressor station impact, the combined concentration, and a comparison with the NAAQS.

TABLE 4.12.1-10

AERSCREEN Modeling Results for NGT Project Compressor Stations						
Pollutant	Averaging Period	Background Concentration (µg/m ³)	AERSCREEN Modeled Impact (µg/m ³)	Combined Impact (µg/m ³)	NAAQS (µg/m ³)	
HANOVERTON COMPRESSOR STATION						
NO ₂	Annual	5.7	2.9	8.7	100	
	1-hour	45.9	29.3	75.2	188	
CO	8-hour	1280.9	44.7	1325.5	10,000	
	1-hour	1746.7	49.6	1796.3	40,000	
SO ₂	3-hour	69.3	3.1	72.3	1,300	
	1-hour	69.3	3.1	72.3	196	
PM _{2.5}	Annual	10.4	0.6	11.0	12	
	24-hour	24.0	3.6	27.6	35	
PM ₁₀	24-hour	40.3	3.6	43.9	150	

TABLE 4.12.1-10 (cont'd)

AERSCREEN Modeling Results for NGT Project Compressor Stations						
Pollutant	Averaging Period	Background Concentration (µg/m ³)	AERSCREEN Modeled Impact (µg/m ³)	Combined Impact (µg/m ³)	NAAQS (µg/m ³)	
WADSWORTH COMPRESSOR STATION						
NO ₂	Annual	5.7	2.2	7.9	100	
	1-hour	45.9	22.0	67.9	188	
CO	8-hour	931.6	33.4	965.0	10,000	
	1-hour	1630.2	37.1	1667.3	40,000	
SO ₂	3-hour	58.6	2.3	60.9	1,300	
	1-hour	58.6	2.3	60.9	196	
PM _{2.5}	Annual	9.5	0.5	10.0	12	
	24-hour	22.0	2.7	24.7	35	
PM ₁₀	24-hour	29.0	2.7	31.7	150	
CLYDE COMPRESSOR STATION						
NO ₂	Annual	5.7	2.1	7.8	100	
	1-hour	45.9	20.8	66.7	188	
CO	8-hour	4308.5	31.6	4340.1	10,000	
	1-hour	8267.6	35.1	8302.7	40,000	
SO ₂	3-hour	186.4	2.2	188.6	1,300	
	1-hour	186.4	2.2	188.6	196	
PM _{2.5}	Annual	9.5	0.4	9.9	12	
	24-hour	22.0	2.5	24.5	35	
PM ₁₀	24-hour	29.0	2.5	31.5	150	
WATERVILLE COMPRESSOR STATION						
NO ₂	Annual	5.7	2.1	7.9	100	
	1-hour	45.9	21.4	67.3	188	
CO	8-hour	1280.9	32.6	1313.5	10,000	
	1-hour	1746.7	36.2	1782.9	40,000	
SO ₂	3-hour	29.3	2.2	31.5	1,300	
	1-hour	29.3	2.2	31.5	196	
PM _{2.5}	Annual	9.9	0.4	10.3	12	
	24-hour	24.0	2.6	26.6	35	
PM ₁₀	24-hour	30.3	2.6	32.9	150	

µg/m³ = micrograms per cubic meter

TABLE 4.12.1-11

AERSCREEN Modeling Results for TEAL Project Compressor Stations					
Pollutant	Averaging Period	Background Concentration (µg/m ³)	AERSCREEN Modeled Impact (µg/m ³)	Combined Impact (µg/m ³)	NAAQS (µg/m ³)
SALINEVILLE COMPRESSOR STATION					
NO ₂	Annual	5.7	5.0	10.7	100
	1-hour	45.9	49.7	95.6	188
CO	8-hour	931.6	45.4	977.0	10,000
	1-hour	1164.5	50.5	1214.9	40,000
SO ₂	3-hour	69.3	3.1	72.4	1,300
	1-hour	69.3	3.1	72.4	196
PM _{2.5}	Annual	10.4	0.6	11.0	12
	24-hour	24.0	3.6	27.6	35
PM ₁₀	24-hour	40.3	3.6	44.0	150

TABLE 4.12.1-11 (cont'd)

AERSCREEN Modeling Results for TEAL Project Compressor Stations						
Pollutant	Averaging Period	Background Concentration (µg/m ³)	AERSCREEN Modeled Impact (µg/m ³)	Combined Impact (µg/m ³)	NAAQS (µg/m ³)	
COLERAIN COMPRESSOR STATION						
NO ₂	Annual	5.7	2.8	8.5	100	
	1-hour	45.9	27.8	73.7	188	
CO	8-hour	931.6	25.4	956.9	10,000	
	1-hour	1164.5	28.2	1192.6	40,000	
SO ₂	3-hour	61.3	1.7	63.0	1,300	
	1-hour	61.3	1.7	63.0	196	
PM _{2.5}	Annual	11.1	0.3	11.4	12	
	24-hour	24.0	2.0	26.0	35	
PM ₁₀	24-hour	39.0	2.0	41.0	150	

µg/m³ = micrograms per cubic meter

As shown in tables 4.12.1-10 and 4.12.1-11, the screening analysis concentration for each modeling run is below the applicable NAAQS for all compressor stations for the NGT and TEAL Projects and the Projects area would continue to remain protective of human health and public welfare for all listed pollutants.

The Lucas County Health Department requested post-construction air quality monitoring and reporting at the NGT Project facilities. As discussed above, the EPA, state, and local agencies have an established network of air quality monitors around the country. The OEPA would determine any long-term monitoring requirements during its air permit review and may choose to install additional air monitors, as it deems appropriate throughout the state. The OEPA would also enforce its requirements for stack testing, emission limits, monitoring, and recordkeeping in accordance with any air permit it issues.

One commenter states that Lucas County, Ohio already experiences “Ozone Action Days”, and believes that emissions from the Waterville Compressor Station may exacerbate this problem. Action days may be established under a wide range of conditions including: 1) days when air quality is moderate but may approach levels that are considered unhealthy for sensitive groups; 2) days when air quality is unhealthy for sensitive groups; or 3) days when air quality may be unhealthy for the general population. Each air pollution control agency determines under which conditions it would identify an action day for cities participating in the Action Day Program. No cities in Lucas County, Ohio participate in the EPA Action Day Program; however, the City of Toledo has its own Ozone Action Season Program. It is unclear under what air quality conditions Toledo enacts ozone action days under its program. However, upon review of nearby ozone monitoring data and ozone air quality maps for Ohio,¹¹ ozone levels have not exceeded the NAAQS or reached levels that were unhealthy for sensitive groups over the past 3 years. Further, NEXUS would be required to obtain an air permit for the Waterville Compressor Station through OEPA.

Numerous commenters expressed concern with public health impacts resulting from operational and intermittent blowdown emissions of HAPs and criteria pollutants in populated areas. One commenter expressed concern for the health of a child diagnosed with alpha-1 antitrypsin deficiency and the health implications associated with emissions from the Waterville Compressor Station. Based on tables 4.12.1-4 through 4.12.1-7, the Hanoverton, Wadsworth, Clyde, and Waterville Compressor Stations would all be

¹¹ Maps are provided through the AirNow system developed by the EPA; NOAA; NPS; and tribal, state, and local agencies (AirNow, 2016)

minor sources of air emissions under all federal programs. Operation of the NGT and TEAL Projects would not result in an exceedance of the NAAQS at any location. Methane, the primary component of natural gas, would be released during a blowdown event, as station blowdowns do not involve combustion. Methane is non-toxic but is classified as a simple asphyxiate if concentrated in a confined space. However, methane is buoyant and rapidly rises in air. Blowdown events are infrequent aspects of compressor station operation and can last for several minutes. However, methane is a GHG, which tends to have less localized effects. Methane emissions from blowdown activities are estimated in tables 4.12.1-12 and 4.12.1-13. The estimated emissions are relatively minor, because blowdowns occur infrequently (i.e., not part of normal, everyday operation), and we conclude they would not have a significant impact on air quality or public health. With respect to the Waterville Compressor Station and the potential health impacts on sensitive populations, the National Heart, Lung, and Blood Institute (a division under the DHHS) indicates that symptoms of alpha-1 antitrypsin deficiency include lung function deterioration, difficulty breathing, and sensitivity to smoking, air pollution, and allergens (DHHS, 2011). As previously discussed, the primary NAAQS were established to protect human health, including sensitive populations such as the elderly, children, and those with chronic respiratory illnesses. As shown in table 4.12.1-10, the AERSCREEN results indicate that the Waterville Compressor Station would not contribute to an exceedance of the NAAQS and would be below the OEPA's Acceptable Incremental Impact levels.

We received a comment indicating that an "oily vapor" would coat lawns in the vicinity of the pipeline and compressor station. While pipeline fugitive methane leaks (e.g., from valves and fittings) and compressor station natural gas combustion emissions would occur, these do not produce oily vapors. The commenter did not provide evidence of such an occurrence involving natural gas pipelines or compression, and based on extensive experience, we conclude that this is unlikely to occur as a result of the NGT and TEAL Projects.

We received a comment stating that Medina County, Ohio is in marginal nonattainment with the NAAQS, and because the Ohio E-Check system is required in Medina County in an attempt to offset its emissions, the Wadsworth Compressor Station should not be constructed at its proposed location. In addition, the commenter states that the compressor station would result in further NAAQS violations characterizing the proposed PTE for the station as high. As discussed throughout section 4.12.1, the emissions associated with the Wadsworth Compressor Station (and the NGT and TEAL Projects as a whole) would not contribute or cause a violation of the NAAQS. According to the OEPA website, the E-Check program was implemented to identify vehicles that emit excessive levels of pollutants into the air. With respect to pollution contributions, the Wadsworth Compressor Station would emit far less than the vehicles tested under the E-Check program as of 2014 (based on the report attached to the comment letter). In 2014, 815,316 vehicles were tested under E-Check. Using the EPA's average emissions factors for standard passenger vehicles (EPA, 2008), this resulted in more than 10,000 metric tpy of VOC and 6,775 metric tpy of NO_x. By comparison, the Wadsworth Compressor Station would emit 32.7 tpy of NO_x and 32.2 tpy of VOC. Further, the E-Check system is designed for passenger vehicles and is not applicable to stationary pipeline facilities.

We received comments about emissions from blowdowns at the NGT Project compressor stations. NEXUS has included startup and shutdown emissions in the air permit applications for the compressor stations, and blowdown estimates are included in the emissions presented in tables 4.12.1-4 through 4.12.1-9.

We received comments concerning potential leaks and emissions from the NGT Project pipelines. The EPA requested that we utilize the DOE's National Energy Technology Laboratory studies on exporting natural gas, particularly liquefied natural gas to evaluate GHG emissions. The DOE expressly states that these reports are not intended NEPA purposes. Further, the proposed Projects do not involve the export of liquefied natural gas, and the FERC has routinely determined that upstream production and downstream

consumption of natural gas are not casually connected to a project. Therefore, we continue to find the use of these reports inappropriate. GHG emission estimates from the NGT Project compressor stations are shown in tables 4.12.1-4 through 4.12.1-9. Pipeline GHG emissions are shown in table 4.12.1-13. Fugitive GHG emissions from the pipeline were calculated using the Interstate Natural Gas Association of America’s *Greenhouse Gas Emission Estimation Guidelines for Natural Gas Transmission and Storage*. Although not subject to stationary source permitting, these emissions are well below major stationary source permitting levels and would occur across a large distance.

Tables 4.12.1-12 and 4.12.1-13 show estimates of CO₂e and VOC emissions by for the NGT M&R stations and the NGT and TEAL Projects pipelines.

TABLE 4.12.1-12		
Estimated Emissions from NGT Project M&R Stations (tpy)		
Source	VOC	CO ₂ e
Gas Releases (Blowdowns)	1.7	2,336
Equipment Leaks	12.5	2,099
Storage Tanks	2.4	72
Liquid Loading	6.7	4
Combustion Sources	6.7	N/A
Total	23.5	4,511

Emissions generated during operation of the NGT and TEAL Projects would include emissions from natural gas combustion, fugitive CO₂e emissions (from valves, fittings, etc.), and CO₂e emissions resulting from planned, non-routine station blowdowns. Table 4.12.1-13 provides an estimate of operational emissions for the NGT and TEAL Projects pipelines.

TABLE 4.12.1-13		
Estimated Emissions from the NGT and TEAL Project Pipelines (tpy)		
Project, Source	VOC	CO ₂ e
NGT PROJECT		
Fugitives	0.1	76.2
Non-Routine (blowdowns)	7.3	5,676
NGT Project Total	7.4	5,752
TEAL PROJECT		
Fugitives	<0.1	1.4
Non-Routine (blowdowns)	0.1	107.0
TEAL Project Total	0.1	108.4

NEXUS has committed to participating in the EPA’s Natural Gas Star Program and implementing standard operating procedures for leak surveys on its compressor stations, M&R stations, and pipeline. NEXUS has also committed to complying with the EPA’s recently issued New Source Performance Standards under 40 CFR Part 60 Subpart OOOO for leak detection and repair. Specifically, NEXUS would minimize the emissions of methane by conducting annual emergency shutdown system tests with the vents capped and electronically testing the blowdown systems, utilizing pump-down techniques to lower gas pressure before maintenance and scheduling multiple maintenance activities concurrently to reduce the number of independent blowdowns, executing pressurized holds on turbines, utilizing “hot taps” when making new connections to the pipeline system whenever possible, and conducting in-service repairs rather than replacing sections of pipe.

In conclusion, potential impacts on air quality associated with construction and operation of the NGT and TEAL Projects would be minimized by strict adherence to all applicable federal and state

regulations that are designed to be protective of air quality. NEXUS' and Texas Eastern's facilities would comply with the NAAQS that were designed to protect human health, including sensitive populations, and the environment. Each compressor station would be a minor source under all federal air quality permitting programs. Based on the analysis presented above, operation of the new Hanoverton, Wadsworth, Clyde, Waterville, Salineville, and modified Colerain Compressor Stations and the new M&R Stations would not have a significant impact on regional air quality.

4.12.1.4 Radon Exposure

We received comments about the potential exposure to released radon gas. We have recently evaluated general background information, studies, and literature on radon in natural gas in several past project EISs.¹² These studies include samples taken at well sites, pre-processing, post processing, and transmission pipelines and the recent Pennsylvania Department of Environmental Protection's (PADEP) Technologically Enhanced Naturally Occurring Radioactive Materials Study Report issued in January 2015 (PADEP, 2015). This PADEP report is consistent with past studies, which identify indoor radon concentrations ranging from 0.0042 picocuries per liter (pCi/L) to 0.13 pCi/L.

The EPA has set the indoor action level for radon at 4 pCi/L. If concentrations of radon are high enough to exceed these activity levels, the EPA recommends implementing remedial actions, such as improved ventilation, to reduce levels below this threshold. Further, the Indoor Radon Abatement Act established the long-term goal that indoor air radon levels be equal to or better than outdoor air radon levels. The average home in the United States has a radon activity level of 1.3 pCi/L, while outdoor levels average approximately 0.4 pCi/L. Past studies demonstrate that indoor radon concentrations from Marcellus Shale sourced gas would remain below the EPA action level and the Indoor Radon Abatement Act long-term goal. Therefore, we find that the risk of exposure to radon in natural gas is not significant.

We also received comments concerning the potential buildup of decay products (progeny) within the pipeline and the risk of releasing these products to the environment either during pipeline maintenance or the removal of existing pipe. First, we note that without a significant presence of the parent radionuclide (i.e. radon), it is unlikely for there to be a significant presence of progeny. However, to further address this potential, the applicants would clean the pipeline to be removed prior to its being reused for another purpose. The applicants also conduct annual inspections and regular cleaning of their operational pipelines. Any liquids or solids removed during these cleanings would be collected and treated as hazardous material that would be disposed of at a licensed facility in accordance with federal, state, and local regulations. These measures would minimize the risk that any radioactive solids would be released into the environment.

4.12.2 Noise

Construction and operation of the NGT and TEAL Projects may affect overall noise levels in the Projects area. The ambient sound level of a region is defined by the total noise generated within the specific environment and is comprised of natural and man-made sounds. At any location, both the magnitude and frequency of environmental noise may vary considerably over the course of a day and throughout the week. This variation is caused in part by changing weather conditions and the effect of seasonal vegetation cover. As a point of reference, a person's threshold of perception for a noticeable change in loudness is about 3 dBA, whereas a 5 dBA change is clearly noticeable and a 10 dBA change is perceived as either twice or half as loud.

¹² New Jersey-New York Expansion Project Final Environmental Impact Statement (Docket CP1156) issued March 2012, Rockaway Delivery Lateral and Northeast Connector Projects Final Environmental Impact Statement (Dockets CP13-36 and CP13-132) issued February 2014, and the Algonquin Incremental Market Project Final Environmental Impact Statement (Docket CP14-96) issued January 2015.

Two measurements used by some federal agencies to relate the time-varying quality of environmental noise to its known effects on people are the equivalent sound level (L_{eq}) and the L_{dn} . The L_{eq} is a sound level over a specific time period corresponding to the same sound energy as measured for an instantaneous sound level assuming it is a constant noise source. Sound levels are perceived differently, depending on the length of exposure and time of day. The L_{dn} takes into account the time of day and duration the noise is encountered. Specifically, in calculation of the L_{dn} , late night and early morning (10:00 p.m. to 7:00 a.m.) noise exposures are increased by 10 dBA to account for people's greater sensitivity to sound during nighttime hours. Due to the 10 dBA nighttime penalty added prior to calculation of the L_{dn} , for a facility to meet the 55 dBA L_{dn} limit, the facility must be designed such that the constant 24-hour noise level does not exceed an L_{eq} of 48.6 dBA at any NSA. The A-weighted scale is used because human hearing is less sensitive to low and high frequencies than mid-range frequencies.

4.12.2.1 Federal Regulations

In 1974, the EPA published its *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety*. This document provides information for state and local governments to use in developing their own ambient noise standards. The EPA has indicated that an L_{dn} of 55 dBA protects the public from indoor and outdoor activity interference. We have adopted this criterion and used it to evaluate potential noise impacts from the proposed Projects at pre-existing NSAs such as schools, hospitals, and residences. In addition, Commission regulations state that operation of compressor stations may not result in any perceptible increase in vibration at any NSA.

4.12.2.2 State and Local Regulations

The Michigan Public Service Commission has established Rule 324.1015 *Nuisance noise* and Rule 324.1016 *Construction standards for noise abatement at compressors associated with surface facilities* in the Michigan Oil and Gas Regulations. Rule 1015 regulates noise from surface facilities associated with the production of oil, gas, or brine. The NGT Project is not associated with oil, gas, or brine production. Ohio has not established noise regulations that would be applicable to the construction or operation of the NGT and TEAL Projects facilities located in the state.

Ypsilanti Charter Township, Michigan established a local ordinance requiring that noise is limited to 75 dBA during daytime and 70 dBA during nighttime at the property line. However, our noise criterion is generally more stringent. Therefore compliance with the 55 dBA L_{dn} limit at the nearest NSA would result in compliance with this ordinance.

Columbiana County, Ohio requires that noise must be limited to 50 dBA between 10:00 p.m. and 7:00 a.m. or 60 dBA between 7:00 a.m. and 10:00 a.m. at the property boundary of the nearest noise-sensitive receptor. Columbiana County provides exceptions to the ordinance, which include construction organizations/workers during normal operations and permitted blasting activities

Monroe County, Ohio maintains a noise ordinance in its Code of Ordinances, Part 6 – General Offenses, Chapter 632 – Noise Control. This rule prohibits noise between the hours of 10:00 p.m. and 8:00 a.m. that is plainly audible at a distance of 75 feet, including construction noise. Texas Eastern would comply with this ordinance by constructing during daytime hours and meeting the FERC noise criterion. If construction is required prior to 8:00 a.m., Texas Eastern should work with the county to determine appropriate mitigation measures.

No other local noise ordinances were identified. However, if additional local noise ordinances are identified through local permitting processes, NEXUS and Texas Eastern would address them during consultations with the local government.

4.12.2.3 Construction Noise Impacts and Mitigation

Noise would be generated during construction of the pipeline and the aboveground facilities for the NGT and TEAL Projects. Noise levels would be highest in the immediate vicinity of construction activities and would diminish with distance from the work area. These impacts would be localized and temporary. The changing number and type of construction equipment at these sites would result in varying levels of noise. Construction activities associated with the Projects would be performed with standard heavy equipment such as track-excavators, backhoes, cranes, bulldozers, dump trucks, boring equipment, and cement trucks. In addition, various powered pumps would be used to control water in the workspace or during hydrostatic testing activities. Noise would also be generated by trucks and other light vehicles traveling in and near areas under construction. Construction would generally not affect nighttime noise levels as it would be limited to daylight hours, with the exception of HDD activities.

Surface topography, vegetation cover, wind, and weather conditions would also affect the distance that construction-related noise would extend from the workspace. Tall, dense vegetation and rolling topography typically attenuates noise when compared to less vegetated, open land. Typically, the most prevalent sound source during construction would be the internal combustion engines used to power the construction equipment. Table 4.12.2-1 provides estimated noise levels (50 feet from the source) for typical construction equipment.

Equipment Type	Sound Level at 50 Feet (dBA)
Trucks	85
Crane	85
Roller	85
Bulldozers	85
Pickup Trucks	55
Backhoes	80
Grader	85
Portable generators	84
Jackhammer	89
Pumps	81
Horizontal Boring Hydraulic Jack	82

^a FHWA, 2011

Pipeline installation would typically be completed within 6 to 10 weeks at any given location, with the exception of HDD activities discussed below. Construction equipment noise levels would typically be about 85 dBA at 50 feet when equipment is operating at full load, which could be heard by people in nearby buildings. However, most pipeline construction noise would be localized. NEXUS and Texas Eastern would mitigate pipeline construction noise by ensuring that sound muffling devices, which would be provided as standard equipment by the construction equipment manufacturer, are kept in good working order and by limiting the majority of construction to daylight hours. Some discrete activities (e.g., hydrostatic testing, tie-ins, and purge and packing the pipeline) may require 24 hours of activity for limited periods of time. However, these activities would be short-term. Due to the temporary, transitory nature of pipeline construction, we conclude that construction noise would not have a significant impact on nearby landowners.

Blasting

NEXUS and Texas Eastern indicate that blasting could potentially be required in areas of shallow bedrock. As discussed in section 4.1.1.2, blasting would be conducted according to the NGT and TEAL Projects' *Blasting Plans*. Instantaneous sounds levels from blasting would vary based on a number of factors, but typical construction blasting operations have been documented at about 94 dBA at a distance of 50 feet (FHWA, 2011). If necessary, blasting would be relatively instantaneous and short-term in duration and nearby landowners would be notified prior to any blasting activities. Noise from blasting would occur infrequently for very short durations. Based on the limited scope and short-term nature of noise associated with blasting and NEXUS' and Texas Eastern's adherence to its *Blasting Plans*, we conclude that blasting would not result in significant noise impacts on nearby landowners.

Aboveground Facilities

Construction of the compressor stations and M&R stations associated with the NGT Project would occur over a period of several weeks to several months and would occur during daylight hours. Figures 4.12.2-1 through 4.12.2-4 in appendix M depict the NSAs within 0.5 mile of the Hanoverton, Wadsworth, Clyde, and Waterville Compressor Stations, respectively. Figures 4.12.2-5 through 4.12.2-8 in appendix M depict the NSAs within a 0.5-mile radius of M&R Stations MR01, MR02, MR03, MR04, and MR05, respectively. MR02 and MR03 are directly adjacent and are shown in the same figure (figure 4.12.2-6). Noise impacts associated with the NGT Project M&R stations would be short-term and temporary. Figures 4.12.2-9 and 4.12.2-10 depict the NSAs within a 0.5 mile of the Salineville and Colerain Compressor Stations, respectively.

Based on an acoustical analysis for the NGT and TEAL Projects, the noise associated with construction of the compressor stations at the nearest NSA to each station would be as follows:

- Hanoverton Compressor Station: 53 dBA
- Wadsworth Compressor Station: 45 dBA
- Clyde Compressor Station: 54 dBA
- Waterville Compressor Station: 47 dBA
- Salineville Compressor Station: 47 dBA
- Colerain Compressor Station: 55 dBA

Based on the analysis above, the temporary nature of construction and compliance with the 55 dBA L_{dn} criterion, we conclude that construction noise at the aboveground facility sites would not have a significant impact on nearby landowners.

HDD Operations

The NGT Project would include 18 HDD locations. HDD operations would generate noise at drill entry and exit points at specific locations (see table 2.3.2-1 for the location of the proposed HDDs). HDD activities in any one area could last from several weeks to several months depending on the length of the drill and the hardness of the substrate being drilled. Typical equipment used at HDD entry sites includes:

- drilling rig and engine-driven hydraulic power unit;
- engine-driven mud pump(s) and engine-driven generator set(s);

- mud mixing/cleaning equipment;
- mobile equipment including a crane, backhoe, front loader, forklift, and/or trucks(s);
- frac tanks; and
- engine-driven lights.

Noise associated with HDD exit sites could result from use of the following equipment:

- backhoe, side boom, and/or truck(s);
- engine-driven generator and pump; and
- engine-driven lights.

The results of NEXUS' HDD noise assessment are summarized in table 4.12.2-2. Additional NSAs are also present farther from the noise-generating sources at the HDD entry/exit sites; however, NGT Project noise levels at further NSAs in each direction would be lower than presented in table 4.12.2-2 due to additional noise attenuation.

TABLE 4.12.2-2					
Estimated Noise Levels for HDD Entry and Exit Sites Along the NGT Project Route					
HDD Segment (Entry or Exit Site)	Distance and Direction to Closest NSA to HDD Site Center	Ambient L _{dn} (dBA)	Calculated L _{dn} of the HDD Operations (dBA)	L _{dn} of HDD Operations + Ambient L _{dn} (dBA)	Change in the Ambient Sound Level (dB)
HDD #1 (Entry)	600 ft. (NW)	43.3	64.2	64.2	20.9
HDD #1 (Exit)	1,260 ft. (E)	43.3	43.4	46.4	3.1
HDD #2 (Entry)	925 ft. (E)	45.5	59.9	60.0	14.5
HDD #2 (Exit)	460 ft. (N)	38.9	53.2	53.4	14.5
HDD #3 (Entry)	450 ft. (NW)	42.6	66.9	67.0	24.4
HDD #3 (Exit)	830 ft. (NW)	43.3	49.4	50.4	7.1
HDD #4 (Entry)	1,670 ft. (WSW)	42.3	53.7	54.0	11.7
HDD #4 (Exit)	1,820 ft. (NW)	49.7	39.6	49.7	0.4
HDD #5 (Entry)	900 ft. (W)	41.2	59.2	59.2	18.0
HDD #5 (Exit)	1,550 ft. (SSE)	40.2	44.7	46.0	5.8
HDD #6 (Entry)	740 ft. (NW)	43.6	62.1	62.2	18.6
HDD #6 (Exit)	370 ft. (S)	41.1	54.3	54.5	13.4
HDD #7 (Entry)	460 ft. (NW)	43.0	66.7	66.8	23.8
HDD #7 (Exit)	680 ft. (S)	44.6	49.5	50.7	6.1

TABLE 4.12.2-2 (cont'd)					
Estimated Noise Levels for HDD Entry and Exit Sites Along the NGT Project Route					
HDD Segment (Entry or Exit Site)	Distance and Direction to Closest NSA to HDD Site Center	Ambient L _{dn} (dBA)	Calculated L _{dn} of the HDD Operations (dBA)	L _{dn} of HDD Operations + Ambient L _{dn} (dBA)	Change in the Ambient Sound Level (dB)
HDD #8 (Entry)	860 ft. (E)	53.0	60.6	61.3	8.3

TABLE 4.12.2-2 (cont'd)

Estimated Noise Levels for HDD Entry and Exit Sites Along the NGT Project Route					
HDD Segment (Entry or Exit Site)	Distance and Direction to Closest NSA to HDD Site Center	Ambient L _{dn} (dBA)	Calculated L _{dn} of the HDD Operations (dBA)	L _{dn} of HDD Operations + Ambient L _{dn} (dBA)	Change in the Ambient Sound Level (dB)
HDD #8 (Exit)	740 ft. (W)	59.6	50.5	60.1	0.5
HDD #9 (Entry)	590 ft. (NE)	55.8	64.3	64.9	9.1
HDD #9 (Exit)	630 ft. (E)	56.4	50.3	57.3	0.9
HDD #10 (Entry)	490 ft. (E)	56.2	66.1	66.6	10.4
HDD #10 (Exit)	910 ft. (WNW)	56.2	46.7	56.7	0.5
HDD #11 (Entry)	520 ft. (NE)	42.3	65.6	65.6	23.3
HDD #11 (Exit)	450 ft. (N)	44.1	53.5	53.9	9.8
HDD #12 (Entry)	970 ft. (E)	43.3	59.4	59.5	16.2
HDD #12 (Exit)	360 ft. (SW)	43.3	54.5	54.9	11.6
HDD #13 (Entry)	1,080 ft. (SW)	45.3	58.3	58.5	13.2
HDD #13 (Exit)	1,310 ft. (S)	43.6	44.8	47.3	3.7
HDD #14 (Entry)	540 ft. (NW)	39.4	65.2	65.2	25.8
HDD #14 (Exit)	1,080 ft. (S)	39.4	45.0	46.0	6.6
HDD #15 (Entry)	460 ft. (NW)	40.8	66.7	66.7	25.9
HDD #15 (Exit)	720 ft. (S)	46.3	49.0	50.8	4.5
HDD #16 (Entry)	1,300 ft. (NW)	49.0	52.5	54.1	5.1
HDD #16 (Exit)	800 ft. (NE)	53.1	47.9	54.3	1.2
HDD #17 (Entry)	220 ft. (W)	51.1	75.1	75.1	24.0
HDD #17 (Exit)	250 ft. (NW)	60.6	62.2	64.5	3.9
HDD #18 (Entry)	970 ft. (NW)	56.9	53.6	58.6	1.7
HDD #18 (Exit)	>1/2 mile	N/A	N/A	N/A	N/A

Note: **Bold** values indicate sites that could exceed FERC's 55 dBA L_{dn} noise guideline at the nearest NSA or where HDD noise would increase the existing ambient sound level by 10 dBA or greater.

As indicated (in bold) in table 4.12.2-2, 17 of the HDD entry or exit sites could exceed the FERC's 55 dBA L_{dn} noise guideline at the nearest NSA. NEXUS estimates that the work associated with HDD installations would range from 14 to 89 days.

NEXUS is evaluating implementation of specific noise mitigation measures for the proposed HDDs that exceed 55 dBA L_{dn}. The mitigation measures considered include:

- a temporary noise barrier constructed of plywood panels or a sound-absorptive material designed with a minimum Sound Transmission Class rating of 20-31;
- a temporary noise-reducing tent lined with sound-absorptive material covering the workspace or equipment;
- a partial noise barrier or enclosure constructed of plywood panels or a sound-absorptive material placed around the hydraulic power unit and engine-driven pumps;
- "low noise" generators (i.e., with factory designed enclosures);

- residential-grade exhaust silencers on any engines associated with the HDD equipment;
- relocation of the mud mixing/cleaning rig and/or locating equipment, such as the mud rig (if must be outside the workspace tent), such that the tent provides sound shielding; and
- limiting HDD operations to daytime hours, if feasible.

NEXUS would employ these mitigation measures, or other measures that would provide equal reductions, to demonstrate compliance with the FERC’s 55 dBA L_{dn} noise standard. The mitigated noise impacts for the 15 referenced HDD entry or exit locations are estimated in table 4.12.2-3.

HDD Segment (Entry or Exit Site)	Calculated L_{dn} of HDD Operations (dBA) ^a	L_{dn} of HDD Operations + Ambient L_{dn} (dBA)	Change in Ambient Sound Level (dBA)
HDD #1 (Entry)	52.1	52.7	9.4
HDD #2 (Entry)	48.0	49.9	4.4
HDD #3 (Entry)	53.5	53.8	11.2
HDD #5 (Entry)	49.2	49.9	8.7
HDD #6 (Entry)	50.2	51.0	7.4
HDD #7 (Entry)	54.3	54.6	11.6
HDD #8 (Entry)	47.7	54.1	1.1
HDD #9 (Entry)	52.3	57.4	1.6
HDD #10 (Entry)	52.2	57.6	1.4
HDD #11 (Entry)	51.4	51.9	9.6
HDD #12 (Entry)	49.5	50.5	7.2
HDD #13 (Entry)	48.7	50.3	5.0
HDD #14 (Entry)	53.1	53.3	13.9
HDD #15 (Entry)	51.1	51.5	10.7
HDD #17 (Entry)	53.3	55.3	4.2
HDD #17 (Exit)	50.1	61.0	0.4

a Assumes additional noise mitigation measures employed to meet the FERC noise criterion.

In addition to noise mitigation measures, NEXUS would provide affected landowners written notification at least 2 weeks prior to any necessary nighttime HDD operations, including in-person notifications and telephone calls as a secondary means of communication. To ensure that HDD noise levels are not significant, **we recommend that:**

- **NEXUS should file in its weekly construction status reports the following for each HDD entry and exit site:**
 - the noise measurements from the nearest NSA for each drill entry/exit site, obtained at the start of drilling operations;**
 - the noise mitigation that NEXUS implemented at the start of drilling operations; and**

- c. **any additional mitigation measures that NEXUS would implement if the initial noise measurements exceeded an L_{dn} of 55 dBA at the nearest NSA and/or increased noise is greater than 10 dBA over ambient conditions.**

4.12.2.4 Operational Impacts and Mitigation

Pipeline Facilities

Operation of the NGT and TEAL Project pipelines would not typically cause noise impacts, except during pipeline blowdown events at MLV sites, which would occur periodically. However, this noise is localized and short-term, lasting minutes. We received comments about potential impacts on residents due to low frequency sounds waves generated by high pressure natural gas flowing through a pipeline. This type of noise is typically associated with compressor stations that include reciprocating engines, which have been reported to result in a “thumping” or “pulsing” effect along the pipeline downstream from the compressor station. There are mitigation measures that can be installed at these types of compressor stations. However, the proposed compressor units at all compressor stations are turbines, and this issue would not occur.

Aboveground Facilities

A noise analysis was completed for each of the NGT Project M&R stations. Table 4.12.2-4 below summarizes the results. Figures 4.12.2-5 through 4.12.2-8 in appendix M display the nearest NSA to each M&R station.

M&R Station	Distance (ft.)/ Direction	Ambient L_{dn} (dBA)	Estimated L_{dn} due to M&R Station (dBA)	M&R Station L_{dn} + Ambient L_{dn} (dBA)	Change in Ambient Sound Level (dB)
NEXUS/TGP M&R Station (MR01)	850 ft./ (West)	45.0	32.0	45.2	0.2
NEXUS/Kensington M&R Station (MR02) and NEXUS/Texas Eastern M&R Station (MR03) ^a	700 ft. (Northeast)	60.0	35.5	60.0	0.0
NEXUS/Dominion East Ohio M&R Station (MR05)	270 ft. (West)	56.7	49.2	57.4	0.7
Columbia Gas of Ohio M&R Delivery Station	2,200 ft. (Southeast)	41.8	26.0	41.9	0.1
NEXUS/Willow Run M&R Station (MR04)	270 ft. (East)	54.2	43.9	54.6	0.4

^a MR03 would be directly adjacent to MR02 and would impact the same NSA.

Based on the M&R station configuration and mitigation measures, the noise attributable to each M&R station would not exceed the FERC criterion of 55 dBA L_{dn} at the nearest NSAs and would not result in a perceptible noise increase at the nearby NSAs. However, it is our experience that M&R stations may vary widely in terms of actual noise impacts after being placed in service relative to predicted noise impacts from these stations. In addition, two M&R stations are sited within 300 feet of residences. Therefore, to ensure that the actual noise levels resulting from operation of the M&R Stations comply with our noise criterion, **we recommend that:**

- **NEXUS should file a noise survey with the Secretary no later than 60 days after placing the new M&R stations into service. If the noise attributable to the operation of all of the equipment at each M&R station exceeds 55 dBA L_{dn} at the nearest NSA, NEXUS should file a report on what changes are needed and should install the additional noise controls to meet the level within 1 year of the in-service date. NEXUS should confirm compliance with the above requirement by filing a second noise survey for each station with the Secretary no later than 60 days after it installs the additional noise controls.**

The noise impact evaluation for the NGT and TEAL Projects considers the noise produced by all significant sound sources associated with the proposed compressor stations that could impact the sound contribution at nearby NSAs. Significant sound sources include the turbine-driven compressor units, gas cooling equipment, and aboveground gas piping at each station. The noise evaluation incorporates reductions from the proposed noise controls. Noise controls for the compressor buildings include acoustical specifications for wall, roof, and entry door materials; prohibition of windows or skylights; and acoustical specifications for the ventilation system. Noise mitigation for the compressor equipment include the use of mufflers and silencers on turbine exhaust and blowdown units and acoustic blankets for exterior aboveground piping. Table 4.12.2-5 shows the estimated noise impact at the nearest NSAs due to the full load operation of the Hanoverton, Wadsworth, Clyde, and Waterville Compressor Stations. Table 4.12.2-6 shows the estimated noise impact at the nearest NSAs due to the full load operation of the Salineville and Colerain Compressor Stations.

TABLE 4.12.2-5					
Estimated Noise Levels for NGT Project Compressor Stations					
Nearest NSA	Distance (ft.)/Direction	Ambient Sound Level (dBA L_{dn})	Sound Level During Operation (dBA L_{dn})	Station L_{dn} + Ambient L_{dn} (dBA)	Change in Ambient Sound Level (dB)
HANOVERTON COMPRESSOR STATION					
NSA #1	1,040 ft./south-southeast	46.4	51.0	52.3	5.9
NSA #2	1,680 ft./west	45.5	45.9	48.7	3.2
NSA #3	1,800 ft./northeast	41.1	45.2	46.6	5.5
NSA #4	1,740 ft./south	45.5	45.6	48.5	3.0
NSA #5	1,900 ft./southwest	45.5	44.7	48.1	2.6
WADSWORTH COMPRESSOR STATION					
NSA #1	1,800 ft./west	56.7	44.5	57.0	0.3
NSA #2	1,840 ft./west-northwest	46.9	44.2	48.8	1.9
NSA #3	2,490 ft./northeast	48.5	40.7	49.2	0.7
CLYDE COMPRESSOR STATION					
NSA #1	1,450 ft./north-northwest	63.2	46.4	63.3	0.1
NSA #2	810 ft./southwest	51.8	52.7	55.3	3.5
NSA #3	1,160 ft./southeast	53.4	48.9	54.7	1.3
WATERVILLE COMPRESSOR STATION					
NSA #1	1,390 ft./east	60.6	48.0	60.8	0.2
NSA #2	1,990 ft./north	48.6	43.8	49.9	1.3
NSA #3	3,790 ft./west	41.5	36.0	42.6	1.1
NSA #4	1,600 ft./southeast	60.6	46.0	60.7	0.1

TABLE 4.12.2-6

Estimated Noise Levels for TEAL Project Compressor Stations					
Nearest NSA	Distance (ft)/ Direction	Ambient Sound Level L_{dn} (dBA)	Estimated L_{dn} of Station during Operation (dBA)	Station L_{dn} + Ambient L_{dn} (dBA)	Change in Ambient Sound Level (dB)
SALINEVILLE COMPRESSOR STATION					
NSA #1	1,490 ft./north	39.7	43.7	45.2	5.5
NSA #2	1,660 ft./west	43.8	42.6	46.2	2.4
NSA #3	1,910 ft./west-northwest	43.8	41.0	45.6	1.8
NSA #4	2,200 ft./northeast	39.7	39.4	42.6	2.9
COLERAIN COMPRESSOR STATION ^A					
NSA #1	1,880 ft./west	45.0 ^b	42.2	46.8	1.8
NSA #2	2,140 ft./south-southeast	43.6 ^b	40.3	45.3	1.7
NSA #3	2,100 ft./north-northeast	43.7 ^b	41.7	45.8	2.1
a	Existing station sound level at the NSA is based on previously measured ambient sound data and the results of a recent acoustical analysis of the compressor station for the OPEN Project, FERC Docket No. CP14-68-000.				

The results of the acoustical analyses indicate that the sound contribution of the compressor stations would remain below our 55 dBA L_{dn} criterion at the nearest NSAs during operation. The highest increase in noise would occur at NSA 1 for the Hanoverton Compressor Station (5.9 dBA). While the increase at this NSA would be noticeable, it would not be significant.

Landowners near the proposed Hanoverton Compressor Station expressed concern with the noise levels resulting from compressor station operations and blowdowns, and that loud and unpredictable noises from a blowdown may startle horses and cause injury. A blowdown involves the venting of natural gas from compressor station components into the atmosphere. Most blowdowns occur as a result of system testing or maintenance activities, and NEXUS would incorporate blowdown silencers to minimize noise during planned blowdowns. In addition, projected sound levels associated with planned blowdown events are also estimated to remain below 55 dBA L_{dn} at the nearest NSAs at each compressor station and would be infrequent, lasting from 1 to 5 minutes. Unsilenced station blowdowns would occur in the event of an emergency. Horses and cattle may be close to blowdown events and experience noise levels greater than the 55 dBA L_{dn} criterion.

Landowners near the Waterville Compressor Station expressed concern regarding the potential for excessive noise levels in the vicinity of the Waterville Compressor Station. The results in table 4.12.2-5 indicate that the Waterville Compressor Station would be below the FERC criterion and would represent an increase of 1.3 dBA or less at the nearest NSA (i.e., would not result in a noticeable increase in noise).

We received comments regarding the potential for low frequency vibrations to cause or exacerbate health issues near compressor stations associated with the Projects. FERC regulations require that applicants show that a new compressor station or modification of an existing station should not result in a perceptible increase in vibration at any NSA. This would apply to both the NGT and TEAL Projects compressor stations. FERC staff would investigate noise and vibration complaints, and to the extent that a violation is documented, each company would be required to address the issue.

To ensure that the actual noise levels resulting from operation of the Hanoverton, Wadsworth, Clyde, and Waterville Compressor Stations are not significant, **we recommend that:**

- **NEXUS should file a noise survey with the Secretary no later than 60 days after placing each of the NGT Project compressor stations in service. If a full load condition noise survey is not possible, NEXUS should instead file an interim survey at the maximum possible hp load and file the full load survey within 6 months. If the noise attributable to the operation of all of the equipment at any station under interim or full hp load exceeds 55 dBA L_{dn} at any nearby NSA, NEXUS should file a report on what changes are needed and should install the additional noise controls to meet the level within 1 year of the in-service date. NEXUS should confirm compliance with the 55 dBA L_{dn} requirement by filing a second noise survey with the Secretary no later than 60 days after it installs the additional noise controls.**

To ensure that the actual noise levels resulting from operation of the Salineville and Colerain Compressor Stations are not significant, **we recommend that:**

- **Texas Eastern should file a noise survey with the Secretary no later than 60 days after placing each of the TEAL Project compressor stations in service. If a full load condition noise survey of the entire station is not possible, Texas Eastern should instead file an interim survey at the maximum possible hp load and file the full load survey within 6 months. If the noise attributable to the operation of all of the equipment at any compressor station under interim or full hp load conditions exceeds 55 dBA L_{dn} at any nearby NSAs, Texas Eastern should file a report on what changes are needed and should install the additional noise controls to meet the level within 1 year of the in-service date. Texas Eastern should confirm compliance with the 55 dBA L_{dn} requirement by filing a second noise survey with the Secretary no later than 60 days after it installs the additional noise controls.**

Based on the noise analyses for the NGT and TEAL Projects M&R Stations and compressor stations, mitigation measures NEXUS and Texas Eastern would employ, and adherence to our noise criterion of 55 dBA L_{dn} (including station blowdowns), we conclude that the noise resulting from operation of the NGT and TEAL Projects would not have a significant impact on the surrounding ambient noise environment.

4.13 RELIABILITY AND SAFETY

The transportation of natural gas by pipeline involves some incremental risk to the public due to the potential for an accidental release of natural gas. The greatest hazard is a fire or explosion following a major pipeline rupture.

CH₄, the primary component of natural gas, is colorless, odorless, and tasteless. It is not toxic but is classified as a simple asphyxiate, possessing a slight inhalation hazard. If breathed in high concentration, oxygen deficiency can result in serious injury or death.

CH₄ has an auto-ignition temperature of 1,000 °F and is flammable at concentrations between 5.0 and 15.0 percent in air. At atmospheric temperatures, CH₄ is buoyant and disperses rapidly in air. An unconfined mixture of CH₄ and air is not explosive; however, it may ignite if there is an ignition source. A flammable concentration within an enclosed space in the presence of an ignition source can explode.

4.13.1 Safety Standards

The DOT is mandated to provide pipeline safety under Title 49 USC Chapter 601. PHMSA's Office of Pipeline Safety administers the national regulatory program to ensure the safe transportation of natural gas and other hazardous materials by pipeline. It develops safety regulations and other approaches to risk management that ensure safety in the design, construction, testing, operation, maintenance, and emergency response of pipeline facilities. Many of the regulations are written as performance standards that set the level of safety to be attained and allow the pipeline operator to use various technologies to achieve the required safety standard.

We received comments from landowners about the need for safety inspections of the construction activities. PHMSA ensures that people and the environment are protected from the risk of pipeline incidents. This work is shared with state agency partners and others at the federal, state, and local level. The DOT provides for a state agency to assume all aspects of the safety program for intrastate facilities by adopting and enforcing the federal standards. A state may also act as the DOT's agent to inspect interstate facilities within its boundaries. Ohio and Michigan perform inspections on interstate natural gas pipeline facilities. The DOT is also responsible for enforcement action in all of the Projects' states. In addition to DOT inspections, NEXUS' and Texas Eastern's contractors, including construction workers, would be required to adhere to federal and state safety regulations and recommendations.

The DOT pipeline standards are published in 49 CFR 190-199. Part 192 specifically addresses the minimum federal safety standards for transportation of natural gas by pipeline. Under a *Memorandum of Understanding on Natural Gas Transportation Facilities* (Memorandum) dated January 15, 1993, between DOT and FERC, DOT has the exclusive authority to promulgate federal safety standards used in the transportation of natural gas. Section 157.14(a)(9)(vi) of FERC's regulations requires that an applicant certify that it would design, install, inspect, test, construct, operate, replace, and maintain the facility for which a Certificate is requested in accordance with federal safety standards and plans for maintenance and inspection, or certify that it has been granted a waiver of the requirements of the safety standards by the DOT in accordance with Section 3(e) of the Natural Gas Pipeline Safety Act. FERC accepts this certification and does not impose additional safety standards. If the Commission becomes aware of an existing or potential safety problem, there is a provision in the Memorandum to promptly alert DOT. The Memorandum also provides for referring complaints and inquiries made by state and local governments and the general public involving safety matters related to pipelines under the Commission's jurisdiction.

FERC also participates as a member of the DOT's Technical Pipeline Safety Standards Committee, which determines if proposed safety regulations are reasonable, feasible, and practicable.

The pipeline and aboveground facilities associated with the NGT and TEAL Projects must be designed, constructed, operated, and maintained in accordance with the DOT Minimum Federal Safety Standards in 49 CFR 192. The regulations are intended to ensure adequate protection for the public and to prevent natural gas facility accidents and failures. The DOT specifies material selection and qualification, minimum design requirements, and protection from internal, external, and atmospheric corrosion. NEXUS and Texas Eastern have stated that the project facilities would be designed, constructed, operated, and maintained in accordance with 49 CFR 192.

The DOT also defines area classifications, based on population density in the vicinity of pipeline facilities, and specifies 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 1-mile length of pipeline. The four area classifications are defined as:

- Class 1: Location with 10 or fewer buildings intended for human occupancy.

- Class 2: Location with more than 10 but less than 46 buildings intended for human occupancy.
- Class 3: Location with 46 or more buildings intended for human occupancy or where the pipeline lies within 100 yards of any building, or small well-defined outside area occupied by 20 or more people on at least 5 days a week for 10 weeks in any 12-month period.
- Class 4: Location where buildings with four or more stories aboveground are prevalent.

Class locations representing more populated areas require higher safety factors in pipeline design, testing, and operation. For example, pipelines constructed on land in Class 1 locations must be installed with a minimum depth of cover of 30 inches in normal soil and 18 inches in consolidated rock. Class 2, 3, and 4 locations, as well as drainage ditches of public roads and railroad crossings, require a minimum cover of 36 inches in normal soil and 24 inches in consolidated rock.

Class locations also specify the maximum distance to a sectionalizing block valve (i.e., 10.0 miles in Class 1, 7.5 miles in Class 2, 4.0 miles in Class 3, and 2.5 miles in Class 4 locations). Pipe wall thickness and pipeline design pressures, hydrostatic test pressures, Maximum Allowable Operating Pressure (MAOP), inspection and testing of welds, and frequency of pipeline patrols and leak surveys must also conform to higher standards in more populated areas.

Class locations for the NGT and TEAL Projects have been determined based on the relationship of the pipeline centerline to other nearby structures and manmade features. Table 4.13.1-1 provides the class locations by milepost for the NGT Project pipeline. In addition, each of the proposed NGT Project compressor stations would be in Class 1 areas. The TEAL Project would only consist of Class 1 pipe.

If a subsequent increase in population density adjacent to the right-of-way results in a change in class location for the pipeline, NEXUS and Texas Eastern would reduce the MAOP or replace the segment with pipe of sufficient grade and wall thickness, if required to comply with DOT requirements for the new class location.

TABLE 4.13.1-1

NGT Project Pipeline Class Locations

State, County	Class 1 ^c			Class 2 ^c			Class 3 ^c		
	MP Start ^a	MP End ^a	Length (miles) ^b	MP Start ^a	MP End ^a	Length (miles) ^b	MP Start ^a	MP End ^a	Length (miles) ^b
OHIO									
Columbiana	0.0	0.9	0.9	0.1	0.2	0.1	0.2	0.5	0.3
	0.0	0.1	0.1	0.5	0.6	0.1	N/A	N/A	N/A
	0.6	0.9	0.3	0.9	1.3	0.4	N/A	N/A	N/A
	1.3	1.5	0.2	1.5	3.0	1.5	N/A	N/A	N/A
	3.0	4.6	1.6	4.6	4.8	0.2	N/A	N/A	N/A
	4.8	5.3	0.5	5.3	5.8	0.5	N/A	N/A	N/A
	5.8	6.1	0.3	6.1	6.6	0.5	N/A	N/A	N/A
	6.6	6.8	0.2	6.8	7.3	0.5	N/A	N/A	N/A
	7.3	7.5	0.2	7.5	7.9	0.4	N/A	N/A	N/A
	7.9	9.7	1.8	9.7	10.7	1.0	N/A	N/A	N/A
Stark	10.7	11.0	0.3	11.0	11.6	0.6	N/A	N/A	N/A
	11.6	12.3	0.7	12.3	12.5	0.2	N/A	N/A	N/A
	12.7	13.0	0.3	12.5	12.7	0.1	31.9	34.1	2.2
	13.6	13.8	0.2	13.0	13.6	0.6	N/A	N/A	N/A
	14.5	18.2	3.7	13.8	14.5	0.7	N/A	N/A	N/A
	18.7	21.8	3.1	18.2	18.7	0.6	N/A	N/A	N/A
	22.4	26.3	3.8	21.8	22.4	0.6	N/A	N/A	N/A
	26.5	26.8	0.2	26.3	26.5	0.2	N/A	N/A	N/A
	27.4	29.2	1.8	26.8	27.4	0.7	N/A	N/A	N/A
	29.5	30.0	0.5	29.2	29.5	0.3	N/A	N/A	N/A
Summit	30.5	31.1	0.6	30.0	30.5	0.5	N/A	N/A	N/A
	31.5	31.9	0.5	31.1	31.5	0.4	31.9	33.5	1.6
	N/A	N/A	N/A	33.5	33.6	0.1	33.6	34.2	0.6
	34.2	34.5	0.3	34.5	35.3	0.8	34.2	34.2	0.02
	35.3	35.8	0.5	35.8	36.4	0.6	36.4	37.6	1.2
	40.4	41.0	0.6	41.0	41.9	0.9	41.8	43.0	1.2
	41.9	41.9	0.04	36.4	37.0	0.6	41.9	43.0	1.1
	N/A	N/A	N/A	43.0	43.2	0.2	43.2	43.8	0.6
	N/A	N/A	N/A	43.8	43.9	0.1	N/A	N/A	N/A
	43.9	44.1	0.2	44.1	45.8	1.6	N/A	N/A	N/A
Wayne	45.8	45.9	0.1	45.9	47.1	1.1	N/A	N/A	N/A
	47.1	48.6	1.6	48.6	49.0	0.4	N/A	N/A	N/A
	49.0	49.2	0.2	48.6	49.0	0.4	49.2	50.2	1.0
	N/A	N/A	N/A	50.2	50.4	0.1	N/A	N/A	N/A
	50.6	51.2	0.6	50.4	50.6	0.2	N/A	N/A	N/A
	51.7	51.8	0.1	51.2	51.7	0.5	N/A	N/A	N/A
	52.2	52.4	0.2	51.8	52.2	0.4	52.4	54.0	1.6
	55.0	55.5	.05	54.0	55.0	1.0	N/A	N/A	N/A
	55.9	56.2	0.3	55.5	55.9	0.4	N/A	N/A	N/A
	N/A	N/A	N/A	56.2	56.6	0.4	N/A	N/A	N/A
N/A	N/A	N/A	57.2	57.3	0.1	57.3	57.5	0.	
N/A	N/A	N/A	57.5	57.7	0.2	N/A	N/A	N/A	
N/A	N/A	N/A	56.6	57.2	0.6	N/A	N/A	N/A	

TABLE 4.13.1-1 (cont'd)

NGT Project Pipeline Class Locations									
State, County	Class 1 ^c			Class 2 ^c			Class 3 ^c		
	MP Start ^a	MP End ^a	Length (miles) ^b	MP Start ^a	MP End ^a	Length (miles) ^b	MP Start ^a	MP End ^a	Length (miles) ^b
Medina	58.6	59.2	0.6	57.7	58.6	0.9	N/A	N/A	N/A
	59.7	60.0	0.3	59.2	59.7	0.5	N/A	N/A	N/A
	60.5	65.3	4.9	60.0	60.5	0.5	N/A	N/A	N/A
	66.1	67.5	1.5	65.3	66.1	0.7	N/A	N/A	N/A
	68.6	71.6	3.0	67.5	67.9	0.4	67.9	68.9	0.9
	73.0	73.4	0.4	68.9	69.5	0.7	N/A	N/A	N/A
	69.5	71.6	2.2	71.6	73.0	1.4	N/A	N/A	N/A
	73.0	73.3	0.3	73.3	74.3	1.0	N/A	N/A	N/A
	74.3	75.8	1.4	75.8	76.6	0.8	N/A	N/A	N/A
	76.6	76.8	0.2	76.8	77.2	0.4	N/A	N/A	N/A
Lorain	77.2	80.5	3.3	N/A	N/A	N/A	N/A	N/A	N/A
	80.5	82.4	2.0	82.4	82.9	0.4	N/A	N/A	N/A
	82.9	93.3	10.4	93.5	93.8	0.3	93.3	93.5	0.2
	93.8	94.4	0.6	95.3	95.4	0.1	94.4	95.4	1.0
	95.4	98.3	2.9	98.3	98.7	0.4	N/A	N/A	N/A
	98.7	98.9	0.2	98.9	99.4	0.5	N/A	N/A	N/A
	99.4	99.8	0.5	99.8	100.2	0.3	N/A	N/A	N/A
	100.2	100.4	0.2	100.4	100.8	0.4	N/A	N/A	N/A
	100.8	101.1	0.3	101.1	101.3	0.2	N/A	N/A	N/A
	101.5	104.7	3.2	101.3	101.5	0.2	N/A	N/A	N/A
Huron	104.7	111.0	6.3	111.0	111.4	0.4	N/A	N/A	N/A
	111.4	111.6	0.3	111.6	112.3	0.7	N/A	N/A	N/A
	112.3	116.8	4.5	116.8	117.5	0.7	N/A	N/A	N/A
	117.5	125.6	8.0	125.6	126.0	0.4	N/A	N/A	N/A
	126.0	126.1	0.1	126.1	126.5	0.3	N/A	N/A	N/A
	126.5	127.3	0.8	127.3	127.9	0.6	N/A	N/A	N/A
Sandusky	127.9	129.9	2.0	129.9	131.0	1.1	N/A	N/A	N/A
	131.0	131.5	0.5	N/A	N/A	N/A	N/A	N/A	N/A
	131.5	145.8	14.3	145.8	146.6	0.8	N/A	N/A	N/A
	146.6	147.2	0.6	146.3	146.6	0.3	N/A	N/A	N/A
	147.7	153.6	5.9	147.2	147.7	0.5	N/A	N/A	N/A
	155.0	157.3	2.3	153.6	154.0	0.5	154.0	155.0	1.0
	157.8	158.0	0.1	157.3	157.8	0.5	N/A	N/A	N/A
	158.3	162.7	4.4	158.0	158.3	0.4	N/A	N/A	N/A
	163.3	163.5	0.2	162.7	163.3	0.5	N/A	N/A	N/A
	N/A	N/A	N/A	163.5	163.7	0.2	N/A	N/A	N/A
Wood	164.0	164.2	0.2	163.7	164.0	0.2	N/A	N/A	N/A
	164.8	165.0	0.2	164.2	164.8	0.7	164.8	165.0	0.2
	165.3	173.3	8.0	165.0	165.3	0.3	N/A	N/A	N/A
	173.7	173.8	0.1	173.3	173.7	0.4	N/A	N/A	N/A
	174.1	181.5	7.3	173.8	174.1	0.3	N/A	N/A	N/A
Lucas	181.5	181.6	0.2	N/A	N/A	N/A	181.6	181.9	0.2
	181.9	187.2	5.3	187.8	189.0	1.2	187.2	187.8	0.6
	189.0	189.0	0.1	189.0	189.3	0.3	N/A	N/A	N/A
Henry	189.5	190.0	0.5	189.3	189.5	0.2	N/A	N/A	N/A
	N/A	N/A	N/A	190.0	190.2	0.2	N/A	N/A	N/A
Fulton	190.4	193.2	2.8	190.2	190.4	0.2	N/A	N/A	N/A
	194.0	194.6	0.7	193.2	194.0	0.8	N/A	N/A	N/A
	195.0	195.1	0.1	194.6	195.0	0.3	N/A	N/A	N/A
	196.4	204.7	8.3	195.1	196.4	1.3	N/A	N/A	N/A
	205.1	208.3	3.2	204.7	205.1	0.4	N/A	N/A	N/A

TABLE 4.13.1-1 (cont'd)

NGT Project Pipeline Class Locations									
State, County	Class 1 ^c			Class 2 ^c			Class 3 ^c		
	MP Start ^a	MP End ^a	Length (miles) ^b	MP Start ^a	MP End ^a	Length (miles) ^b	MP Start ^a	MP End ^a	Length (miles) ^b
MICHIGAN									
Lenawee	208.3	230.4	22.1	N/A	N/A	N/A	N/A	N/A	N/A
Monroe	230.4	236.8	6.5	N/A	N/A	N/A	N/A	N/A	N/A
	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Washtenaw	236.8	244.2	7.4	244.2	244.5	0.4	N/A	N/A	N/A
	244.5	244.7	0.1	244.7	245.2	0.5	245.2	245.3	0.1
	245.5	247.2	1.7	245.3	245.5	0.2	249.6	250.3	0.7
	248.4	248.5	0.1	247.2	247.6	0.4	247.6	248.2	0.6
	248.4	248.5	0.1	248.2	248.4	0.2	248.5	248.9	0.4
	249.3	249.4	0.1	248.9	249.3	0.5	N/A	N/A	N/A
	250.3	250.8	0.5	249.4	249.6	0.2	249.6	250.3	0.7
	N/A	N/A	N/A	N/A	N/A	N/A	250.8	253.0	2.2
	253.3	253.7	0.4	253.0	253.3	0.3	253.7	253.9	0.2
	253.9	254.5	0.6	254.5	254.7	0.2	254.7	254.9	0.2
	254.9	255.0	0.1	N/A	N/A	N/A	N/A	N/A	N/A

a Approximate milepost along the proposed pipeline rounded to the nearest 0.1 mile
b Crossing length of each pipeline class within each county
c Class 1: Location with 10 or fewer buildings for human occupancy
Class 2: Location with more than 10 but fewer than 46 buildings intended for human occupancy
Class 3: Location with 46 or more buildings intended for human occupancy or where pipeline lies within 100 yards of any building, or small, well-defined outside area occupied by 20 or more people during normal use
Class 4: Location where buildings with four or more stories aboveground are prevalent
N/A = not applicable

The DOT Pipeline Safety Regulations require operators to develop and follow a written Integrity Management Program (IMP) that contains all the elements described in 49 CFR 192.911 and addresses the risks on each transmission pipeline segment. Specifically, the rule establishes an IMP that applies to all HCA.

The DOT has published rules in 49 CFR 192.903 that define HCAs where a gas pipeline accident could do considerable harm to people and their property, and requires an IMP to minimize the potential for an accident. This definition satisfies, in part, the Congressional mandate for DOT to prescribe standards that establish criteria for identifying each gas pipeline facility in a high-density population area.

The HCAs may be defined in one of two ways. In the first method, an HCA includes:

- current Class 3 and 4 locations;
- any area in Class 1 or 2 where the potential impact radius¹³ is greater than 660 feet and there are 20 or more buildings intended for human occupancy within the potential impact circle¹⁴; or
- any area in Class 1 or 2 where the potential impact circle includes an identified site.

¹³ The potential impact radius is calculated as the product of 0.69 and the square root of the MAOP of the pipeline in pounds per square inch (gauge), multiplied by the square of the pipeline diameter in inches.

¹⁴ The potential impact circle is a circle of radius equal to the potential impact radius.

An “identified site” is an outside area or open structure that is occupied by 20 or more persons on at least 50 days in any 12-month period; a building that is occupied by 20 or more persons on at least 5 days a week for any 10 weeks in any 12-month period; or a facility that is occupied by persons who are confined, are of impaired mobility, or would be difficult to evacuate.

In the second method, an HCA includes any area within a potential impact circle that contains:

- 20 or more buildings intended for human occupancy; or
- an identified site.

We received numerous comments regarding the safety of homes, schools, daycares, hospitals, etc., that would be within the potential impact radius for the NGT Project pipeline, which would be 943 feet. For the NGT Project compressor stations, the potential impact radius also would be 943 feet. The potential impact radius is designed to identify locations where additional safety measures are required to ensure and promote pipeline safety in populated areas. NEXUS would develop a Public Awareness Program as outlined in 49 CFR 192.616, which would provide outreach measures to the affected public, emergency responders, and public officials. NEXUS’ program would use multiple media channels (e.g., direct mail, e-mail, social networking, public service announcements, print advertisement, and public meetings) to engage these core audiences. In addition, NEXUS would also mail informational brochures to landowners, businesses, potential excavators, and public officials along the pipeline system each year to inform them of the presence of the pipeline and instruct them on how to recognize and react to unusual activity in the area. These brochures would provide emergency contact phone numbers and reinforce the need for excavators to use the “811 Call Before You Dig” service.

We also received numerous comments regarding the need for required setbacks for homes and structures in relation to pipelines, in reference to 49 CFR 195.210; however this regulation is only applicable to pipelines transporting hazardous liquids. The DOT regulations applicable to the NEXUS and TEAL Projects under 49 CFR 192 for pipelines transporting natural gas do not have a similar setback provision. As discussed throughout this section, the DOT maintains and enforces pipeline safety regulations. The Commission sites pipelines in cooperation with the DOT under a memorandum of understanding. At this time there are no established setback requirements for natural gas pipeline facilities.

Once a pipeline operator has determined the HCAs along its pipeline, it must apply the elements of its IMP to those sections of the pipeline within HCAs. DOT regulations specify the requirements for the IMP at Section 192.911. The HCAs for the Projects have been determined based on the relationship of the pipeline centerline to other nearby structures and identified sites. Table 4.13.1-2 lists the HCAs for the NGT Project, which have been determined using the second method. The NGT Project compressor stations would not be constructed in HCAs. There are no HCAs located along the proposed facilities associated with the TEAL Project.

State, Facility Name, County	Milepost Begin ^a	Milepost End ^a	Length (miles) ^b
OHIO			
Mainline			
Columbiana	0.0	0.8	0.8
Columbiana	1.5	2.4	0.9
Stark	18.1	18.9	0.8
Stark	29.2	29.8	0.6

TABLE 4.13.1-2 (cont'd)

Location of High Consequence Areas along the NGT Project Pipeline Facilities

State, Facility Name, County	Milepost Begin ^a	Milepost End ^a	Length (miles) ^b
Stark	31.9	34.2	2.3
Summit	34.2	34.3	0.1
Summit	34.8	35.3	0.5
Summit	36.3	37.8	1.4
Summit	38.4	38.8	0.4
Summit	38.8	39.4	0.6
Summit	39.6	40.1	0.5
Summit	41.1	41.8	0.8
Summit	42.0	43.3	1.3
Summit	43.3	43.9	0.7
Summit	44.7	45.2	0.5
Summit	49.1	50.2	1.1
Wayne	51.7	52.1	0.5
Wayne	52.3	54.1	1.8
Wayne	56.3	56.5	0.3
Medina	57.0	57.3	0.3
Wayne	57.3	57.7	0.4
Medina	62.3	62.8	0.5
Medina	64.6	65.1	0.5
Medina	67.7	69.1	1.5
Medina	70.0	71.4	1.4
Medina	72.9	74.0	1.1
Medina	76.1	76.5	0.4
Lorain	93.0	93.8	0.8
Lorain	94.3	95.6	1.3
Erie	116.8	117.8	1.0
Erie	118.2	119.6	1.4
Erie	120.1	120.6	0.5
Erie	130.5	131.1	0.6
Sandusky	138.6	139.2	0.6
Sandusky	145.9	146.6	0.8
Sandusky	153.9	155.1	1.2
Wood	164.5	165.3	0.8
Wood	181.4	181.5	0.1
Lucas	181.5	182.2	0.7
Lucas	187.2	188.0	0.8
		Ohio Total	32.9
MICHIGAN			
Mainline			
Washtenaw	244.5	245.7	1.2
Washtenaw	247.6	255.0	7.4
		Michigan Total	8.6
		Project Total	41.5
^a	Approximate mileposts along the proposed pipeline have been rounded to the nearest 0.1 mile		
^b	Crossing length of segment within county		

As previously discussed and required by PHMSA regulations, the pipelines and aboveground facilities would be designed, constructed, operated, and maintained to meet or exceed the requirements at 49 CFR 192. The general construction methods that NEXUS and Texas Eastern would implement to ensure the safety of the Projects are described in section 2.3, including welding, inspection, and integrity testing procedures. NEXUS and Texas Eastern identified the following voluntary safety measures that would be implemented and are more stringent than the requirements in 49 CFR 192:

- minimum depth of cover of 36 inches is required over the proposed pipeline for all pipeline Class locations and geological conditions;
- all welding, coating, and backfilling activities would be inspected;
- all welds would be non-destructively examined by an independent radiographic inspection company, regardless of Class location;
- remote-controlled valves and monitoring equipment would be installed for all MLVs;
- spacing of MLVs would be based on population density and 49 CFR 192 area classifications;
- valves would be installed as close to roads as possible to provide good access;
- all mainline piping would have at least 16 mils nominal thickness of epoxy coating; and
- the minimum pressure for pressure tests, based upon the pipeline MAOP, would be greater than the operating pressure of the pipeline.

The DOT prescribes the minimum standards for operating and maintaining pipeline facilities, including the requirement to establish a written plan governing these activities. Each pipeline operator is required to establish an emergency plan that includes procedures to minimize the hazards in a natural gas pipeline emergency. Key elements of the plan include procedures for:

- 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;
- emergency system shutdown and safe restoration of service;
- making personnel, equipment, tools, and materials available at the scene of an emergency; and
- protecting people first and then property, and making them safe from actual or potential hazards.

We received several comments indicating that local first responders along the NGT Project pipeline route were not capable of responding to a pipeline incident. NEXUS stated that its employees and local emergency response personnel would meet for emergency drills periodically to test staff readiness and identify improvement opportunities. In accordance with 49 CFR 192.615, NEXUS would develop,

maintain, and implement a written emergency response plan to minimize the hazards from a pipeline emergency. Key features would include:

- identifying, verifying, and classifying emergency events – leaks, fires, explosions, or natural disasters;
- managing communications with emergency responders and public officials to establish incident command and coordinate response efforts;
- making personnel, equipment, tools, and materials available for emergencies;
- ensuring that response efforts focus on public safety first; and
- ensuring emergency shutdown actions are taken in a timely manner.

The DOT regulations specified in 49 CFR 192 require that pipeline operators establish and maintain liaison with appropriate fire, police, and public officials to learn the resources and responsibilities of each organization that may respond to a natural gas pipeline emergency and to coordinate mutual assistance. Pipeline operators 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 appropriate public officials. NEXUS and Texas Eastern would provide the appropriate training to local emergency service personnel before the pipeline is placed in service. NEXUS would also provide pipeline location information in the National Pipeline Mapping System to inform the public and others of the general location of their pipeline facilities.

The DOT also requires pipeline operators to place pipeline markers identifying the owner of the pipe and a 24-hour telephone number, as close as practical over each buried pipeline at each crossing of a public road and railroad, and wherever necessary to identify the location of the pipeline to reduce the possibility of damage or interference. Pipeline right-of-way markers can help prevent encroachment and excavation-related damage to pipelines. Because the right-of-way is much wider than the pipeline itself and a pipeline can be anywhere within the right-of-way, state laws require excavators to call their state One Call center well in advance of digging to locate underground utilities and ensure it is safe for the contractor to dig in that location.

We received several comments regarding the potential for pipeline leaks. Several commenters expressed concern regarding methane leaks from the pipeline causing soil and waterbody contamination. Commenters also expressed concern for pipeline leaks resulting in power line accidents where the proposed pipeline would be co-located with power lines. In accordance with DOT regulations, NGT and TEAL Projects facilities would be regularly inspected for leakage as part of scheduled operations and maintenance, including:

- physically walking and inspecting the pipeline corridor periodically;
- conducting fly-over inspections of the right-of-way as required; and
- conducting leak surveys at least once every calendar year or as required by regulations.

In addition to the DOT-required surveys described previously, NEXUS and Texas Eastern would monitor portions of its pipeline system using a supervisory control and data acquisition system. This system would gather information related to system pressures, flows, and customer deliveries 24 hours per day, 365 days per year. Finally, methane is lighter than air and at typical pipeline burial depths (i.e., 30 to 36 inches)

it migrates through soil and water before dispersing into the atmosphere. Further, fugitive pipeline leaks generally occur at valves sites, fittings, and other aboveground and/or connection points at very low levels. Because methane is lighter than air, the gas would disperse into the atmosphere; therefore the methane concentration would not be high enough to cause a power line incident. Pipeline operators use in-line inspection tools to detect internal pipe anomalies, including deformations and metal loss. In addition, there are remote-controlled valves along the route and should a major leak occur, natural gas can be isolated and evacuated from that portion of the line to allow for repairs. For these reasons, it is unlikely that a pipeline leak would result in methane levels in soil or water that would cause significant environmental impacts on these resources along the pipeline routes; it is also unlikely that a pipeline leak would result in a power line incident.

We received comments from numerous citizens expressing concern about impacts on residences and public safety resulting from operation of the proposed compressor stations associated with the NGT and TEAL Projects. Residents expressed concerns for public recreation areas, schools, homes, businesses, and large populations in the event of a pipeline accident. As discussed previously, the compressor stations for the NGT and TEAL Projects would be designed, constructed, operated, and maintained in accordance with the DOT Minimum Federal Safety Standards in 49 CFR 192. These regulations include more stringent design criteria for facilities located near populated areas, public use areas, and schools. In addition to the general safety procedures discussed previously, NEXUS and Texas Eastern would also implement the following specific safety measures at its proposed compressor stations:

- Each compressor station would be completely surrounded by a chain link fence with barbed wire to maintain the safety of the facility and workers.
- A controlled access system and intrusion alarm network would be installed to restrict access to authorized personnel and the facilities would be monitored with video cameras.
- Compressor buildings would be constructed of noncombustible material and ventilated to minimize the potential of gas accumulating in enclosed areas.
- Compressor stations would be equipped with automatic emergency detection and shutdown systems that include sensors for detecting natural gas concentrations as well as sensors for detecting flames. The system would be maintained and tested routinely to ensure proper operation.
- Compressor station equipment would be designed to shut down automatically if system operation deviates from its designed operating limits, which could cause a mechanical failure and pose risk to personnel and equipment, or otherwise constitute a hazard. The compressor stations would also be equipped with relief valves to protect the piping from over-pressurization.
- Fire protection, first aid, and safety equipment would be maintained at the compressor stations, and NEXUS' and Texas Eastern's emergency response personnel would be trained in proper equipment use and in first aid.

The most effective and immediate way to begin to address a gas pipeline rupture is to shut off the gas source. NEXUS would have valves spaced along the pipeline that can be used to shut off the gas and isolate each pipeline segment. In an emergency, NEXUS and Texas Eastern would rely on the local emergency services (e.g., fire and police) to communicate with the public.

We received comments from landowners about the need for safety inspections of the construction activities. NEXUS' and Texas Eastern's contractors, including construction workers, would be required to adhere to federal and state safety regulations and recommendations. In addition, FERC staff or its contractors would routinely inspect construction activities to ensure environmental compliance.

Based on NEXUS' and Texas Eastern's compliance with federal design and safety standards and their implementation of the aforementioned safety measures, we conclude that constructing and operating the pipeline facilities would not significantly impact public safety.

4.13.2 Pipeline Accident Data

The DOT requires all operators of natural gas transmission pipelines to notify the National Response Center at the earliest practicable moment following the discovery of an incident and to submit a report within 30 days to PHMSA. Incidents are defined as any leaks that:

- cause a death or personal injury requiring hospitalization; or
- involve property damage, including cost of gas lost of more than \$50,000 in 1984 dollars.¹⁵

During the 20-year period from 1996 through 2015, a total of 1,312 significant incidents were reported on the more than 300,000 total miles of natural gas transmission pipelines nationwide. To provide perspective, there were 30 incidents in Michigan and 24 incidents in Ohio during this same time period (DOT, 2015a).

Additional insight into the nature of service incidents may be found by examining the primary factors that caused the failures. Table 4.13.2-1 provides a distribution of the causal factors as well as the number of each incident by cause from 1996 to 2015.

We received numerous comments regarding potential pipeline accidents, including explosions, fires, and ruptures, among others. The dominant causes of pipeline incidents from 1996 to 2015 were corrosion and pipeline material, weld, or equipment failure, constituting 50.9 percent of all significant incidents. The pipelines included in the data set in table 4.13.2-1 vary widely in terms of age, diameter, and level of corrosion control. Each variable influences the incident frequency that may be expected for a specific segment of pipeline.

Cause	Number of Incidents	Percentage
Corrosion ^b	311	23.7
Excavation	210	16.0
Pipeline material, weld, or equipment failure	357	27.2
Natural force damage	146	11.1
Outside Force ^c	84	6.4
Incorrect operation	41	3.1
All other causes ^d	163	12.4
Total	1,312	100

¹⁵ The equivalent of \$50,000 in 1984 is approximately \$114,060 in 2015 (Bureau of Labor Statistics, 2016).

TABLE 4.13.2-1 (cont'd)

Natural Gas Transmission Pipeline Significant Incidents by Cause (1996 to 2015) ^a		
Cause	Number of Incidents	Percentage
a	All data gathered from PHMSA Significant Incident files, March 30, 2016	
b	Includes third-party damage	
c	Fire, explosion, vehicle damage, previous damage, or intentional damage	
d	Miscellaneous causes or other unknown causes	
Source: DOT, 2016a		

The frequency of significant incidents is strongly dependent on pipeline age. Older pipelines have a higher frequency of corrosion incidents because corrosion is a time-dependent process. Jones et al. (1986) compared reported incidents with the presence or absence of cathodic protection¹⁶ and protective coatings. The results of that study, summarized in table 4.13.2-2, indicated that corrosion control was effective in reducing the incidence of failures caused by external corrosion. The use of both an external protective coating and a cathodic protection system, required on all pipelines installed after July 1971, significantly reduces the corrosion rate compared to unprotected or partially protected pipe. The data also indicate that cathodically protected pipe without a protective coating actually has a higher corrosion rate than unprotected pipe. This anomaly reflects the retrofitting of cathodic protection to actively corroding spots on pipes.

TABLE 4.13.2-2

Incidents Caused by External Corrosion and Level of Protection (1970 through June 1984)	
Corrosion Control	Incidents per 1,000 Miles per Year
None – bare pipe	0.4
Cathodic protection only	1.0
Coated only	0.4
Coated and cathodic protection	0.1
Source: Jones et al., 1986	

Older pipelines also have a higher frequency of outside force incidents partly because their location may be less well-known and less well-marked than newer lines. In addition, the older pipelines contain a disproportionate number of smaller diameter pipelines, which are more easily crushed or broken by mechanical equipment or earth movements.

We received comments stating that the pipelines could rust, resulting in soil contamination. To prevent corrosion, the NGT and TEAL Projects would be constructed using pipe with an external coating capable of withstanding stress from a variety of environmental sources, including oxygen, water, and other chemicals. NEXUS would also install cathodic protection along the entire length of the NGT Project pipeline and Texas Eastern would connect the TEAL pipeline to its existing cathodic protection system. In addition, the applicants would complete annual surveys of their pipelines for evidence of corrosion. Based on NEXUS' and Texas Eastern's use of cathodic protection and external pipeline coating, we do not believe that the pipeline would be subject to extensive rusting or cause soil contamination.

Outside force, excavation, and natural forces were the cause in 33.4 percent of significant pipeline incidents from 1996 to 2015. These result from the encroachment of mechanical equipment such as

¹⁶ Cathodic protection is a technique to reduce corrosion (rust) of the natural gas pipeline that includes the use of an induced current and/or a sacrificial anode that corrodes preferentially.

bulldozers and backhoes; earth movements due to soil settlement, washouts, or geological hazards; weather effects such as winds, storms, and thermal strains; and willful damage. Table 4.13.2-3 provides a breakdown of outside force incidents by cause.

Cause	Number of Incidents	Percent of All Incidents
Third party excavation damage	172	13.1
Operator excavation damage	25	1.9
Unspecified excavation damage/Previous damage	13	1.0
Heavy Rain/Floods	74	5.6
Earth Movement	32	1.4
Lightning/Temperature/High Winds	27	2.1
Other/Unspecified natural force damage	13	1.0
Vehicle (not engaged with excavation)	49	3.7
Fire/Explosion	9	0.7
Previous mechanical damage	6	0.5
Maritime equipment, vessel adrift, fishing, or maritime activity	9	0.7
Intentional damage	1	0.1
Electrical arcing from other equipment/facility	1	0.1
Unspecified/Other outside force	9	0.7
Total ^b	438	33.5

a Derived from Excavation, Outside Force, and Natural Force categories in table 4.13.2-1
b Sum of addends may not total due to rounding
Source: DOT, 2016a; 2016b

Since 1982, operators have been required to participate in One Call public utility programs in populated areas to minimize unauthorized excavation activities in the vicinity of pipelines. The One Call program is a service used by public utilities and some private sector companies (e.g., oil pipelines and cable television) to provide preconstruction information to contractors or other maintenance workers on the underground location of pipes, cables, and culverts.

We received comments regarding the safety history on Spectra’s existing pipeline systems. Spectra is the parent company to Texas Eastern and partial owner of NEXUS. The Commission reviews each project based on its own merits and has siting authority for interstate natural gas infrastructure. PHMSA would be notified of and investigate all pipeline accidents and take any necessary action. In addition, pipeline operator compliance and incident history is publically available at www.phmsa.dot.gov/pipeline.

4.13.3 Impacts on Public Safety

The service incident data summarized in table 4.13.2-3 include pipeline failures of all magnitudes with widely varying consequences. Table 4.13.3-1 presents the average annual fatalities that occurred on natural gas transmission pipelines between 2011 and 2015. The data have been separated into employees and nonemployees to better identify a fatality rate experienced by the general public. Fatalities among the public averaged two per year over the 20-year period from 1996 to 2015. There were no injuries in Michigan and five in Ohio during this time period; however, there were no fatalities in either state.

Year	Injuries		Fatalities	
	Employees	Public	Employees	Public
2011	1	0	0	0
2012	1	6	0	0
2013	0	2	0	0
2014	1	0	0	0
2015	1	13	1	2

Source: DOT, 2016b
Note: On April 29, 2016, a segment along Texas Eastern's Penn-Jersey Line exploded, resulting in 1 injury. PHMSA is currently investigating the pipeline incident.

The majority of fatalities from natural gas pipelines are associated with local distribution pipelines. These pipelines are not regulated by FERC; they distribute natural gas to homes and businesses after transportation through interstate transmission pipelines. In general, these distribution lines are smaller-diameter pipes and/or plastic pipes and are more susceptible to damage. In addition, local distribution systems do not have large rights-of-way and pipeline markers common to FERC-regulated interstate natural gas transmission pipelines.

The nationwide totals of accidental fatalities from various anthropogenic and natural hazards are listed in table 4.13.3-2 in order to provide a relative measure of the industry-wide safety of natural gas transmission pipelines. However, direct comparisons between accident categories should be made cautiously, because individual exposures to hazards are not uniform among all categories. As indicated in table 4.13.3-2, the number of fatalities associated with natural gas facilities is much lower than the fatalities from natural hazards such as lightning, tornados, floods, earthquakes, etc.

Type of Accident	Annual No. of Deaths
All accidents	130,557
Poisoning	38,851
Motor vehicle	33,804
Falls	30,208
Drowning	3,391
Fire, smoke inhalation, burns	2,760
Floods ^b	81
Lightning ^b	49
Tornado ^b	72
Natural gas distribution lines ^c	14
Natural gas transmission pipelines ^c	2

a All data, unless otherwise noted, reflects 2013 statistics from U.S. Department of Health and Human Services (2016)
b Reflects 30 Year Average (1985 to 2014) statistics from U.S. Department of Commerce, NOAA, National Weather Service (2016)
c 20-year average, 1996-2015 (DOT, 2015c; 2015d)

We received comments expressing concern that pipeline integrity would be compromised due to vibration from blasting at the Waterville Stone Quarry. The NGT Project pipeline route would be about 0.5 mile away from the quarry and, as a result, activities would not impact the pipeline.

Several commenters expressed concern that the NEXUS pipeline route would cross abandoned or unmapped mine shafts, resulting in pipeline bending, sinkholes, and failure. We also received comments regarding karst and the potential for subsidence to impact the pipeline. Routing across potentially unmapped mine shafts and karst terrain are addressed in sections 4.1.3.4, 4.1.3.5, and 4.1.5 and would not affect the pipelines.

Although incidents have occurred on natural gas transmission systems, the available data show that natural gas transmission pipelines continue to be a safe, reliable means of energy transportation. From 1996 to 2015, there were an average of 63 significant incidents and 2 fatalities per year. The number of significant incidents distributed over the more than 300,000 miles of natural gas transmission pipelines indicates the risk is low for an incident at any given location. The rate of total fatalities for the nationwide natural gas transmission lines in service is approximately 0.01 per year per 1,000 miles of pipeline. The operation of the NGT and TEAL Projects would represent only a slight increase in risk to the nearby public.

4.13.4 Terrorism

We received comments regarding concerns that the Projects' facilities could be used in a terrorist attack. We received a comment from CORN requesting that FERC require NEXUS to conduct a Security Vulnerability Assessment comparing the proposed route to the City of Green alternative route. Safety and security concerns have changed the way pipeline operators as well as regulators must consider terrorism, both in approving new projects and in operating existing facilities.

The U.S. Department of Homeland Security is tasked with the mission of coordinating the efforts of all executive departments and agencies to detect, prepare for, prevent, protect against, respond to, and recover from terrorist attacks within the United States. The Commission, in cooperation with other federal agencies, industry trade groups, and interstate natural gas companies, is working to improve pipeline security practices, strengthen communications with the industry, and extend public outreach in an ongoing effort to secure pipeline infrastructure.

The Commission, like other federal agencies, is faced with a dilemma in how much information can be offered to the public while still providing a significant level of protection to the facility. Consequently, the Commission has taken measures to limit the distribution of information to the public regarding facility design and layout location information to minimize the risk of sabotage. Facility design and location information has been removed from FERC's website to ensure that sensitive information filed as Critical Energy Infrastructure Information is not readily available to the public (Docket No. RM06-23-000, issued October 30, 2007 and effective as of December 14, 2007).

NEXUS and Texas Eastern, through their parent company Spectra, would continue to participate in various activities in close collaboration with the U.S. Department of Homeland Security's Transportation Safety Administration (TSA) and key industry groups concerning security as part of the Projects. This would include:

- complying with the TSA's Pipeline Security Division's Security Guidelines;
- participating in monthly intelligence meetings with both the U.S. Department of Homeland Security's Intelligence Program and the TSA's Pipeline Security Division's monthly update conference calls;
- attending classified briefings with the U.S. Department of Homeland Security for the industry, annually, and as needed;

- chairing the Interstate Natural Gas Association of America Security Committee and participating in the American Gas Association Security Committee, as well as the Oil and Natural Gas Sector Coordinating Council's Pipeline Working Group;
- participating in the production of a new video, sponsored by TSA, aimed at training law enforcement officers to respond to security events at pipeline facilities;
- participating annually in TSA's International Pipeline Security Forum;
- reporting suspicious incidents to the Transportation Security Operations Center; and
- conducting major crisis management drills, at least annually, within the company.

In accordance with DOT surveillance requirements, NEXUS and Texas Eastern would also incorporate air and ground inspection of their proposed facilities into their inspection and maintenance program. Security measures at the new aboveground facilities would include secure fencing and camera surveillance.

Safety and security are important considerations in any action undertaken by FERC. However, the likelihood of future acts of terrorism or sabotage occurring at the proposed facilities, or at any of the myriad natural gas pipeline or energy facilities throughout the United States, is unpredictable given the disparate motives and abilities of terrorist groups. The continuing need to construct facilities to support future natural gas pipeline infrastructure is not diminished from the ongoing potential for terrorist acts. The efforts of the Commission, the DOT, and the Office of Homeland Security to continually improve pipeline safety would minimize the risk of terrorist sabotage of the NGT and TEAL Projects to the maximum extent practical, while still meeting the country's natural gas needs.

4.14 CUMULATIVE IMPACTS

In accordance with NEPA, we identified other actions in the vicinity of NGT and TEAL Projects' facilities and evaluated the potential for a cumulative effect on the environment. As defined by the CEQ, a cumulative effect is the impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions (CEQ, 1997b). In this analysis, we consider the impacts of past projects within the regions of influence as part of the affected environment (environmental baseline) that was described and evaluated in the preceding environmental analysis. However, present effects of past actions that are relevant and useful are also considered. This cumulative impacts analysis uses an approach consistent with the methodology set forth in relevant guidance. Under these guidelines, inclusion of actions within the analysis is based on identifying commonalities of impacts from other actions to potential impacts that would result from the Projects.

To avoid unnecessary discussions of insignificant impacts and projects, and to adequately address and accomplish the purposes of this analysis, the cumulative impacts analysis for the NGT and TEAL Projects was conducted using the following guidelines:

- A project must impact the same resource category as the NGT and TEAL Projects for there to be a cumulative impact on that resource category. Typically this occurs when other projects are in the same region or area as the proposed actions. The effects of more distant projects generally are not assessed because their impacts would be localized and would not contribute significantly to impacts in the NGT and TEAL Projects area. An exception is air quality, which can affect larger areas; therefore, air quality was considered based on the

county and/or air basin. Another exception is loss and fragmentation of migratory bird habitat. Similar species will utilize the forests of the Marcellus and Utica shale formations. BCCs have already declining populations and loss and fragmentation of additional forested habitat has a possibility of continuing this decline with impacts at the population level.

- The distance into the past and future that other projects could cumulatively impact the area of the Projects is based on whether the impacts are short term, long term, or permanent. Most of the impacts associated with the NGT and TEAL Projects, other than forest clearing and air quality, are short-term effects that would occur during the period of construction.
- Where a potential for cumulative impacts exists, those impacts are quantified to the extent practicable; however, in some cases the potential impact can only be described qualitatively. This is particularly the case for projects that are in the planning stages; are contingent on economic conditions, availability of financing, and/or the issuance of permits; or for which there is a lack of comprehensive information available.
- The scope of the cumulative impact assessment depends on the availability of information about other projects. For this assessment, other projects were identified from information provided by the applicants, field reconnaissance, internet research, and communications with federal, state, and local agencies.

Projects meeting one or more of the following criteria were considered in this cumulative analysis. These criteria define the NGT and TEAL Projects' region of influence, which will be used in this analysis to describe the general area where projects could potentially contribute to cumulative impacts with the NGT and TEAL Projects. The region of influence varies depending on the resource being discussed. Specifically, we included:

- minor projects, including residential development, small commercial development, and small transportation projects, within 0.5 mile of the NGT and TEAL Projects area;
- major projects, such as large commercial, industrial, transportation and energy development projects (including production well, gathering lines, and access roads), requiring more than 10 acres of land within 10 miles of the NGT and TEAL Projects area;
- major projects within watersheds crossed by the NGT and TEAL Projects; and
- projects with potential to result in longer-term impacts on air quality (for example, natural gas pipeline compressor stations) located within an AQCR crossed by the NGT and TEAL Projects area and loss of forested migratory bird habitat.

4.14.1 Background

The Midwest region of the United States has been affected by human activity for thousands of years. Today, approximately 21.5 million people reside in Michigan and Ohio (Census Bureau, 2014). These two states have a combined annual gross domestic product of approximately \$1 trillion based on farming, transportation, construction, commerce, tourism, education, health, and other industries. The Midwest economy is traditionally heavily industrial, although other areas such as education and medicine are becoming more prevalent. Although the region has been significantly affected by human activity, valuable natural resources remain.

Actions located outside the regions of influence are generally not evaluated because their potential to contribute to a cumulative impact diminishes with increasing distance from the NGT and TEAL Projects. For example, we received comments recommending that we evaluate the cumulative impacts of the NGT and TEAL Projects and shale gas production in the Appalachian Basin. While shale gas production may impact the same resources affected by the NGT and TEAL Projects, these impacts are so far removed from the Projects area that the effects are not additive. Furthermore, impacts from natural gas production are generally neither caused by a proposed pipeline project nor are they reasonably foreseeable consequences of the Commission's approval of an infrastructure project. Therefore, we do not address these activities in this analysis.

About 45 percent of the NGT Project pipeline would be co-located with existing utilities (e.g., overhead electric transmission lines, pipelines, and railroads), while the TEAL Project would primarily consist of pipeline loops (parallel to existing pipe) with the exception of some reroutes implemented to avoid construction constraints. Co-location reduces impacts across most, if not all, environmental resources. Based on NEXUS' and Texas Eastern's implementation of impact avoidance, minimization, and mitigation measures as described in their construction and restoration plans, and their adherence to our recommendations, we find that with the exception of temporary socioeconomic impacts (e.g., housing, traffic, public services) and long-term air emissions, the impacts of the NGT and TEAL Projects would be largely limited to a narrow corridor that extends for about 255 miles across two states. Furthermore, because the impacts of the NGT and TEAL Projects would generally be localized, they would only contribute incrementally to a cumulative impact in the region of influence. As a result, we have related the scope of our analysis to the magnitude of the aforementioned environmental impacts.

Based on the impacts of the NGT and TEAL Projects as identified and described in this EIS and consistent with CEQ guidance, we have determined that the following resource-specific regions of influence are appropriate to assess cumulative impacts:

- Impacts on geology, soils, wetlands, vegetation, and terrestrial wildlife would be largely contained within or adjacent to proposed NGT and TEAL Projects' workspaces. Impacts on water resources (primarily increased turbidity) could extend outside of the workspaces but would also be contained to a relatively small area. Therefore, for these resources we evaluated other projects/actions within the HUC 12 sub-watersheds crossed by the NGT and TEAL Projects.
- Loss and fragmentation of upland forests would result in impacts on BCCs and migratory birds in the region, and could potentially result in significant impacts on bird populations.
- Impacts on cultural resources would also be largely contained within or adjacent to proposed workspaces. Therefore, we evaluated other projects/actions that overlapped with known cultural features potentially affected by the NGT and TEAL Projects.
- Temporary impacts on air quality, including fugitive dust, would be largely limited to areas immediately around active construction. Long-term impacts on air quality would be largely contained within about a 30-mile radius. We evaluated other projects/actions that overlap in time and location with construction activities and those with potentially significant long-term stationary emission sources within a 30 mile radius of the NGT and TEAL Projects.
- Long-term impacts on NSAs were evaluated by identifying other stationary source projects with the potential to result in significant noise that would affect the same NSAs within 0.5

mile of the NGT and TEAL Projects' compressor stations. None were identified; therefore, we do not consider long-term cumulative noise impacts further in this analysis. However, we did consider areas where the temporary noise from construction of the NGT and TEAL Projects would overlap with noise from other construction projects.

- Communities that could be affected by the increased workforce were considered in our analysis (socioeconomics). In more rural locations of the NGT and TEAL Projects, these communities could be located numerous miles from the NGT and TEAL Projects' workspaces.

In addition to the geographic relationship between the NGT and TEAL Projects and other projects in the area, we also considered the temporal relationship. The NGT and TEAL Projects would begin construction in the first quarter of 2016, with an in-service date of November 1, 2017. The majority of impacts associated with the NGT and TEAL Projects would occur during construction and most resources (with exceptions) would return to pre-construction conditions shortly after or within 3 years of construction. Thus, construction-related cumulative impacts could occur if other projects in the regions of influence would impact the same resources within these timeframes. Additionally, permanent impacts resulting from the operation of the NGT and TEAL Projects could contribute to a cumulative impact in the regions of influence. Specifically, permanent impacts on air quality and forest resources from operation of the NGT and TEAL Projects could contribute to a cumulative impact in the regions of influence for those resources.

Four types of projects that would potentially cause a cumulative impact when considered with the NGT and TEAL Projects are identified in appendix N. These are: 1) natural gas production; 2) FERC jurisdictional and non-jurisdictional linear pipeline projects; 3) energy projects; and 4) major residential, commercial, and industrial development projects within counties affected by the Projects.

4.14.2 Present and Reasonably Foreseeable Projects

The table in appendix N identifies present and reasonably foreseeable projects or actions that occur within the region of influence. These projects were identified by a review of publicly available information; consultations with federal, state, and local agencies and development authorities; and information provided by NEXUS and Texas Eastern, affected landowners, and concerned citizens. These projects, their impacts, and our determinations of cumulative impact are discussed in the following sections.

We received comments requesting that our cumulative impacts analysis take a "hard look" at the potential impacts of other projects as described in relevant guidance. NEPA requires "reasonable forecasting," but an agency is not required "to engage in speculative analysis" or "to do the impractical, if not enough information is available to permit meaningful consideration." For example, and as discussed below, the actual timing and final scope of many development projects in the NGT and TEAL Projects' region of influence are simply unknown. Therefore, the impacts that may result from these projects, and their potential cumulative effects, are speculative and would not permit meaningful consideration of the potential cumulative effects with the NGT and TEAL Projects.

4.14.3 Natural Gas Production

4.14.3.1 Shale Formations

Several shale formations occur in the NGT and TEAL Projects area, including the well-known Marcellus and Utica Shales and to a lesser extent the Antrim Shale formation. The Marcellus Shale is an approximately 385-million-year-old, organic-rich shale formation that exists beneath 145,313 square miles of Pennsylvania, southern New York, eastern Ohio, and northern West Virginia. The Utica Shale is an

older formation at approximately 460 million years old and is over twice the size of the Marcellus Shale. The Utica Shale largely overlaps the range of Marcellus Shale at greater depths, but extends farther west into Ohio and farther north into New York. The Antrim Shale in Michigan was formed approximately 360 million years ago and covers approximately 39,000 square miles of the state. Over geologic time and with the pressure and temperature associated with deep burial, oil and natural gas is generated within organic-rich shale formations.

Because shale is generally impermeable (fluids do not readily flow through the formation), the oil and natural gas contained in these types of rocks cannot be economically produced using conventional well drilling and completion methods. Within the last 20 years, however, the petroleum industry has developed the horizontal drilling technique in conjunction with hydraulic fracturing (fracking), which has been in use for over 50 years, to recover natural gas from shale reservoirs. Fracking involves the injection of fluids and sand under high pressure to fracture the shale around the wellbore, thus enabling the flow of natural gas to the well. Where the Utica and Marcellus Shales overlap, the Marcellus Shale has been the first target of development since it occurs at shallower depths and is therefore easier to drill. Marcellus Shale development has focused on the formation in Pennsylvania, West Virginia, and New York, while the Utica Shale formation is a larger focus in Ohio because the Marcellus Shale is only located along the eastern edge of the state. The smaller Antrim Shale in Michigan has been the primary focus of development in that state.

The USGS has estimated that the Marcellus Shale contains about 84 trillion cubic feet of technically recoverable natural gas. An additional 38 trillion cubic feet of recoverable natural gas was estimated to be locked within the Utica Shale according to USGS estimates. For comparison, in 2015 the United States consumed approximately 27.5 trillion cubic feet of natural gas (EIA, 2015a); thus, the Marcellus and Utica Shales represents a significant natural gas deposit in close proximity to the high population centers of the northeastern United States. Production and gathering activities, and the pipelines and facilities used for these activities, are not regulated by the FERC but are overseen by the affected region's state and local agencies with jurisdiction over the management and extraction of the Marcellus and Utica Shale gas resources. The FERC's authority under the NGA review requirements relate only to natural gas facilities that are involved in interstate commerce. Thus, the facilities associated with the production of natural gas are not under FERC-jurisdiction.

The EIA maintains records of energy production and usage on a national and state level. Those records document the rise in the production rates in the states where the NEXUS and TEAL Projects would be located. Although it does not identify the source of the shale gas, be it Marcellus or Utica Shale, the EIA does identify natural gas developed by "Shale Gas Wells" as a whole (EIA, 2015b). In Ohio gas development occurs primarily within the Utica Shale. Natural gas from shale gas wells in Ohio accounted for 441 bcf of production in 2014, which was an increase from the 101 bcf produced in the state in 2013. Michigan wells are drilled to tap into the Antrim Shale formation which sits in the state's Upper Peninsula. Although a sizeable formation, the production rates have been declining since 2007. Michigan produced 96 bcf from its shale gas wells in 2014, which was a slight decrease from 101 bcf produced in 2013.

Each of the states that contain Marcellus and Utica shale gas resource development have specific offices within their respective environmental departments that handle the permitting as well as and enforcement of applicable laws. In each of the states, there are specific branches of local government tasked with permitting of gas resources, which includes:

- in Michigan – MDEQ's Office of Oil, Gas, and Minerals;
- in Ohio – ODNR's Division of Oil & Gas Resources

Each organization has developed BMPs for the construction and operation of upstream oil and gas production facilities as part of their permitting process. These BMPs include erosion and sediment control practices; setback requirements from springs, wetlands, and waterbodies; wetland and waterbody crossing procedures; access road construction practices; soil amendment procedures; and right-of-way restoration measures.

Although we do not examine the impacts of Marcellus and Utica Shale upstream facilities to the same extent as the NGT and TEAL Projects in this EIS, we considered the general development of the Marcellus and Utica Shale in proximity to the Projects within the context of cumulative impacts throughout section 4.14. A more specific analysis of Marcellus and Utica Shale upstream facilities is outside the scope of this analysis because the exact location, scale, and timing of future facilities are unknown.

4.14.3.2 Wells

Multiple FERC non-jurisdictional intrastate natural gas wells and gathering/interconnection systems are either proposed, under construction, or have been constructed in the vicinity of the NGT and TEAL Projects. It is likely that development activities would continue through the construction of the proposed Projects, but the exact extent of such drilling is unknown.

Based on our review of publicly available data (ODNR, 2016e), there are numerous wells permitted in proximity to the NGT and TEAL Projects. In the Utica-Point Pleasant shale play in Ohio, there are about 556 producing wells at varying distances from the proposed Projects. In the Marcellus shale play, there are 20 producing wells. These wells are located in Columbiana, Medina, Stark, Monroe, Belmont, and Jefferson Counties, Ohio and are varying distances from the NGT and TEAL Projects.

Marcellus and Utica Shale production wells involve improvement or construction of roads, preparation of a well pad, and drilling and completion of the well. It is likely that drilling would continue through the construction of the proposed Projects. It is difficult to provide a qualitative analysis of well-drilling activities because the exact extent of such drilling is unknown; however, the potential impacts of well-drilling and associated activities are qualitatively analyzed in this EIS.

We received several comments regarding the proposed Projects and whether they would result in or cause additional well drilling in the Project area. Indirect effects of shale formation development activities may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems (40 CFR 1508.8[b]). Typically, the growth-inducing potential of a project would be considered adverse if it fosters growth or a concentration of population above what is assumed in local and regional land use plans, or in projections made by regional planning authorities. Growth impacts could also occur if a project provides infrastructure or service capacity to accommodate growth levels beyond those permitted by local or regional plans and policies. The purpose of the proposed Projects is to meet market demand for the transportation of natural gas supplies from the production region to areas of higher demand, premium markets. The Projects area is already served by various natural gas transmission lines so the Projects would not extend public service to areas currently unserved by natural gas transmission lines. However, local distribution companies may build additional lines to serve new customers, but it is highly speculative to assume where the new lines would go and predict any resulting impacts. Further, economic activity is already taking place. The demand for energy and the proposed Projects are a result of, rather than a precursor to, development in this region. Therefore, the Projects would not result in adverse growth-inducing effects.

4.14.3.3 Intrastate Pipeline Systems

We received several comments regarding the cumulative impact of North Coast Gas Transmission, LLC's (a subsidiary of Somerset Gas Transmission Company, LLC) pipeline and the NGT and TEAL Projects. North Coast, an intrastate pipeline regulated by the Public Utility Commission of Ohio, operates 280 miles of pipeline in northern Ohio (North Coast Gas Transmission, 2014). The pipeline was originally used to transport petroleum products; however, in September 1998, North Coast Gas Transmission, LLC acquired the pipeline and converted it to natural gas (North Coast Gas Transmission, LLC, 2013). Although North Coast Gas Transmission, LLC took ownership of the pipeline in 1998, it is unclear exactly when the pipeline was constructed. Because the pipeline has likely been in operation for at least 18 years, it is part of the baseline for the NGT and TEAL Projects.

4.14.4 FERC Jurisdictional Pipeline Projects

There are nine planned, proposed, or existing FERC-jurisdictional natural gas transmission projects that could potentially have cumulative environmental impacts with the proposed Projects. In addition to the following project summaries, additional details regarding each project filed with the Commission can be obtained through our website at <http://www.ferc.gov/> by utilizing the docket number given for each project.

Energy Transfer's Rover Pipeline Project (FERC docket no. CP15-93-000) consists of 711 miles of pipeline, 10 compressor stations, numerous valves, M&R Stations, and auxiliary facilities in Ohio, Michigan, Pennsylvania, and West Virginia. The Rover pipeline specifically includes about 142 miles of pipeline in NEXUS and TEAL Projects-affected counties in Ohio (i.e., Monroe, Belmont, Wayne, Stark, and Fulton), and 56.8 miles in Washtenaw and Lenawee Counties, Michigan. The Rover Pipeline Project would be about 7 miles from the NEXUS Project at its closest point (i.e., Wood County, Ohio) and 0.1 mile from the TEAL Project.

Texas Eastern's Ohio Pipeline Energy Network (OPEN) Project (FERC Docket No. CP14-68-000) is in service. A portion of the OPEN Project includes facilities in Columbiana, Belmont, Jefferson, and Monroe Counties, Ohio. Specifically 12.9 miles of 36-inch-diameter pipeline in Columbiana County, 24.5 miles of pipe in Belmont County, 35.5 miles of pipe in Jefferson County, and 2.7 miles of pipe in Monroe County. The OPEN Project would be approximately 0.3 mile from the proposed NEXUS pipeline and M&R Stations. In addition, Texas Eastern's Colerain Compressor Station was constructed under the OPEN Project. Other aboveground facilities, such as MLVs, a pig launcher, and pipeline taps, were constructed in Belmont, Jefferson, and Monroe Counties.

Columbia's Leach Xpress Project (FERC docket no. CP15-514-000) would involve construction of about 127 miles of greenfield pipeline as well as 2 loops totaling 30 miles, abandonment of 27 miles of pipeline, construction of 3 new compressor stations, and modifications at 2 existing stations. The Columbia Leach Xpress Project would consist of about 28 miles of pipeline in Monroe County, Ohio, approximately 0.1 mile from the TEAL Project pipeline loop.

Columbia Pipeline Group's Pipeline Improvement Project includes several pipeline replacements in Wood, Lucas, Huron, Erie, Medina, and Lorain Counties, Ohio. These projects range from 1 to 20 miles from the facilities associated with the NGT and TEAL Projects and involve replacements of up to about 18 mile-long pipeline segments.

Dominion Transmission, Inc.'s Clarrington Project (FERC docket no. CP14-496-000) added an additional 10,000 hp of compression to the existing Mullett Compressor Station in Monroe County, Ohio

and 6,130 hp at an existing station in West Virginia. In addition, Dominion will add two new M&R stations and 5,368 feet of suction/discharge pipe in Monroe County.

Texas Eastern's Access South, Adair Southwest, and Lebanon Extension Projects (Access South Project) (FERC docket no. CP16-3-000) consist of 15.8 miles of pipeline looping, modifications to 12 existing compressor stations, launchers/receivers and valves, and auxiliary facilities. Modification to the Berne Compressor Station, would be constructed in Monroe county Ohio. At its nearest point, these projects would be about 0.7 mile from the TEAL Project.

TransCanada Corporation's ANR East would include the construction of 320 miles of new pipeline and 140,000 hp of compression originating in Clarington or Cadiz, Ohio (depending on the final design), through northern Ohio, terminating at the ANR Joliet Hub in Lake County, Indiana. Since TransCanada has not yet filed with the FERC, there is no docket number associated with this project at this time.

Kinder Morgan's Utopia East Project (FERC docket no. OR15-28-000) would likely involve a 240-mile-long, 12-inch-diameter pipeline from Harrison County, Ohio, to Kinder Morgan's Cochin Pipeline near Riga, Michigan, where the company would then move product eastward to Windsor, Ontario, Canada. Kinder Morgan has not requested to enter the FERC's pre-filing process at this time. The project would cross several counties in Ohio affected by the NGT Project, including Fulton, Henry, Wayne, Stark, Sandusky, and Huron. Kinder Morgan has petitioned for a Declaratory Order with FERC.

Tennessee Gas Pipeline's Abandonment and Capacity Restoration (ACR) Project (FERC docket no. CP15-88-000) and Kinder Morgan's Utica Marcellus Texas Pipeline Project involve the abandonment and conversion of over 1,000 miles of natural gas service on Tennessee Gas pipelines to natural gas liquids. These projects would involve construction of about 200 miles of new pipeline from Louisiana to Texas, and 155 miles of new laterals in Pennsylvania, Ohio, and West Virginia.

4.14.5 Jurisdictional and Non-jurisdictional Project-related Facilities

To support the NGT and TEAL Projects, Vector would make modifications to the existing Milford Meter Station in Oakland County, Michigan. The modifications at this facility are jurisdictional to the FERC and would be conducted under Vector's Blanket Certificate (see section 1.0). In addition, DTE Gas would make modifications to three existing facilities (Willow Gate Station and Willow Run and Milford Compressor Stations) and Columbia Gas of Ohio is proposing to install a short segment of pipeline and a tee-tap on its existing pipeline system. The modifications at the DTE Gas and Columbia Gas of Ohio facilities are not jurisdictional to the FERC. The potential cumulative impacts of both jurisdictional and non-jurisdictional Project-related activities are discussed below.

4.14.5.1 DTE Gas Company Modifications

DTE Gas would modify its existing Willow Gate Station, Willow Run Compressor Station, and Milford Compressor to accommodate the NGT and TEAL Projects. These modifications are non-jurisdictional and would be permitted through various federal and state agencies, including the MDEQ, Michigan Public Service Commission, PHMSA, FWS, and county/local agencies, among others.

Existing Willow Gate Station Modifications (Washtenaw County, Michigan)

Construction at the Willow Gate Station would occur in two phases. Phase 1 (bath line heaters, relocation of storage tank, and tie-in to existing DTE Gas pipelines) would begin in summer 2016 and Phase 2 (interconnecting pipeline, tie-ins for NEXUS pipelines, and metering facilities) would begin in summer

2017. Modifications to the Willow Gate Station would be constructed entirely within property currently owned by DTE Gas and would include:

- pipe additions totaling approximately 2,000 linear feet of 36-inch, 30-inch, 24-inch, 16-inch, and 12-inch-diameter pipe and necessary valves; and
- three new 10 MMBtu/hr water bath line heaters to replace two existing heaters.

Due to the minor nature of the modifications at the existing facility, we conclude that the activities would not result in a significant cumulative impact on environmental resources in the area.

Existing Willow Run Compressor Station Modifications (Washtenaw County, Michigan)

Construction at the Willow Run Compressor Station is planned to begin in fall 2016 and would be available for service by November 1, 2017. Modifications to the Willow Run Compressor Station would be constructed entirely within property currently owned by DTE Gas and would include:

- addition of up to 17,700-hp of gas compression and associated compressor buildings;
- miscellaneous station/unit piping; and
- about 2,500 linear feet of 30-inch-diameter station discharge piping to Willow Gate Station.

The Willow Run Compressor Station modifications in combination with the Project's Willow Run M&R Station could result in cumulative impacts on noise and air quality. These impacts are discussed further below.

Existing Milford Compressor Station Modifications (Oakland County, Michigan)

Construction at the Milford Compressor Station is planned to begin in fall 2016 and would be available for service by November 1, 2017. Modifications to the Milford Compressor Station would be constructed entirely within property currently owned by DTE Gas and would include:

- addition of up to 45,000 hp of new gas compression including associated compressor buildings;
- miscellaneous station/unit piping; and
- about 2,000 linear feet of 36-inch-diameter suction/discharge header piping to existing DTE Gas transmission pipeline(s) valve nest.

The Milford Compressor Station is approximately 20 miles from the nearest NGT Project facility. Based on this distance, there would be no cumulative impacts on noise. While there is the potential for some cumulative impact on air quality, it is not expected to be significant.

4.14.5.2 Vector U.S. Modifications

Vector U.S. would make modifications to the existing Milford Meter Station in Oakland County, Michigan to support the NGT and TEAL Projects. The Milford Meter Station is approximately 20 miles

from the proposed NGT facilities. The modifications include replacing an existing 30-inch ultrasonic meter with two 20-inch ultrasonic meters; the addition of bi-directional meters; and station piping and valves. Vector would make these modifications under its blanket Certificate (issued by FERC in Docket No. CP98-135-000 on May 27, 1999). Modifications at Vector's facilities would result in minor impacts on air quality and noise during construction and operation. We conclude that Vector's modifications and the NGT Project facilities in Oakland County, Michigan would not result in a significant cumulative impact on environmental resources in the area.

4.14.5.3 Columbia Gas of Ohio Modifications.

Columbia Gas of Ohio is proposing to install approximately 110 feet of buried interconnecting 20-inch-diameter pipeline and a tee-tap on its existing pipeline system located just west of the proposed MR06 meter station at MP 159.3. The tap would consist of a buried tee and valve with aboveground valve operator or hand wheel. Due to the minor nature of the modifications at his location, we conclude that that these activities would not result in a significant cumulative impacts.

4.14.6 Energy Projects

FirstEnergy Corporation's Hayes-West Fremont Transmission Project includes construction of about 30 miles of a 138-kV electric transmission line in Sandusky and Erie Counties, Ohio (FirstEnergy, 2016a). FirstEnergy states that its projects are needed (as identified by PJM, the region's regional transmission organization) to enhance system reliability due to the deactivation of several power plants in the region, including nine FirstEnergy plants. The power line would require a 60-foot-wide right-of-way and would be supported primarily by wood pole structures. Construction would begin in mid-2017, with an anticipated in-service date of August 31, 2018.

FirstEnergy Corporation's Glenwillow-Bruce Mansfield Transmission Project was constructed, in part, in Columbiana County, Ohio approximately 16.5 miles from the TEAL Project. The project involved construction of 119 miles of 345 kV electric transmission line from the Bruce Mansfield Plant in Pennsylvania to a new Glenwillow Substation in Ohio. According to FirstEnergy, 70 percent of the project involved adding a new line to existing infrastructure to minimize impact. FirstEnergy began construction in the spring of 2013 and placed the facilities in service on June 1, 2015.

FirstEnergy Corporation's Dowling Substation and Transmission Line involved extending an existing 345 kV and 138 kV electric transmission line by 150 feet, constructing a new substation, and extending a third 138 kV power line 3 miles to the new substation. The project was placed into service on June 1, 2015 and is approximately 5 miles from the nearest NGT Project facility in Wood County, Ohio.

4.14.7 Transportation and Commercial/Residential Development Projects

Transportation and commercial/residential development projects (see appendix N) typically consist of short-term, localized activities that require state or local approval and that BMPs would be implemented to minimize environmental impacts such as erosion and sedimentation.

4.14.7.1 Transportation Projects

ODOT and Michigan Department of Transportation are overseeing multiple ongoing and proposed infrastructure projects in the region of influence for the NGT and TEAL Projects in addition, some counties and localities are performing transportation/road work in the Projects area. The scopes of these projects are limited to work on existing infrastructure, including road widening and additional highway lanes, bridge reconstruction, a new railroad underpass, culvert replacements, and repaving, among other activities.

The majority of the projects listed in appendix N have been completed, are currently under construction, or would be completed prior to construction of the NGT and TEAL Projects. Of the listed transportation projects, those that are located in counties crossed by the NGT and TEAL Projects were evaluated according to the guidelines and criteria established for this cumulative analysis. These projects have the potential to impact traffic in the Projects area and are discussed in the relevant section of this cumulative analysis.

4.14.7.2 Commercial/Residential Development Projects

NEXUS and Texas Eastern contacted county planning departments and other sources to identify whether residential or commercial developments are planned near their Projects (see appendix N). There are several residential and commercial developments in various stages of planning along the Project routes. Many of these projects are in the conceptual and/or preliminary stages (no plans filed with the county). The commercial/residential projects range from small additions to single-landowner properties to large subdivisions and commercial spaces. The NGT and TEAL Projects would be adjacent to and potentially cross some of these planned projects. The potential cumulative impacts associated with these residential and commercial development projects are discussed in the relevant section of this cumulative analysis.

4.14.8 Potential Cumulative Impacts of the Proposed Action

The potential impacts that we consider as part of our cumulative review pertain to geology and soils; groundwater, surface water, and wetlands; vegetation; wildlife; land use, recreation, special interest areas, and visual resources; socioeconomics; cultural resources; and air quality and noise. In the following analysis, we discuss the potential cumulative impacts associated with the projects mentioned above and their contribution to impacts on sensitive resources in conjunction with NGT and TEAL Projects.

4.14.8.1 Geology and Soils

Cumulative effects on geology affected by the NGT and TEAL Projects would be limited primarily to the combined impacts of construction projects located within the same construction footprint as the proposed Projects, and recently completed or concurrent construction activities along the same route as the proposed Projects. These include natural gas wells, energy projects, and state DOT projects. The facilities associated with the NGT and TEAL Projects are expected to have a temporary but direct impact on near-surface geology and soils. The soil stabilization and revegetation requirements included in the NGT and TEAL construction plans would prevent or minimize any indirect impacts. Because the direct effects would be highly localized and limited primarily to the period of construction, cumulative impacts on geology and soils would primarily occur if other projects are constructed at the same time and place as the NGT and TEAL Projects. Construction of some of the projects listed in appendix N, such as some state DOT and local road construction projects as well as the Leach Xpress, Rover, and Access South Projects, would occur within 0.25 mile of either NGT or TEAL Projects facilities for limited distances. The OPEN Project, placed in service in November 2015, involved construction of the Colerain Compressor Station, which would be subsequently modified as part of the TEAL Project. As a result, direct cumulative impacts at this site would occur. In addition, projects that require significant excavation or grading would have temporary, direct impacts on near-surface geology and soils, although like the NGT and TEAL Projects, the duration and effect of these projects would be minimized by the implementation of erosion control and restoration measures. However, in general, the potential for cumulative soil impacts resulting from one or more of these projects is low and primarily temporary because construction of other pipeline facilities would generally not result in loss of soils.

The Marcellus and Utica shale well drilling activities are various distances from the NGT and TEAL Projects facilities. Ohio and Michigan have specific offices within their respective environmental

departments that handle the permitting and enforcement of applicable laws. In each state, there are specific branches of local government tasked with permitting of gas resources, which include the ODNR's Division of Oil & Gas Resources and the MDEQ's Office of Oil, Gas, and Minerals. Each organization has developed BMPs for the construction and operation of upstream oil and gas production facilities as part of their permitting process. These BMPs include erosion and sediment control practices; setback requirements from springs, wetlands, and waterbodies; wetland and waterbody crossing procedures; access road construction practices; soil amendment procedures; and right-of-way restoration measures. Implementation of these measures, in combination with the measures outlined in NEXUS' and Texas Eastern's construction plans, would avoid or minimize cumulative impacts of shale development activities on geology and soil resources in the area of the NGT and TEAL Projects, particularly where there are adjacent workspaces.

The NGT and TEAL Projects, along with other projects described previously, could result in some loss of productive soils from the additions of impervious surfaces (e.g., compressor station sites and road widening/lane additions); however, these would be limited in scope. Furthermore, land impacted by pipeline projects would be restored to previous uses, with some exceptions (forested areas), thereby minimizing permanent impact. The potential for cumulative soil impacts resulting from the projects combined with the NGT and TEAL Projects is low and primarily temporary because construction of these projects would generally not result in loss of soils. NEXUS and Texas Eastern would follow the recommended procedures and take the necessary precautions to avoid and mitigate soil impacts, therefore, the NGT and TEAL Projects are not expected to significantly contribute to the potential cumulative impact on soils. Consequently, the cumulative effect of the NGT and TEAL Projects on geological resources and soils would be temporary and minor and would not be significant.

4.14.8.2 Water Resources

Construction and operation of the NGT and TEAL Projects would likely result in only short-term impacts on water resources (see section 4.3.2.7). These impacts, such as increased turbidity, would return to baseline levels over a period of days or weeks following construction.

Groundwater

Projects listed in appendix N that are within the same watersheds as the NGT and TEAL Projects and involve ground disturbance or excavation could result in cumulative impacts on groundwater resources. The major pipeline construction activities that could affect groundwater include the clearing of vegetation, excavation and dewatering of the trench and bore pits, soil mixing and compaction, heavy equipment and associated fuels, and hazardous material handling. Implementation of proper storage, containment, and handling procedures would minimize the chance of such releases. NEXUS' and Texas Eastern's *SPCC Plans* address the preventative and mitigative measures that would be implemented to avoid or minimize the potential impacts of hazardous material spills during construction. In addition, NEXUS and Texas Eastern would adhere to FERC's *Procedures* to ensure protection of wetlands and waterbodies during construction. Therefore, impacts from the NGT and TEAL Projects are expected to be short-term and minor. All of the major projects (such as the other FERC projects and the Utica and Marcellus wells) would be required to obtain water use and discharge permits and would implement their various *SPCC Plans* as mandated by federal and state agencies.

For these reasons, we conclude that the NGT and TEAL Projects would only contribute to minor and temporary cumulative impacts on groundwater when combined with the planned projects in the area.

Wetlands, Waterbodies, Fisheries, and Aquatic Resources

Generally, impacts resulting from pipeline construction across waterbodies are localized and short-term. Cumulative impacts would only occur in the event that more than one project crossing the same waterbody are constructed within a similar period of time. The NGT and TEAL Projects would require 475 separate waterbody crossings in Ohio and Michigan. These include 208 perennial stream crossings and 8 major waterbody crossings (100 feet or greater), with the remaining crossings consisting of small intermittent or ephemeral streams. The majority of these would be crossed using either the open-cut method or a dry-cut method; however, waterbodies would be crossed via the HDD method at 18 locations.

Most of the projects listed in appendix N are within watersheds crossed by the NGT and TEAL Projects and could result in impacts on wetlands and surface waters. Several of these could be under construction during the same time as the NGT and TEAL Projects, including some of the Marcellus and Utica Shale well drilling, several state DOT and local/county road projects, FirstEnergy's transmission projects, and FERC-jurisdictional pipeline projects. However, the NGT and TEAL Projects would contribute little to the long-term cumulative impacts on wetlands and waterbodies because the majority of construction impacts would be temporary and end shortly after pipeline installation. Further, FirstEnergy's transmission projects and non-jurisdictional project-related facilities would likely follow BMPs similar to those proposed by NEXUS and Texas Eastern, which would further minimize impacts on waterbodies. Other FERC-regulated projects would be required to adhere to our *Procedures*, which minimize impacts on waterbodies and wetlands. Therefore, we conclude that the cumulative impacts on wetland and waterbody resources would be temporary and minor.

We received comments regarding cumulative impacts on Ohio peatlands. Over a 100-year timeframe, impacts from mining and development activities only contributed approximately 3 percent of peatland loss in Ohio. Further, pursuant to 33 CFR 332.3(e)(3), impacts on difficult-to-replace resources (e.g., fens and peatlands) would need to be appropriately mitigated via in-kind methods. NEXUS would implement its *Wetland Mitigation Plan*, which we have recommended be filed with the Secretary prior to construction. The projects listed in appendix N would likely be required to implement similar mitigation measures to minimize wetland impacts. Based on NEXUS' mitigation measures and adherence to its project-specific *E&SCP*, we do not believe there would be a significant cumulative impact on peatlands in Ohio.

The proposed Projects would minimize fisheries impacts through adherence to timing restrictions for construction, as well as implementation of appropriate setbacks, erosion and sediment control measures, BMPs, and restoration requirements. In addition, the other FERC-regulated projects, such as the Rover, ANR East, and Leach Xpress projects, would be designed to minimize impacts on waterbodies, and subsequently fisheries, to the extent possible. For example, Rover recommended dry crossings in cold water fisheries and trout sensitive fisheries. Any impacts on waterbodies that could not be avoided would be minimized through implementation of BMPs and restoration practices in accordance with the respective federal, state, and local regulatory requirements.

Therefore, we conclude that the fishery impacts discussed in this section are not expected to be cumulatively significant because of the limited overlap of construction activities affecting the same sensitive resources, the temporary nature of impacts, and the avoidance and mitigation measures that would be implemented. Further, operation of the proposed NGT and TEAL Projects would not result in any additional impacts unless maintenance activities occur in or near streams.

4.14.8.3 Vegetation

Cumulative impacts on vegetation disturbed by the NGT and TEAL Projects would be limited primarily to the combined impacts of construction projects located within the same region of influence (i.e., 10 miles) as the NGT and TEAL Projects and recently completed or concurrent construction activities along the same route as the NGT and TEAL Projects. While the vegetation impacts of the projects discussed previously and the NGT and TEAL Projects would not be inconsequential, the overall impact of these projects would be considered minor in comparison to the abundance of comparable habitat in the area. The applicants would be required to restore vegetation in temporarily disturbed areas, and non-jurisdictional project-related facilities would likely be held to similar standards by state permitting agencies. The FERC-jurisdictional projects would be held to the same restoration standards as the NGT and TEAL Projects.

Implementation of NEXUS' and Texas Eastern's *E&SCPs* would promote revegetation of rights-of-way and aboveground facilities following construction and each applicant would provide mitigation funding to address loss of forest habitat. Shale development and non-jurisdictional project-related facilities would also likely be required to implement mitigation measures designed to minimize the potential for long-term erosion and resource loss, increase the stability of site conditions, and revegetate disturbed areas, thereby minimizing the degree and duration of the impacts of the NGT and TEAL Projects. Thus, cumulative impacts on vegetation resulting from the NGT and TEAL Projects, Marcellus and Utica Shale development, state DOT and local road construction projects, the FirstEnergy projects, and the other FERC-jurisdictional projects are expected to be minor, with the exception of forested impacts discussed in section 4.14.8.6. Further, considering the limited area impacted within the region of influence and that these projects are expected to take the required precautions and mitigation measures in accordance with federal and state regulations, the incremental and cumulative impacts on vegetation would not be significant.

4.14.8.4 Wildlife

Cumulative impacts on wildlife would occur where projects are constructed in the same general proximity and timeframe, or which represent permanent or long-term loss of habitat types important to wildlife. These include the Marcellus and Utica Shale gathering systems projects, several state DOT projects, the Black Fork Wind Project, and the other FERC-jurisdictional projects listed in appendix N. Construction activities such as right-of-way and other workspace clearing and grading would result in loss of vegetation cover and soil disturbance, alteration of wildlife habitat, displacement of wildlife species from the construction zone and adjacent areas, mortality of less mobile species, and other potential indirect effects as a result of noise created by construction and human activity in the area. Overall impacts would be greatest where projects are constructed in the same timeframe and area as the NGT and TEAL Projects or that have long-term or permanent impacts on the same or similar habitat types.

In general, wildlife is expected to return to affected areas following construction of the NGT and TEAL Projects and other projects in the area. Clearing and grading of the construction rights-of-way for the NGT and TEAL Projects and other nearby projects would result in a loss of wildlife habitat. This is most likely to occur in locations where the NGT and TEAL Projects would be constructed in proximity to other projects. For example, the planned intersection at 53 and Ohio Turnpike in Sandusky County, Ohio, FirstEnergy's planned power line in Erie County, Ohio, the Lucas County, Ohio road work, and the OPEN Project would each be within 1 mile of the NGT or TEAL facilities (see appendix N for project details and locations). The effect of workspace clearing on forest-dwelling wildlife species would be greater than on open habitat wildlife species since forested lands could take decades to return to pre-construction condition in areas used for temporary workspace and would be permanently prevented from re-establishing on the permanent right-of-way. This may result in the cumulative loss of individuals of small mammal species, amphibians, reptiles, nesting birds, and non-mobile species. However, we expect that any projects constructed in the area would be required to restore some vegetation cover to the disturbed areas unless

they are covered by buildings or impervious surfaces. Once the area is restored, some wildlife displaced during construction of any of the projects would return to the newly disturbed area and adjacent, undisturbed habitats after completion of construction.

NEXUS has verbally committed to fully mitigate the impacts to forested areas, including avoidance and minimization of impacts to the extent practicable, as well as provide mitigation funding to replace or provide substitute resources for the impacted forested habitat. Assuming the habitat impacts would be fully mitigated, the negative impacts of this project on wildlife would be considered minor by FWS.

The aboveground facilities associated with the NGT and TEAL Projects would result in some permanent impacts on wildlife habitat. The Rover, ACP, Clarington, OPEN, and Access South Projects would also have associated aboveground facilities; however, due to the limited size of these facilities, some of which include modifications to existing facilities, and the prevalence of similar habitats in adjacent areas, the permanent conversion of forested lands would not be a cumulatively significant impact on wildlife resources within the area of the NGT and TEAL Projects.

Construction of any shale development projects would also result in some long-term loss of wildlife habitat due to aboveground structures and well pads. The FirstEnergy projects (ranging from 0.5 to 17 miles from the NGT Project) would also result in impacts on wildlife habitat, but because the primary construction would be of overhead powerlines with limited vegetative clearing and permanent land requirements, only minor permanent impacts would occur.

Impacts on wildlife species from construction of any of the projects listed in appendix N would be local, temporary, and minor; therefore, cumulative impacts are expected to be negligible for any individual wildlife species relative to the population in the region of influence.

4.14.8.5 Special Status Species

The species discussed in section 4.8 could potentially be affected by construction and operation of other projects occurring within the same area as the NGT and TEAL Projects. NEXUS and Texas Eastern, and all other companies, are required to consult with the appropriate federal, state, and local agencies to evaluate the types of species that may be found in the area of the projects; identify potential impacts from construction and operation of the projects on any species identified; and implement measures to avoid, minimize, or mitigate impacts on special status species and their habitat. Based on projected impacts and proposed mitigation measures, the majority of federally and state-listed endangered and threatened species were determined to be either unaffected or not adversely affected by the NGT and TEAL Projects.

All federal projects are required by law to coordinate with the FWS, which will take into account regional activity and changing baseline conditions in determining the extent of impacts on a federally listed or proposed species. Non-federal projects are also required to adhere to the ESA, although the FWS has a different mechanism for evaluating and minimizing impacts. Consequently, we conclude that past and present projects in combination with the NGT and TEAL Projects would have minor cumulative impacts on special status species.

4.14.8.6 Land Use and Visual Resources

Land Use

Projects with permanent aboveground components, such as turbines, buildings, residential projects, roads, and aboveground electrical transmission lines, would generally have greater impacts on land use than the operational impacts of a pipeline (such as gathering lines for Marcellus and Utica Shale development

and other FERC-jurisdictional projects) that would be buried and thus allow for most uses of the land following construction. Therefore, with the exception of aboveground facilities and the permanent right-of-way, pipeline projects typically only have temporary impacts on land use. The majority of long-term or permanent impacts on land use are associated with vegetation clearing and maintenance of the pipeline right-of-way.

The projects listed in appendix N would disturb hundreds of acres of land affecting a variety of land uses. Of the projects listed in appendix N, those with the greatest potential for impacts include the Marcellus and Utica Shale development projects, linear infrastructure facilities such as those associated with the FERC-regulated projects, the FirstEnergy electric transmission line projects, and the ANR East Project.

The OPEN Project impacted about 209 acres of agricultural lands, 590 acres of open lands, 10 acres of wetlands, and 610 acres of upland forested lands during construction; and 74 acres of agricultural lands, 186 acres of open lands, 6 acres of wetlands, and 225 acres of upland forested lands during operation. The ACR Project would impact about 105 acres of agricultural lands, 66 acres of open lands, 10 acres of wetlands, and 106 acres of upland forested lands during construction; and 36 acres of agricultural lands, 22 acres of open lands, 4 acres of wetlands, and 47 acres of upland forested lands during operation. We estimate the ANR East Project could impact 360 acres of forest land, 1,930 acres of agricultural lands, 70 acres of open lands, and 40 acres of wetlands during construction; and 160 acres of forest land, 780 acres of agricultural lands, 30 acres of open lands, and 20 acres of wetlands during operation. The Rover Project would impact 2,919 acres of forested land, 5,135 acres of agricultural land, 450.5 acres of open land, and 18 acres of open water during construction; and 1,172.6 acres of forested land, 1,939.8 acres of agricultural land, 178.9 acres of open land, and 12.6 acres of open water during operation. The Clarington Project would occur at existing aboveground facilities, so greenfield impacts would be minimal. Additionally, the Columba Pipeline Improvement Projects would generally involve in-ditch pipeline replacements of existing pipelines, thereby limiting new impacts.

Cumulative impacts on forested lands could occur if these projects are constructed around the same time as the NGT and TEAL Projects. Unlike other resources, the NGT and TEAL Projects' impacts on forested land would be long term. From 2006 to 2011, Ohio's overall land mass was recorded as consisting of 8.1 million acres of forested land, covering approximately 30 percent of the state (Widmann, et al., 2014). In that same timeframe, Ohio's forest cover increased by 2.1 percent and the net volume of trees increased by 7.0 percent, totaling 15.9 billion cubic feet (Widmann, et al., 2014). According to the study *Ohio Forests 2011*, Ohio will continue to see an increase in forested land, continuing a decades-long trend, as well as a net annual growth in tree volume; however, threats such as a shift in tree species (away from oak) and thousand cankers disease could be issues of concern moving forward. According to the MDNR, about half of Michigan's 36.4 million acres are forested. Construction and operation of the NGT Project would impact a very small portion of available forested land in Michigan.

Ohio currently has extensive forest cover that is projected to grow and the impact of the NGT and TEAL Projects on Ohio's forested area (375.3 of 8.1 million acres) would be limited. In Michigan, the forest impacts associated with the NGT Project would impact less than 0.1 percent of the available resource. Adding the NGT and TEAL Projects' impacts on forest with the forest clearing of other projects and actions would contribute to a cumulative impact within the region of influence. While there would be a large amount of forested land cleared when considering the proposed projects with other FERC-regulated projects, the impacts would occur over a large area. The actual amount and timing of forest clearing and the restoration or mitigation measures that other FERC non-jurisdictional project proponents may implement is unknown.

Constructing the NGT and TEAL Projects would affect, in aggregate, 405.0 acres of forest during construction, and about 178.8 acres (41 percent) would be permanently impacted during operation of the facilities. In Ohio, construction would impact 363.1 acres, with 163.2 permanently impacted during operation. In Michigan, construction would impact 41.9 acres of forested land and 15.6 would be permanently converted during operation of the facilities. However, the proposed Projects primarily impact agricultural land and avoids forested areas to the extent practicable. The NGT and TEAL Projects would impact 4,016.3 acres of agricultural land during construction and 1,331.8 acres for operation. Agricultural land would be restored to pre-construction conditions and would return to previous uses after construction. However, we do acknowledge that natural gas production in the region, including construction of well pads and access roads, contributes to deforestation and forest fragmentation. Impacts on migratory birds and BCCs would result from these ongoing activities. However, based on the linear nature of the NGT and TEAL Projects and the impacts of the projects as discussed in this section, we have determined that the NGT and TEAL Projects would not contribute to a significant cumulative impact on land use, including interior forest land.

The majority of the NGT and TEAL Projects' impacts on agricultural land and other non-forested land use types would be temporary, as most land uses would be allowed to revert to prior uses following construction. Any impacts would be minimized or mitigated to the greatest extent practicable through the use of construction plans and consultation with federal and state agencies and landowners. It is anticipated that other projects in the region of influence would be required to implement similar construction and restoration practices to minimize impacts on land use. The FERC-jurisdictional projects would be required to adhere to our *Plan* (or implement a plan that provides equal or greater protection) so as to minimize impacts on agricultural land and other non-forested land uses.

Interior Forest Impacts

Interior forest habitat is not managed as a federal- or state-regulated sensitive area, but does provide habitat for a variety of wildlife species. We are defining interior forests as forested areas greater than 300 feet from the influence of forest edges or open habitat (Jones et al., 2001). These habitats provide protection from disturbance and predation, food resources, and brooding habitat for wildlife. Clearing or fragmentation of interior forests creates more edge habitat and smaller forested tracts, which can impact availability and quality of feeding and nesting habitat for certain species as well as isolate species populations (Rosenberg et al., 1999). Interior forest has a higher habitat value for some wildlife species and is generally considered more rare in the environment compared to edge forest which has a lower habitat value for many species and can be created immediately with disturbance (Landowner Resource Center, 2000; Sprague et al., 2006).

Although breeding habitat for interior forest birds varies significantly, ranging in size from 3 to 6,200 forested acres, in general forest tracts of 100 acres or larger (Jones et al., 2001) represent adequate forest interior dwelling bird habitat.

In the late 1700s (pre-settlement), Ohio was approximately 95% forested; however, this forest cover steadily declined to a low of 12% in 1940 due to settlement (ODNR, 2013b). About 100 different bird species nest in various stages of forested habitat in Ohio, but forest fragmentation has impacted the number and distribution of bird species. Species restricted to the interiors of mature woodlands may disappear from fragmented forests or suffer high rates of nest predation or parasitism (ODNR, 2013b). Since 1940, Ohio has seen a dramatic increase in forest cover; however, this coverage occurs in isolated patches of 20 acres or less, and some forest interior birds require relatively large, contiguous expanses of forest (ODNR, 2013b)

In order to minimize and reduce impacts on sensitive habitat, NGT has implemented a number of measures to reduce adverse effects of construction and operation of the NEXUS Project on forest species, including interior forest species:

- Project facilities have been routed to avoid sensitive environmental resources where possible;
- Pipelines would be co-located with existing rights-of-way where possible;
- construction and operation rights-of-way widths and temporary land requirements for installation would be limited to the minimum necessary, e.g. 150 feet in agricultural land and 75 feet in forested wetlands;
- avoidance of forested areas, especially contiguous forested areas to the extent possible;
- providing mitigation for impacts on sensitive environmental resources, including compensatory mitigation for impacts on migratory bird and listed species habitat;
- following the measures outlined in NGT's and Texas Eastern's Plans and Procedures during construction and operation of the Project; and
- prohibiting right-of-way maintenance during the bird nesting season (April 15 through August 1).

In addition to direct impacts on interior forest tracts by the proposed clearing during construction and maintenance operations, indirect impacts also would occur on interior forest tracts. Newly created edge habitats would be established by maintenance of the permanent right-of-way and the indirect impacts could extend for 300 feet on each side (600 feet total) of the new corridor into remaining interior forest blocks. The actual indirect impacts could be less or more depending upon the size, shape, and post-construction status of the remaining, adjacent forested areas in relation to the permanent right-of-way. These adjacent areas could remain classified as forest interior blocks with some indirect impacts or their classification as forest interior could be changed altogether based on a reduction in block size. While the indirectly affected lands adjacent to the right-of-way would remain forested, they would have reduced habitat value compared to pre-construction conditions. The creation of edge habitat could increase the risk of establishment of invasive species and other impacts on wildlife species. Section 4.6.4 describes potential impacts of edge habitat on wildlife.

Although NEXUS and Texas Eastern have attempted to route the Project adjacent to existing disturbance and outside of forested areas, impacts on the upland forest habitat and migratory birds and other wildlife that use this habitat would still occur. In addition, the permanent clearing of a 30- to 50-foot-wide right-of-way may result in effectively disconnected forested tracts (Jones et al., 2001).

On July 6, 2015, NEXUS and Texas Eastern filed a *Draft Migratory Bird Conservation Plan* that details impacts on upland forest habitat and measures proposed to reduce impacts and offset temporary and permanent impacts through conservation.

To reduce impacts on forest habitat, NEXUS and Texas Eastern would implement its general avoidance and impact minimization measures and upland forest conservation measures as described in their respective *MBCPs*. A final plan developed in coordination with the applicable agencies prior to construction would identify compensatory mitigation for forest habitat loss.

Visual Impacts

The visual character of the existing landscape is defined by historic and current land uses such as recreation, conservation, and development. The visual qualities of the landscape are further influenced by

existing linear installations such as highways, railroads, pipelines, and electrical transmission and distribution lines. Within this context, the pipelines and electrical transmission lines listed in appendix N would have the greatest cumulative impact on visual resources in the NGT and TEAL Projects area. The NGT and TEAL Projects' facilities (e.g., compressor stations and meter stations) would add incrementally to this impact, but the overall contribution would be relatively minor given that the majority of the NGT and TEAL Projects involve buried pipeline. Existing vegetation around the NGT and TEAL Projects' aboveground facilities would provide adequate visual shielding for surrounding areas, where appropriate. In addition, disturbed areas would be revegetated according to the NGT and TEAL Projects' *E&SCPs*. The impact of Marcellus and Utica Shale development activities on land use, recreation, special interest areas, and visual resources would vary widely depending on the location of specific facilities and access roads, but they would be minimized to the extent possible through the appropriate state's review and permitting process. One advantage of the type of drilling technique used in the Marcellus and Utica Shale is that numerous wells can be drilled from a single well pad, thereby reducing the land use requirements and visual impacts for access roads, gathering pipelines, and individual well pads.

Although the visual impact of Marcellus and Utica Shale production may be long-term, only a minor visual impact would occur due to the operation of the NGT and TEAL Projects, primarily resulting from the conversion of forested land to scrub-shrub or herbaceous vegetation types. Non-jurisdictional project-related facilities would restore disturbed areas in accordance with state permitting agency requirements, thereby limiting permanent visual impacts on those areas where previously existing forest would not be allowed to reestablish within the new permanent right-of-way. ANR East Project would be about 23 miles from the NGT Project at its nearest point; therefore, we do not anticipate any visual cumulative visual impacts. The OPEN Project involved construction of the Colerain Compressor Station (which would be subsequently modified as part of the TEAL Project) and four new meter stations, as well as modifications to five existing compressor stations and one existing meter station. Permanent visual impacts would also occur to a lesser extent as a result of the development projects listed, where permanent structures (e.g., transmission line posts) would remain. Other recently completed or proposed aboveground facilities would, for the most part, likely be located adjacent to an existing right-of-way, at existing paved commercial/industrial sites, in remote locations, and/or within a permanent right-of-way. Whereas these permanent visual impacts may be locally noticed, generally they would be consistent with the existing visual character of the area. Therefore, the NGT and TEAL Projects' contribution to cumulative impacts on land use, recreation, special interest areas, and visual resources would mostly be limited to the construction phase and would be temporary and minor.

4.14.8.7 Socioeconomics

Present and reasonably foreseeable future projects and activities could cumulatively impact socioeconomic conditions in the region of influence for the NGT and TEAL Projects. The socioeconomic issues considered in the area of the NGT and TEAL Projects were employment, housing, public services, transportation, property values, economy and tax revenues, and environmental justice.

Employment

The projects considered in this section would have cumulative effects on employment during construction if more than one project is built at the same time. NEXUS and Texas Eastern estimate that the NGT and TEAL Projects would create about 5,325 jobs with \$565 million in labor income for construction and 59 jobs with \$3.8 million in labor income for operation. Approximately 36 permanent employees would work in Ohio, with up to 60 percent being local hires.

Local hires and local union halls would supply approximately 50 percent of the workforce for such jobs as surveyors, welders, equipment operators, and general laborers. Approximately 38 new permanent

employees would be hired to operate the new pipeline system, which would not have a measurable impact on the economy or employment.

The construction and operation of the projects listed in appendix N would result in a temporary increase in employment during construction, including both local and non-local hires depending on the project. Operation of pipeline projects typically do not require a large local workforce as pipeline facilities are generally monitored remotely. The number of permanent employees required for any given project (e.g., residential, commercial, and energy projects) after completion would be limited and would not materially impact employment levels in the project areas.

Temporary Housing

Temporary housing would be required for construction workers drawn from outside the local area. Given the current vacancy rates, the number of rental housing units in the area, and the number of hotel/motel rooms available in the vicinity of the NGT and TEAL Projects, construction workers should not encounter difficulty in finding temporary housing. If construction occurs concurrently with other projects, particularly during peak tourist periods, temporary housing would still be available but may be slightly more difficult to find and/or more expensive to secure. These effects would be temporary, lasting only for the duration of construction, and there would be no long-term cumulative impact on housing.

Infrastructure and Public Services

The cumulative impacts of the NGT and TEAL Projects and the other projects listed in appendix N on infrastructure and public services would depend on the number of projects under construction at one time. The small incremental demands of several projects occurring at the same time could become difficult for police, fire, and emergency service personnel to address. The problem would be temporary, occurring only for the duration of construction; however, if the projects are constructed consecutively, then this impact would likely be minimized. The NGT and TEAL Projects, along with other FERC-regulated projects and non-jurisdictional project facilities, would adhere to OSHA guidelines to ensure safety. Contractors for NEXUS and Texas Eastern would be required to attend safety and environmental training prior to entering the rights-of-way. Presumably other projects, such as FirstEnergy's transmission projects and Marcellus and Utica drilling work, would also adhere to OSHA's safety guidelines, further minimizing the need for public services. In addition, the need for public services would be mitigated, to some extent, by the fact that the NGT and TEAL Projects and those considered in this cumulative impacts analysis would occur over a large geographic area, reducing the impacts on any single locality. No long-term cumulative effect on infrastructure and public services is anticipated.

Increased use of local roadways from multiple projects could accelerate degradation of roadways and require early replacement of road surfaces. NEXUS and Texas Eastern would repair any roadways damaged during installation of the pipelines and would coordinate with local authorities regarding any project-related impacts on roads.

Transportation and Traffic

Construction of the NGT and TEAL Projects could result in temporary impacts on road traffic in some areas and could contribute to cumulative traffic, parking, and transit impacts if other projects are scheduled to take place at the same time and in the same area. The local road and highway system in the vicinity of the NGT and TEAL Projects is readily accessible by interstate highways, U.S. highways, state highways, secondary state highways, county roads, and private roads. However, portions of the NGT and TEAL Projects are located in rural areas and some of the impacted roads would be county or private roads.

NEXUS and Texas Eastern would use major highways, as well as the construction right-of-way to the extent practicable, to reduce impacts on local roadways.

The addition of traffic associated with construction personnel commuting to and from the NGT and TEAL Projects could also contribute to cumulative regional traffic congestion; however, the cumulative traffic impacts would be temporary and short-term. Workers associated with the NGT and TEAL Projects would generally commute to and from the pipeline rights-of-way, pipe/contractor yards, or aboveground facility sites during off-peak traffic hours (e.g., before 7:00 AM and after 6:00 PM). It is unlikely that other projects listed in appendix N would have similar commuting schedules or reach peak traffic conditions simultaneously. Highway and road work that would occur in the same timeframe and in the general vicinity of the NGT and TEAL Projects could result in additional traffic (above normal conditions) due to reroutes and road closures. NEXUS and Texas Eastern would adhere to regulations and guidance from state and local authorities with respect to traffic impacts (e.g., reroutes and closures). Increased traffic due to the NGT and TEAL Projects and/or state and local highway/road construction would be temporary.

The NGT and TEAL Projects would not contribute to any long-term cumulative impacts on the transportation infrastructure, because only a small number of new permanent employees would be required to operate the NGT and TEAL Projects at select locations.

4.14.8.8 Cultural Resources

Cumulative impacts on cultural resources would only occur if other projects were to impact the same historic properties impacted by the NGT and TEAL Projects. The currently proposed projects listed in appendix N that are defined as federal actions would include mitigation measures designed to avoid or minimize additional direct impacts on cultural resources. Where direct impacts on significant cultural resources are unavoidable, mitigation (e.g., recovery of data and curation of materials) would occur before construction. The federal projects listed in appendix N would be required to adhere to the NHPA, and non-federal actions would need to comply with any mitigation measures required by the affected states. NEXUS and Texas Eastern have each developed project-specific plans to address unanticipated discoveries of cultural resources and human remains in the event they are discovered during construction and have conducted surveys to identify sensitive cultural resources and historic properties. The NGT and TEAL Projects may incrementally add to the cumulative effects of other projects that may occur at the same time in proximity to the proposed facilities; however, this incremental increase would not be significant.

4.14.8.9 Air Quality and Noise

Air Quality

Construction of the NGT and TEAL Projects and the projects listed in appendix N would involve the use of heavy equipment that would generate air emissions, including fugitive dust. The majority of these impacts, with the exception of HDD installations, would be minimized because the construction activities would occur over a large geographical area and would be transient in nature. The construction emissions associated with the NGT and TEAL Projects would be temporary and would be minimized by mitigation measures such as using properly maintained vehicles and commercial gasoline and diesel fuel products with specifications to control pollutants.

Air emissions resulting from diesel- and gasoline-fueled construction equipment and vehicles would be minimized by federal design standards required at the time of manufacture of the equipment and vehicles and would comply with the EPA's mobile and non-road emission regulations found in 40 CFR Parts 85, 86, and 89. While fugitive dust impacts would also be temporary and not expected to affect local or regional air quality, implementation of NEXUS' and Texas Eastern's respective *Fugitive Dust Control*

Plans in construction work areas would minimize the effects of fugitive dust emissions. Fugitive dust generated by other projects in the area would be limited to the vicinity of the construction activities. The NGT and TEAL Projects construction schedules would overlap with some of the projects listed in appendix N and would be constructed in close proximity; however, many of those projects are minor (e.g., road construction) and would not result in significant cumulative impacts.

With the exception of GHG emissions, air impacts from construction of the NGT and TEAL Projects would be localized and confined primarily to the airsheds where the activities occur. In all counties crossed, the NGT and TEAL Projects' estimated emissions would be below the *de minimus* threshold for a general conformity determination, therefore impacts would not be expected to result in a significant impact on local or regional air quality. The combined effect of multiple construction projects occurring in the same airshed, ACQR, and timeframe as the NGT and TEAL Projects could temporarily add to the ongoing air quality effects of existing activities. However, the contribution of the NGT and TEAL Projects to the cumulative effect of all foreseeable projects would be temporary. The projects listed in appendix N have varying construction schedules and would take place over a relatively large geographic area, further reducing any potential cumulative impacts on air quality.

It is likely that mitigation measures similar to those employed for the NGT and TEAL Projects would be required for other projects to protect ambient air quality, thereby reducing the extent of cumulative impacts on air quality that could occur if projects are being constructed within the same timeframe and within the same region of influence. Industrial-type projects, including the project-related non-jurisdictional compressor station modifications to be constructed by DTE Gas, would be required to adhere with any applicable regulations promulgated by the CAA. As established throughout section 4.12.1 and further demonstrated by air quality modeling, construction of the NGT and TEAL Projects would not have a significant long-term, adverse impact on air quality and would not add significantly to the long-term cumulative impact of other projects.

Operation of the NGT and TEAL Projects' pipelines would generate emissions from maintenance vehicles and equipment, as well as vented and fugitive GHG emissions. The NGT and TEAL Projects' compressor stations would primarily generate GHG, NO_x, VOC, CO, HAP, and PM emissions, and to a lesser extent, SO₂ emissions. However, none of the NGT and TEAL Projects' compressor stations would trigger PSD permitting requirements for any pollutant. Emissions associated with the various FERC-regulated projects would result in cumulative operational impacts on air quality; however, each compressor station would be required to comply with permit conditions based on CAA regulations and Ohio and Michigan's State Implementation Plans.

Construction and Operation of the Willow Run M&R Station and DTE Gas' Willow Run Compressor Station would have a cumulative impact on air quality due to their proximity. However, the construction impacts would be localized and temporary. Table 4.14.5-1 provides the estimated cumulative emissions for the proposed Willow Run M&R Station and DTE Gas' Willow Run Compressor Station. As shown, the Willow Run M&R Station would not significantly contribute to cumulative changes in air emissions. The Willow Run Compressor Station may be subject to air permitting requirements through MDEQ, which would ensure that this non-jurisdictional facility does not result in significant air quality impacts.

TABLE 4.14.5-1

Cumulative Emissions from Willow Run M&R Station and DTE Gas' Willow Run Compressor Station (tpy)

Facility	NO _x	VOC	CO	SO ₂	PM ₁₀ / PM _{2.5}	CO ₂ e	Total HAPs
Willow Run Compressor Station Post-Project PTE ^a	159.7	104.2	124.0	2.8	5.0	90,855	12.8
Willow Run M&R Delivery Station PTE	3.0	2.9	0.4	<0.01	0.03	782	0.3
Cumulative Post-Project PTE	162.7	107.1	124.4	2.8	5.0	91,637	13.1
Willow Run Compressor Station Existing Station PTE ^b	89.0	89.0	89.0	0.1	0.02	24,462	12.5
Cumulative Change in PTE	73.7	18.1	35.4	2.7	5.0	67,175	0.6

a Emissions represented are based on the air permit application submitted to the MDEQ and are based on current design; changes may occur to proposed equipment and emissions.

b Facility operates under a PTI with a permit site limit of 89 tpy of NO_x, CO, and VOC.

Fugitive pipeline emissions would be limited to GHG, which would not necessarily translate to impacts on local air quality (climate change and cumulative GHG emissions are discussed below). FirstEnergy's transmission line projects would not result in operational emissions.

Ongoing drilling activities of Marcellus and Utica Shale natural gas reserves and other projects in the area such as non-jurisdictional project-related facilities would involve the use of heavy equipment that would generate emissions of air contaminants and fugitive dust during construction. Because pipeline construction moves through an area quickly, air emissions associated with pipelines would be intermittent and short term. The majority of these impacts would be minimized further because the construction activities would occur over a large geographical area and, in many cases, construction schedules would not directly overlap. Although these projects would result in short-term construction air emissions, they are not likely to significantly affect long-term air quality in the region. Operation of the NGT and TEAL Projects, Marcellus and Utica Shale drilling activities, other FERC-jurisdictional projects, and other nearby projects would also contribute cumulatively to existing air emissions. The emissions from producing wells in Ohio were estimated using the EPA's 2014 GHG Reporting Program (GHGRP): Onshore Petroleum and Natural Gas Production (average basin emissions per well) (EPA, 2014). In Ohio, the average emissions per well are between 5 to 25 tpy of CO₂e. To conservatively estimate emissions, 25 tpy CO₂e was used. For 576 wells, estimated CO₂e emissions in Ohio would equal 14,400 tpy CO₂e.

As with the operational impacts of the NGT and TEAL Projects, operation of other nearby, similar projects would generate emissions from maintenance vehicles and equipment, as well as vented and fugitive GHG emissions, which would contribute to cumulative impacts on air quality within the region of influence. We expect that operation of nearby, similar projects would be required to comply with the same permit requirements and mitigation measures as the NGT and TEAL Projects.

We received comments requesting that we consider cumulative air quality impacts while taking into account the Ohio E-Check requirements. As discussed in section 4.12.1, the E-Check system was established specifically for passenger vehicles and would not be applicable to industrial-type projects.

Climate Change

We received several comments expressing concern about the NGT and TEAL Projects' contribution to global climate change. Climate change is the change in climate over time, whether due to natural variability or as a result of human activity, and cannot be represented by single annual events or individual anomalies. For example, a single large flood event or particularly hot summer are not indications

of climate change, while a series of floods or warm years that statistically change the average precipitation or temperature over years or decades may indicate climate change.

The Intergovernmental Panel on Climate Change (IPCC) is the leading international, multi-governmental scientific body for the assessment of climate change. The United States is a member of the IPCC and participates in the IPCC working groups to develop reports. The leading U.S. scientific body on climate change is the U.S. Global Change Research Program (USGCRP). Thirteen federal departments and agencies¹⁷ participate in the USGCRP, which began as a presidential initiative in 1989 and was mandated by Congress in the Global Change Research Act of 1990.

The IPCC and USGCRP have recognized that:

- globally, GHGs have been accumulating in the atmosphere since the beginning of the industrial era (circa 1750);
- combustion of fossil fuels (coal, petroleum, and natural gas), combined with agriculture and clearing of forests, is primarily responsible for this accumulation of GHG;
- these anthropogenic GHG emissions are the primary contributing factor to climate change; and
- impacts extend beyond atmospheric climate change alone, and include changes to water resources, transportation, agriculture, ecosystems, and human health.

In May 2014, the USGCRP issued a report, *Climate Change Impacts in the United States*, summarizing the impacts that climate change has already had on the United States and what projected impacts climate change may have in the future (USGCRP, 2014). The report includes a breakdown of overall impacts by resource and impacts described for various regions of the United States. Although climate change is a global concern, for this cumulative analysis, we will focus on the potential cumulative impacts of climate change in the NEXUS and TEAL Project areas.

The USGCRP's report notes the following observations of environmental impacts with a high or very high level of confidence that may be attributed to climate change in the Midwest region:

- Average temperatures have risen about 1.5 °F between 1900 and 2010 and are projected to increase another 4 to 5 °F over the next several decades;
- an increase in health risks due to projected additional heat stress and poor air quality;
- the agricultural crop growing season has lengthened since 1950 and is projected to continue lengthening due to the earlier occurrence of the last spring freeze, potentially increasing crop production in the short term;

¹⁷ The following departments comprise the USGCRP: the EPA, DOE, U.S. Department of Commerce, U.S. Department of Defense, USDA, U.S. Department of the Interior, U.S. Department of State, PHMSA, DHHS, National Aeronautics and Space Administration, National Science Foundation, Smithsonian Institution, and Agency for International Development.

- increased temperature stress, wetter springs, and the continued occurrence of springtime cold air outbreaks are projected may reduce crop yields overall in the long term (particularly corn and soybeans);
- a change in range and/or elevation is projected for many tree species with potential declines in paper birch, quaking aspen, balsam fir, and black spruce and increases in oaks and pines;
- tree species in flat terrain may have difficulty migrating the long distances needed to reach temperatures suitable for the species, resulting in some potential decline in forests;
- increased insect outbreaks, forest fires, and drought may result in increased tree mortality and the reduction in beneficial carbon sinks;
- annual precipitation has increased by about 20 percent over the past century, particularly from increased high-intensity rainfall events, and this trend is projected to continue;
- surface water temperatures in the Great Lakes have increased several degrees between 1968 and 2002, and are projected to increase by about 7 to 12 degrees by the end of the century; and
- increased surface water temperatures, increased precipitation, and longer growing seasons are projected to result in an increase in blue-green and toxic algae in the Great Leaks, harming fish and reducing water quality.

The GHG emissions associated with construction and operation of the NGT and TEAL Projects, including mitigation measures to reduce methane emissions are discussed in more detail in section 4.12.1.3. Although the GHG emissions from construction and operation of the Projects appear large, the emissions are small in comparison to the GHGs from each state (162,000,000 and 229,000,000 metric tpy of CO₂ in Michigan and Ohio, respectively). We note that this comparison provides a frame of reference for the general magnitude of GHG emissions and is not an indicator of significance.

GHG emissions from the proposed Projects and other regional projects would not have any direct impacts on the environment in the Projects area. Currently, there is no scientifically-accepted methodology available to correlate specific amounts of GHG emissions to discrete changes in average temperature rise, annual precipitation fluctuations, surface water temperature changes, or other physical effects on the environment in the Midwest region. However, contributions to GHG emissions globally results in the climate impacts discussed above for the Midwest region.

Climate change impacts, such as increased precipitation, flooding, erosion, and scouring could potentially result in pipeline exposure. Pipelines are typically buried at least 3 feet below grade and are routinely inspected and maintained per regulations at 49 CFR 192, including discovery and handling of any exposed pipeline. As stated in section 4.13.1, to prevent corrosion, the NGT and TEAL Projects would be constructed using pipe with an external coating capable of withstanding stress from a variety of environmental sources, including oxygen, water, and other chemicals. As such, the pipelines would not likely be significantly impacted by climate change. Flooding could impact aboveground facilities, potentially resulting in service outages. Compressor stations would employ backup generators in the event of loss of power. Due to the nature of pipeline systems, loss of service on one portion of the system would likely be offset by employing facilities elsewhere along the pipeline. For example, isolation valves could be used to essentially reroute gas away from inoperable facilities/pipeline segments and compressor stations could be bypassed (gas would be sent through the station without being compressed).

We received comments stating that our climate change analysis should include a lifecycle analysis of the NGT and TEAL Projects, including indirect upstream and downstream impacts. In accordance with CEQ's *Final Guidance for Federal Departments and Agencies on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in National Environmental Policy Act Reviews*, issued on August 1, 2016. CEQ's final guidance recognizes the difficulties in implementing its guidance on ongoing NEPA analyses, recommending that the final guidance apply "to all new proposed agency actions when a NEPA review is initiated" and that "[a]gencies should exercise judgement whether to apply this guidance to the extent practicable to an ongoing NEPA process." As such, the Projects were not initiating a new NEPA review, and therefore, this final EIS includes substantive information, including quantification of GHG emissions, identification of mitigation measures, and discussion of climate change impacts.

Although CEQ's final guidance includes an example of indirect emissions for coal production being the end use combustion of that coal, that example also notes that the indirect effects would vary with the circumstances of the proposed action. The Commission staff's longstanding practice is to conduct an environmental review for each proposed project, or a number of proposed projects that are interdependent or otherwise interrelated or connected. Actions are "connected" if they: "automatically trigger other actions which may require environmental impact statements;" "cannot or will not proceed unless other actions are taken previously or simultaneously;" or "are interdependent parts of a larger action and depend on the larger action for their justification."¹⁸ NEPA does not, however, require us to engage in speculative analyses or provide information that will not meaningfully inform the decision-making process. Even if we were to find a sufficient connected relationship between the NGT and TEAL Projects and upstream development or downstream end-use, it would still be difficult to meaningfully consider these impacts, primarily because emission estimates would be largely influenced by assumptions rather than direct parameters about the NGT and TEAL Projects. Stakeholders and interested parties should review the U.S. DOE's National Energy Technology Laboratory's May 29, 2014 report *Life Cycle Analysis of Natural Gas Extraction and Power Generation*. The report looks at the lifecycle of natural gas from various sources and compares the lifecycle GHG emissions to other fuels used for energy production (most notably coal). The report indicates that, although natural gas may have higher upstream GHG emissions than coal, the total lifecycle GHG emissions from electricity production using natural gas is significantly lower than that of electricity from coal. In addition, emissions of criteria pollutants and HAPs are significantly lower from natural gas combustion than from coal. For a typical (baseload) case, the report indicates that the lifecycle emissions of electricity from natural gas are less than half that of coal.

As discussed above, the upstream production and downstream combustion of gas is not causally connected because the production and end-use would occur with or without the projects. Therefore, the circumstances in this case do not warrant the inclusion of production or end-use as an indirect effect of the Projects. While upstream and downstream emissions are not causally connected to the Projects, we recognize the availability of a reasonable, EPA-developed methodology to estimate the downstream GHG emissions from a project, assuming all of the gas to be transported is eventually combusted. As such, we estimated the GHG emissions from the end-use combustion of the natural gas to be transported by the Projects. All of the TEAL Project volumes would be delivered to the NGT Project and some of the NGT Project volumes would utilize existing available capacity on other transmission system. Therefore, avoiding the double counting of volumes, the Projects combined can deliver up to 925,000 Dth/d of new volumes, which can produce 17,900,878 metric tons of CO₂ per year from end-use combustion.²⁰ However, this value may represent a significant overestimation of emissions because it assumes the total maximum

¹⁸ 40 CFR § 1508.25(a)(1)(i)-(iii).

²⁰ Estimated using EPA's GHG Equivalencies Calculator - Calculations and References. Available at: <https://www.epa.gov/energy/ghg-equivalencies-calculator-calculations-and-references>.

capacity is transported 365 days per year. Many projects in front of the Commission are designed for peak use. As such, it is unlikely that this total amount of GHG emissions would occur.

The USGCRP report states that in the Midwest region “per capita GHG emissions are 22 percent higher than the national average due, in part, to the reliance on fossil fuels, particularly coal for electricity generation” (USGCRP, 2014). Natural gas emits less CO₂ compared to other fuel sources (e.g., fuel oil or coal); therefore, the USGCRP report also notes that increased use of natural gas in the Midwest may reduce emissions of GHGs. We find that the Projects, along with other planned natural gas projects in the Midwest region, may result in the displacement of some coal use or encourage the use of lower carbon fuel for new growth areas, thereby regionally offsetting some GHG emissions.

We received comments stating that the proposed Projects are not in line with the U.S. goal of GHG reduction and that FERC must ensure national GHG goals are met. The goal of the EPA’s Clean Power Plan rule is to reduce CO₂ emissions from existing electricity generation units that burn fossil fuels. States have freedom to exercise discretion in developing compliance plans. Regulations at 40 CFR 60 – indicate that available strategies include, but are not limited to increasing use of existing natural gas-fired capacity and lower use of existing coal-fired generators; increasing use of lower-carbon technologies; and increasing generation from renewables. The U.S. Energy Information Administration projects that under the Clean Power Plan, natural gas then renewables would increase share of electricity generation. The EIA also projects that the power sector CO₂ emissions would fall to about 1,500 million metric tpy by 2025, a level not seen since the early 1980s, in the Base Policy case from its 2015 Annual Energy Outlook (EIA, 2015).

As discussed above, we have disclosed the potential GHG emissions from the Projects, mitigation measures to minimize GHG emissions, climate change impacts associated with the Projects, the impacts of climate change on the Projects, and provided and discussed consistency with climate change goals. As emissions have been minimized, and the Projects would be consistent with climate goals, we conclude that the NGT and TEAL Projects would not significantly contribute to GHG cumulative impacts or climate change.

Noise

The NGT and TEAL Projects could contribute to cumulative noise impacts; however, the impact of noise is highly localized and attenuates quickly as the distance from the noise source increases; therefore, cumulative impacts are unlikely unless one or more of the projects listed in appendix N are constructed at the same time and location. Based on the schedule and proximity of these activities to the pipeline route, there may be some cumulative noise impacts. However, since the majority of noise impacts associated with the projects would be limited to the period of construction and most construction activities would occur during daytime hours and be intermittent rather than continuous, the contribution from the NGT and TEAL Projects to cumulative noise impacts would primarily be for only short periods of time when construction activities are occurring at a given location. Construction at the Willow Run Compressor and Gate Stations would result in cumulative noise impacts with construction at NEXUS’ Willow Run M&R Station; however, these impacts would be localized and temporary.

Operation of the NGT and TEAL Projects’ compressor stations would result in noise from the engines, gas aftercoolers, utility coolers, fuel gas regulation skids, discharge and suction piping, blowdown vents, engine air intakes, engine exhaust systems, and compressor and engine casings. Based on the analyses conducted and mitigation measures proposed, we conclude that the compressor stations would not result in significant noise impacts on residents, or the surrounding communities during operation as noise levels are expected to be below our 55 dBA L_{dn} requirement, and they are not expected to result in a perceptible noise increase at the nearest NSAs. In addition, NGT and TEAL Projects’ operations are not expected to result in a perceptible increase in vibration at any NSA. In order for there to be a cumulative

impact, noise associated with the NGT and TEAL Projects and any of those listed in appendix N would have to affect the same NSAs. The closest facilities to the NGT and TEAL Projects (within about 0.5 mile) are transportation (i.e., highway/road work) and pipelines, which would either have temporary noise impacts or no perceptible noise impacts at nearby NSAs. We did not identify locations where compressor stations for the NGT and TEAL Projects would impact the same NSAs as other projects during operation. In addition, construction and operation of other FERC-jurisdictional projects would be required to adhere to similar noise requirements and mitigations measures as the NGT and TEAL Projects.

NEXUS provided the results of an acoustical analysis prepared for DTE Gas projecting the Willow Run Compressor Station post-modifications would contribute 35 dBA L_{dn} at the common NSA for the compressor and M&R stations. When combined with the existing background sound level (54.2 dBA L_{dn}) and the projected noise level from the Willow Run M&R Station (43.9 dBA L_{dn}), the total noise level would be 54.6 dBA L_{dn} . The cumulative noise level would remain below our criterion of 55 dBA L_{dn} and result in a 0.4 dBA increase in the ambient noise level during operation of these two facilities, which is below the threshold of perceptible change. Therefore, the cumulative impacts from DTE Gas' modifications and the NGT Project facilities in Washtenaw County, Michigan would not result in a significant cumulative impact on environmental resources.

4.14.8.10 Reliability and Safety

Impacts on reliability and public safety would be mitigated through the use of the DOT Minimum Federal Safety Standards in 49 CFR 192, which are intended to protect the public and to prevent natural gas facility accidents and failures. In addition, NEXUS' and Texas Eastern's construction contractors would be required to comply with OSHA's Safety and Health Regulations for Construction in 29 CFR 1926. No significant cumulative impacts on safety and reliability are anticipated to occur as a result of the NGT and TEAL Projects.

4.14.9 Conclusion

For the NGT and TEAL Projects, 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 forested vegetation and associated wildlife habitats. Short-term cumulative benefits would also be realized through jobs and wages and purchases of goods and materials. There is also potential for contributing to a cumulative improvement in regional air quality if a portion of the natural gas associated with the NGT and TEAL Projects displaces the use of other more polluting fossil fuels.

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 SUMMARY OF THE ENVIRONMENTAL ANALYSIS

The conclusions and recommendations presented in this section are those of the FERC environmental staff. Our conclusions and recommendations were developed with input from the EPA, FWS, and USACE as cooperating agencies. A cooperating agency may adopt the EIS per 40 CFR 1506.3 if, after an independent review of the document, it concludes that its permitting requirements and/or regulatory responsibilities have been satisfied. However, each cooperating agency would present its own conclusions and recommendations in its respective and applicable record of decision. Otherwise, it may elect to conduct its own supplemental environmental analysis, if necessary.

We determined that construction and operation of the Projects would result in some adverse environmental impacts. Most of these environmental impacts would be temporary or short term during construction and operation, but long-term and potentially permanent environmental impacts on vegetation, land use, visual resources, and air quality and noise would also result from the Projects. However, if the Projects are constructed and operated in accordance with applicable laws and regulations, the mitigation measures discussed in this EIS, and our recommendations, these impacts would be reduced to acceptable levels. This determination is based on a review of the information provided by NEXUS and Texas Eastern and further developed from data requests; field investigations; scoping; literature research; alternatives analysis; and contacts with federal, state, and local agencies, as well as individual members of the public. As part of our review, we developed specific mitigation measures that we determined would appropriately and reasonably reduce the environmental impacts resulting from construction and operation of the Projects. We therefore recommend that our mitigation measures be attached as conditions to any authorization issued by the Commission. A summary of the anticipated impacts and our conclusions is provided below, by resource area.

5.1.1 Geology

The overall effect of the Projects on geologic resources would be minor. Geologic impacts would be limited to disturbance to the existing topography within the Project areas. All areas disturbed during construction, including in rugged terrain, would be returned as closely as possible to preconstruction contours during cleanup and restoration.

The removal of bedrock, including by blasting, may be required if bedrock is encountered within the pipeline trench or at aboveground facility sites. If uncontrolled, blasting could damage nearby pipelines and other structures, and could initiate landslides or ground subsidence over karst features or underground mines. However, blasting events would be designed to break up only the amount of bedrock needed for construction, and impacts on bedrock would be minor and limited to the immediate area of construction. NEXUS and Texas Eastern would comply with all federal, state, and local blasting regulations and have developed *Blasting Plans* that describe the measures that would be implemented to minimize potential blasting-related impacts. We have reviewed NEXUS and Texas Eastern's *Blasting Plans* and find them acceptable. NEXUS and Texas Eastern also would prepare site-specific blasting plans where required by local permit requirements.

We do not anticipate that the Projects would impact active mineral resource operations.

The potential for seismic activity, active faults, or soil liquefaction to adversely affect the Projects is low due to the low probability of significant earthquakes in the area. The facilities would be designed and constructed with modern methods and materials and would be capable of withstanding the low level of ground movement that could occur in conjunction with earthquakes in the area.

The potential for landslides to adversely affect the NGT Project also is low; however, the TEAL Project is in an area of elevated landslide risk. During final design, Texas Eastern has committed to conducting geotechnical investigations to further evaluate landslide risk in areas of steep slopes, and would implement best management practices as outlined in its *E&SCP* to manage surface water and maintain slope stability. We have reviewed the *E&SCP* and found it consistent with our *Upland Erosion Control, Revegetation, and Maintenance Plan* and *Wetland and Waterbody Construction and Mitigation Procedures*. Where the *E&SCP* differed from our plans, we found the modifications acceptable. To ensure landslide risks are appropriately mitigated, Texas Eastern would file the results of the geotechnical studies and final landslide mitigation measures with the Commission for review and approval prior to construction.

There are areas along the NGT Project where a karst hazard may be present; no karst hazards exist along the TEAL Project. NEXUS has routed the NGT Project to avoid known sinkholes and conducted electromagnetic geophysical surveys to identify additional karst. The survey data are currently being analyzed to identify additional karst features along the alignment that might warrant further investigation and engineering design. NEXUS has indicated that all construction supervisory staff and inspectors would be trained to recognize the signs of sinkhole formation. If previously undocumented karst features are encountered during construction, NEXUS would implement a minor reroute if possible to avoid the feature, or stabilize the feature to avoid further sinkhole development. To further minimize risk associated with karst, we recommend that prior to construction NEXUS should file with the Commission the results of geophysical surveys to detect previously unidentified karst features. If previously unidentified karst features are found, NEXUS also should file for review and written approval of the Commission its plans to avoid or mitigate the features prior to construction.

Ground subsidence could occur in areas where abandoned underground mines are crossed. NEXUS has routed the NGT Project to avoid all known abandoned underground mines. Texas Eastern has routed the TEAL Project above abandoned underground mines at the same location as its existing facilities, which have been unaffected by mine subsidence. NEXUS would implement additional investigation (and mitigation, if necessary) in the event that a previously undocumented abandoned underground mine is discovered prior to, or during construction. Comments received during draft EIS comment period identified possible recent mine subsidence in Summit County, Ohio. Because of the recent nature of this possible subsidence, and the presence of mapped abandoned underground mines nearby, we recommend that prior to construction NEXUS should conduct a geophysical investigation at Summit County parcel number 2400603 and file the report, including appropriate avoidance and mitigation measures, with the Commission for review and written approval.

Flash flooding is a potential hazard in the Project areas. NEXUS and Texas Eastern would bury the pipeline to a depth that would provide at least 5 feet of cover below the existing streambed to minimize impacts from flash flooding, scouring, and high flow velocities. In addition, NEXUS and Texas Eastern would implement the measures in their respective *E&SCPs* to reduce the likelihood of sedimentation and erosion during flash flood events.

With the implementation of NEXUS' and Texas Eastern's *E&SCPs*, *Blasting Plans*, plans to further evaluate landslide risk, and procedures to be followed in the event of discovery of previously undocumented karst features or abandoned underground mines, and our recommendations, we conclude that impacts on geological resources would be adequately minimized and would not be significant.

Paleontological resources in the vicinity of the NGT and TEAL Projects are limited to Pleistocene bones found in glacial sediments. No specific sites containing significant paleontological resources were identified in the NGT and TEAL Project areas, thus impacts on significant paleontological resources would be unlikely.

5.1.2 Soils

The Projects would traverse a variety of soil types and conditions. Construction activities could adversely affect soil resources by causing erosion, compaction, and introduction of excess rock or fill material to the surface, which could hinder restoration. However, the applicants would implement the mitigation measures contained in their respective *E&SCPs* to control erosion, segregate topsoil, enhance successful revegetation, and minimize any potential adverse impacts on soil resources, including any impacts on crop productivity. Additionally, the applicants would implement their respective *SPCC Plans* during construction and operation to prevent and contain, and if necessary clean up, accidental spills of any material that may contaminate soils. We have reviewed the *SPCC Plans* and find them acceptable. We received comments during the draft EIS comment period concerning the adequacy of soil handling on the Projects, particularly in agricultural land. To address these concerns, we recommended that NEXUS file with the Secretary an *Agricultural Impact Mitigation Plan* detailing construction and restoration measures to be implemented on the NGT Project to address agricultural issues unique to Ohio and Michigan. We also recommended that NEXUS file a 5-year post-construction monitoring program to evaluate crop productivity in areas impacted by construction. Given these measures, we conclude that construction of the Projects would not significantly alter the soils of the region.

Permanent impacts on soils would mainly occur at the aboveground facilities where the sites would be graveled and converted to industrial use. Implementation of the *E&SCPs*, as well as other Project-specific plans, would adequately avoid, minimize, or mitigate construction impacts on soil resources in the remainder of the area of the Projects. Based on our analysis of the applicants' proposed measures, we conclude that potential impacts on soils would be avoided or effectively minimized or mitigated to less than significant levels.

5.1.3 Water Resources

Groundwater

Groundwater resources in the Project areas include unconsolidated glacial, lacustrine, and alluvial deposits or consolidated and partially consolidated bedrock units confined by siltstone, shale, sandstone, limestone, and dolomite bedrock. None of the Projects' facilities would be within SSAs or state-designated aquifers. Construction of the Projects could result in increased turbidity and alteration of flow in shallow aquifers if encountered within trench depth or during grading and excavation at aboveground facilities. These impacts would be minimized by measures included in the applicants' *E&SCP*. An inadvertent release of fuel, lubricants, and other substances would be minimized and mitigated by implementing the applicants' Project-specific *SPCC Plans* that identify contractor training; the use of EIs; procedures for the safe storage and use of hazardous materials; and remedial actions that would be taken to address a spill.

The NGT Project would cross 16 WHPA at 26 locations. The TEAL Project would not cross any WHPAs. Implementation of NEXUS' *E&SCP* and *SPCC Plan* would be mitigating factors protecting WHPAs, as would our recommendation for NEXUS to consult with water suppliers in the WHPAs regarding recommended mitigation.

A total of 245 wells and 6 springs were identified within 150 feet of the Projects. Additionally, the NGT Project would cross 16 wellhead protection areas; the TEAL Project would not cross any wellhead protection areas. To mitigate impacts on wells, springs, and wellhead protection areas, the applicants would implement their *SPCC Plans* to avoid, minimize, and mitigate any chemical spills, and would prohibit fueling within 200 feet of a private well and within 400 feet of a public well. The applicants also would offer to conduct pre- and post-construction testing of water quality and yield in all wells within 150 feet of the construction workspace, and would repair or replace any wells that are adversely affected, or would

otherwise compensate the owner. Additionally, NEXUS has committed to conduct pre-and post-construction testing at springs if requested by a landowner, and we have recommended that Texas Eastern conduct similar pre- and post-construction testing. We also have recommended that NEXUS and Texas Eastern repair or replace the water supply of any springs that are damaged by construction, or otherwise compensate the owner of the spring. We conclude that these measures would be protective of nearby wells and springs.

NEXUS proposes to use the HDD method at 18 locations, whereas Texas Eastern would not use the HDD method. An inadvertent release of drilling mud could occur during drilling operations, affecting groundwater turbidity, which would diminish with time and distance from the point of release. NEXUS would implement measures detailed in its Project-specific *HDD Design Report* and *HDD Plan* to avoid or minimize the inadvertent release of drilling mud. We have reviewed the plans and find that it would be protective of groundwater resources in the NGT Project area.

The Projects would not significantly affect groundwater resources because the majority of construction would involve shallow, temporary, and localized excavation. Potential impacts would be avoided or further minimized by the use of construction techniques and mitigation measures described in the applicants' *E&SCPs* and *SPCC Plans*, and NEXUS' *HDD Design Report* and *HDD Plan*, as well as our recommendations.

Surface Waters

The Projects would cross a total of 478 waterbodies (216 perennial, 155 intermittent, 93 ephemeral, 11 ponds, and 3 reservoirs). The applicants would use the HDD method to cross 30 waterbodies at 16 HDD locations, including all Section 10 navigable, NRI-designated, and OEPA-designated outstanding and superior water quality streams. The applicants would use the conventional bore method to cross 69 waterbodies. The remaining waterbodies would be crossed using dry (dam-and-pump or flume) and open-cut wet crossing methods. Successful implementation of HDD or bore methods would avoid impacts on waterbodies. Impacts on waterbodies that would be crossed using dry and open-cut wet crossing methods would be minimized by implementing mitigation measures outlined in the applicants' *E&SCPs* and other project-specific plans. We further recommend that, prior to starting each HDD, NEXUS file with the Commission for review and approval a site-specific contingency crossing plan.

The Projects would cross 12 surface water protection areas and 5 waterbodies that have public water intakes within 3 miles downstream. The applicants would avoid or minimize impacts by implementing the BMPs detailed in each Projects' *E&SCP* and *SPCC Plan*, and the NEXUS Project *Blasting Plan*, if needed, and would use HDD and conventional bore crossing methods for several stream crossings.

The applicants requested use of additional temporary workspace (ATWS) in several areas where it concluded that site-specific conditions do not allow for a 50-foot setback of extra workspace from waterbodies. Based on our review, we believe that the applicants have provided adequate justification for the need of the ATWS at all locations on the Projects.

No long-term effects on surface waters would result from construction and operation of the Project. No designated water uses would be permanently affected. During maintenance activities in or near streams, the applicants would employ protective measures similar to those proposed for construction of the Projects. Consequently, we conclude that any maintenance-related effects would be short term.

Surface Water Uses During Construction

The applicants would use both surface water and water trucks as sources for hydrostatic testing (about 68.3 million gallons), the HDD construction method (about 1.8 million gallons), and dust suppression (amount would be highly variable based on the conditions at the time of construction). The source of water transported by trucks could be from municipal or groundwater sources. Impacts associated with the withdrawal of surface water would be effectively minimized by using pumps placed adjacent to the waterbody with hoses placed into the waterbody with floating intake structures that would be screened to prevent the uptake of aquatic organisms and fish. Additionally, water withdrawals would be conducted in compliance with all necessary permits required for surface water extraction. Discharge of water to upland areas could contribute to erosion, which would be minimized by adhering to the measures contained in the Projects' *E&SCPs*.

Based on the mitigation measures developed by the applicants as described above, as well as our recommendations, we conclude that the Projects would not have a significant adverse impacts on surface water resources.

5.1.4 Wetlands

Construction of the pipeline facilities associated with the Projects would temporarily affect a total of 199.7 acres of wetlands, including 75.5 acres of PFO wetlands, 69.8 acres of PEM wetlands, 30.1 acres of PSS wetlands, 22.9 acres of AG-PEM wetlands, 0.2 acre of PUB wetlands, and 1.1 of PEM/PSS complex wetlands. No wetlands would be permanently filled. Impacts on emergent wetlands would be relatively brief because the emergent vegetation would regenerate quickly, typically within 1 to 3 years. Impacts on scrub-shrub and forested wetlands would be long-term or permanent because the woody vegetation would take several years to grow back. Additionally, the applicants would maintain a 10-foot-wide corridor centered over the pipeline in an herbaceous state and would selectively cut trees within 15 feet of the pipeline centerline. Approximately 41.1 acres would be converted from PFO or PSS to PEM or PSS wetland habitat.

Construction and operation-related impacts on wetlands would be mitigated by the applicants. NEXUS would create a project-specific *Wetland Mitigation Plan* in consultation with the USACE, MDEQ, and OEPA, where mitigation would include the purchase of wetland mitigation credits from established wetland mitigation banks, the use of an in-lieu fee program, or a combination of the two. Texas Eastern would create a project-specific *Wetland Mitigation Plan* in consultation with USACE and OEPA. Mitigation would include the purchase of wetland mitigation credits from established wetland mitigation banks, the use of an in-lieu fee program, or a combination of the two. We recommend that each applicant file its final *Wetland Mitigation Plan* with the Commission prior to construction.

The applicants requested use of ATWS in several areas where they concluded that site-specific conditions do not allow for a 50-foot setback of extra workspace from wetlands. Based on our review, we believe that the applicants have provided adequate justification for the need of the ATWS at all locations on the Projects.

Based on the types and amounts of wetlands that would be impacted and the applicants' measures to avoid, minimize, and mitigate wetlands impacts as described in their construction and restoration plans, as well as our recommendations, we conclude that impacts on wetlands would be effectively minimized or mitigated. These impacts would be further minimized and mitigated by the applicants' compliance with USACE Section 404 and state permit requirements, including the purchase of wetland mitigation credits and use of in-lieu fee programs.

5.1.5 Vegetation

Construction of the Projects would affect 371.5 acres of forested upland, 43.3 acres of forested wetland, 571.8 acres of open upland, 43.8 acres of emergent wetland, and 19.5 acres of scrub-shrub wetland. The remaining 4,202.7 acres are agricultural land, developed land, or open water. Operation of the Projects would affect 148.0 acres of forested upland, 26.7 acres of forested wetland, 154.5 acres of open upland, 21.0 acres of emergent wetland, and 10.0 acres of scrub-shrub wetland. The remaining 1,347.4 acres are agricultural land, developed land, or open water.

Impacts on upland open land, emergent wetlands, and agricultural lands would be short-term as these vegetation cover types would likely return to their pre-construction states within one to three growing seasons after restoration is complete and typically not require maintenance mowing. The exception would be at aboveground facilities where construction would permanently convert existing vegetation cover into an industrial site.

Impacts on forested uplands, forested wetlands, and scrub-shrub wetlands would be long-term or permanent and would constitute the most pronounced change in vegetation strata, appearance, and habitat. Trees would be cleared with the construction area and replaced by herbaceous plants, shrubs, saplings, and other successional species until trees can again flourish, which can take several decades or longer to occur. Regeneration of scrub-shrub wetlands would take two to four years or longer. Forested uplands and wetland would take several more years to grow back. Moreover, the forest land on the permanent right-of-way would be permanently impacted by ongoing vegetation maintenance during operations, which would preclude the re-establishment of trees on the right-of-way. Due to the prevalence of forested habitats within the Project areas, the ability to co-locate the proposed facilities adjacent to existing rights-of-way (46 percent of the route would be co-located), and the eventual regrowth of forested areas outside of the permanent right-of-way, we conclude that the permanent conversion of forested lands would not result in a significant impact. In addition, impacts on forested and non-forested vegetation types would be further mitigated through implementation of the applicants' construction and restoration plans and our recommendations.

The NGT Project would cross approximately 9.7 miles of the Oak Openings Region in Henry and Fulton Counties, Ohio. Roughly 99 percent of the ecosystem has been altered and fragmented by agricultural development, primarily through tree clearing and wetland draining. Botanical surveys confirmed two remnant communities totaling about 0.5 miles in length would be crossed by the NGT Project: the Swamp White Oak-Pin Oak Flatwoods and the Black Oak-White Oak/Blueberry Forest Plant communities. Neither of these areas contained all of the indicative species that would be present in high-quality remnant communities, and most of the clearing would be adjacent to the existing forest edge. Therefore, based on our review, impacts on the Oak Openings Region would be minor.

Construction of the Projects would temporarily impact about 1,049.9 acres of pollinator habitat (including upland forest, forested wetland, upland open land, emergent wetland, and scrub-shrub wetland). The temporary loss of this habitat would increase the rates of stress, injury, and mortality experienced by honey bees and other pollinators. The applicants would revegetate both the temporary workspaces and permanent rights-of-way immediately after the pipeline facilities are installed with herbaceous and riparian seed mixes in consultation with the NRCS. Once revegetated, the restored workspaces and permanent rights-of-way would provide pollinator habitat after the first or second growing season, and may naturally improve pollinator habitat along the Project areas. We recommended prior to construction of the Projects, the applicants shall provide plans describing the feasibility of incorporating plant seeds that support pollinators into the seed mixes used for restoration of construction workspaces.

The applicants have identified several areas where noxious weeds or invasive species are present or are located near the construction right-of-way. NEXUS and Texas Eastern have each developed an *ISMP* to minimize and control the spread of the noxious and invasive species, which we reviewed and find acceptable.

5.1.6 Wildlife and Aquatic Resources

The Projects could have both direct and indirect impacts on wildlife species and their habitats, including the displacement of wildlife, potential individual mortality, and reduction in habitat. Forest fragmentation would increase in certain locations due to clearing, thus reducing the amount of habitat available for interior forest species (i.e. movement and dispersal corridors). With habitat conversion and forest fragmentation, there is also a risk of intrusion by invasive or noxious species. To minimize wildlife impacts, the applicants have routed the pipelines to avoid a number of sensitive areas, co-locate with existing rights-of-way where practical, and reduce workspace in wetlands and interior forest areas. The applicants also would adhere to their *E&SCPs* and respective *Invasive Species Management Plans*.

A variety of migratory bird species, including Birds of Conservation Concern, are associated with the habitats that would be affected by the Projects. NEXUS has prepared a final *MBCP* in coordination with the FWS Region 3 office for portions of the NGT Project. The purpose of the plan is to reduce direct and indirect effects on migratory birds and their habitats. During operations, the applicants would avoid mortalities or injuries of breeding birds and their eggs or young by conducting vegetation clearing and maintenance activities outside of the breeding season to the extent practicable, particularly in key habitat areas. Vegetative maintenance in the permanent right-of-way would take place no more than once every 3 years, and impacts on ground-nesting birds in upland areas would be minimized by conducting maintenance activities outside the nesting season (March 31 to August 1).

The Projects would involve 478 waterbody crossings, many of which support fisheries and aquatic habitat. All of the waterbodies are classified as warmwater fisheries. Construction and operation the Projects could result in temporary and permanent impacts on fisheries and aquatic habitat, including increasing sedimentation and turbidity, alteration or removal of instream and stream bank cover, stream bank erosion, introduction of water pollutants, water depletions, and entrainment of small fishes during water withdrawals resulting. These impacts could indirectly increase stress, injury, and mortality of stream biota. The degree of impact on fisheries from construction activities would depend on the waterbody crossing method, the existing conditions at each crossing location, the restoration procedures and mitigation measures employed, and the timing of construction. To minimize impacts on fisheries and aquatic habitat, the applicants would follow their respective *E&SCPs*. Further, all waterbodies identified as fisheries of concern (potentially containing federal or state-listed species) would be crossed using dry crossing methods or HDDs. Based on our review of the potential impacts, we conclude that construction and operation of the Projects would not significantly impact fisheries or aquatic resources.

Based on the presence of suitable adjacent habitat available for use and given the impact avoidance, minimization, and mitigation measures proposed by NEXUS, as well as our recommendations, we conclude that the construction and operation of the Projects would not have a significant adverse effect on wildlife or aquatic species.

5.1.7 Threatened, Endangered, and Other Special Status Species

To comply with Section 7 of the ESA, we consulted either directly or indirectly (through the applicants' informal consultation) with the FWS and state resource agencies regarding the presence of federally listed, proposed for listing, or state-listed species in the Project areas. Based on these consultations, we identified 11 federally listed or proposed species as potentially occurring in the Project

areas. We determined that the northern riffleshell, the snuffbox mussel, Mitchell's satyr butterfly, the Poweshiek skipperling, the Karner blue butterfly, Kirtland's warbler, eastern massasauga rattlesnake, and the eastern prairie fringed orchid would not be affected by construction and operation of the Projects. We also determined that the Projects may affect, but would not likely adversely affect the rayed bean mussel. The Projects may affect, and are likely to adversely affect the northern long-eared bat and Indiana. These determinations are based on consultations with the FWS and our own analyses. Based on our analyses we have concluded that Projects-related impacts on federally listed species would be reduced to levels that would not threaten a species population viability, or contribute to trends toward extinction.

The rayed bean mussel is known to occur in the vicinity of the Project facilities. NEXUS conducted mussel surveys for this species in waterbodies crossed by the NGT Project in fall of 2015. Surveys identified live individuals of the rayed bean mussel in the River Raisin and shell fragments in the Vermillion River. Both rivers would be crossed using the HDD method to minimize the likelihood impacting the species. The River Raisin crossing is considered to have a "low" level of risk of an inadvertent return of drilling mud. The rayed bean mussel is recently considered extirpated from the Vermillion River. Therefore, we conclude that the NGT Project may affect, but is not likely to adversely affect the rayed bean mussel. The FWS concurred with this determination on October 21, 2016.

The Indiana bat and the northern long-eared bat are known to occur in the Project areas. Portal surveys to identify hibernacula for both the Indiana bat and northern long-eared bat were conducted in 2015 and 2016. No portals were identified during the surveys for either species, and therefore, no potential hibernacula would be affected by the Projects. Mist-net surveys for the Indiana bat also were conducted in 2015 and 2016; no Indiana bats were detected during the summer presence/absence surveys, demonstrating probable absence of Indiana bats in these portions of the NGT and TEAL Project areas. Mist-net surveys were conducted for the northern long-eared bat in 2015 and 2016 along the NGT Route; eight northern long-eared bats were captured and radio-tagged; telemetry surveys successfully tracked seven of the bats to roost trees. Three northern long-eared bat roost trees were identified within 150 feet of the NGT Project workspace. Surveys conducted for the species in 2016 along the TEAL Route; 14 northern long-eared bats were captured. One female bat was fitted with a radio transmitter. This bat was then tracked to three separate roost trees, one of which falls within 150 feet of the TEAL Project workspace.

FERC has prepared a BA for the NGT Project as a contingency for adjustments to construction schedules and constraints regarding access to properties. The BA defines anticipated impacts to both Indiana bats and northern long-eared bats in the event that spring and/or summer clearing may be required, and would provide the data necessary for the FWS to calculate levels of take for both species. FERC and the FWS entered into formal consultation for the Indiana bat and the northern long-eared bat on October 21, 2016. The FWS will prepare a Biological Opinion for these species for the NGT Project. Texas Eastern would utilize the final 4(d) rule for the northern long-eared bat in the event that it cannot adhere to winter clearing timelines, and would institute the summer clearing restrictions as defined in the final 4(d) rule. FERC, as the lead federal agency, has chosen to rely upon the finding of the programmatic Biological Opinion developed by FWS on January 5, 2016 to fulfill its Section 7 consultation obligations for this species. Because consultations are ongoing for federally listed species, we recommend that NEXUS should not begin construction until FERC staff receives comments from the FWS regarding the proposed actions; FERC staff completes formal consultation with the FWS; and NEXUS has received written notification from the Commission that construction or use of mitigation may begin.

The rayed bean mussel is known to occur in the vicinity of the Project facilities. NEXUS conducted mussel surveys for this species in waterbodies crossed by the NGT Project in fall of 2015. The bald eagle retains federal protection under the BGEPA and the MBTA, which prohibit the taking of eagles, their eggs, or their nests. NEXUS conducted aerial bald eagle nest surveys along the NGT Project route in spring

2015. No bald eagle nests were identified within 660 feet of the NGT Project area; therefore, no impact on bald eagles is anticipated.

A total of 91 state-listed species may occur in the Project areas. Seventy-seven species are listed at the state level only; 11 species are also listed as federally protected and are discussed above, while 3 are listed as federally protected, but are not present in the Project areas). Of these species, 58 species either do not have suitable habitat within the Project areas or have habitat would be avoided by implementing special construction techniques (e.g., HDD). For the remaining 19 species, the applicants have proposed measures to reduce habitat and species impacts, and continue to consult with resource agencies to identify and develop additional conservation and mitigation measures to further minimize impacts on state-listed species. After evaluating potential impacts to Michigan listed species, we have concluded that no impacts are anticipated to Michigan state-listed species, and that impacts to habitat will be temporary and minor. The MIDNR concurred with this conclusion on October 13, 2016. Ohio permitting agencies have further opportunity during their permit review and authorization processes to require additional conservation and mitigation measures that would further protect and conserve sensitive species and their habitats according to each agencies' mission and conservation goals. Because additional mitigation may be developed through ongoing consultations with Ohio agencies, we recommend that the NEXUS and Texas Eastern file with the Commission prior to construction any additional mitigation measures for state-protected species in Ohio developed in consultation with the applicable state agencies.

Although a number of other candidate, state-listed, or special concern species were identified as potentially present in the Project areas, none were detected during surveys and we do not expect any adverse effects given the applicants' proposed measures and our recommendations. Based on implementation of these measures and our recommendations, we conclude that impacts on special-status species would be adequately avoided or minimized.

5.1.8 Land Use, Recreation, and Visual Resources

Construction of the Projects would affect a total of 5,223.7 acres of land. About 85.6 percent of this acreage would be utilized for the pipeline facilities, including the construction right-of-way (59.1 percent) and additional temporary workspace (26.5 percent). The remaining acreage affected during construction would be associated with contractor yards (4.5 percent), staging areas (0.9 percent), new and modified aboveground facilities (7.7 percent), and access roads (1.3 percent). During operation, the new permanent pipeline right-of-way, aboveground facilities, and permanent access roads would affect 1,741.9 acres of land.

The land retained as new permanent right-of-way would generally be allowed to revert to its former use, except for forest/woodland and tree crops. Certain activities, such as the construction of permanent structures or the planting of trees, would be prohibited within the permanent right-of-way. To facilitate pipeline inspection, operation, and maintenance, the entire permanent right-of-way in upland areas would be maintained in an herbaceous vegetated state. This maintained right-of-way would be mowed no more than once every 3 years, but a 10-foot-wide strip centered over the pipeline might be mowed more frequently to facilitate corrosion and other operational surveys.

The NGT Project's proposed construction work area is within 50 feet of 178 residential structures (including homes, garages, and associated structures). A total of 15 garages or associated structures abut or are within the construction work area; however, no homes abut or are within the construction work areas. Seven homes are within 10 feet of the construction work area. NEXUS has developed site-specific *RCPs* for the residential structures within 50 feet of the construction work area. We reviewed these plans and find them acceptable. To further minimize effects on residences, we recommend that for the seven residences located within 10 feet of the construction work area, NEXUS provide evidence of landowner concurrence with the

site-specific *RCPs* prior to construction. NEXUS has also developed an *Issue Resolution Plan* that identifies how stakeholders can contact pipeline company representatives with questions, concerns, and complaints prior to, during, and after construction. We have reviewed this plan and find it acceptable. The TEAL Project is not within 50 feet of any structure.

The NGT pipeline and FirstEnergy's transmission line generally follow similar linear routes for about 21 miles in Erie and Sandusky counties, Ohio. There are five locations where the NGT Project would cross the transmission line right-of-way and NEXUS has indicated it would work with FirstEnergy to coordinate construction activities at these locations. Because consultations are ongoing, we recommend that, prior to construction, NEXUS should provide updated documentation of consultation with FirstEnergy regarding coordination of construction activities in these five areas.

Sixty-two planned or ongoing residential and commercial/industrial development projects have been identified within 0.25 mile of the proposed NGT Project facilities. We recommend that NEXUS continue discussions with developers and file updated correspondence with the Commission prior to construction for review and approval. No planned or ongoing residential or commercial/industrial development projects were identified within 0.25 mile of the proposed TEAL Project facilities.

Construction of the Projects would affect a total of 4,016.3 acres of agricultural land, and 1,331.8 acres would be retained during operation of the Project. Agricultural land in the construction rights-of-way would generally be taken out of production for one growing season and would be restored to previous use following construction (except fruit and tree crops). NEXUS would provide agricultural monitors that would be on site to monitor construction activities within agricultural lands.

NEXUS developed a *Drain Tile Mitigation Plan*, which provides a general overview of the types of drain tile systems potentially encountered during construction, and describes NEXUS' drain tile mitigation strategy during pre-construction, construction, and post-construction. If drain tiles are damaged during construction, temporary repairs would be conducted immediately and permanent repairs would be completed following construction. Repairs and restoration to these systems conducted by NEXUS would be monitored for three years, or until restoration is considered successful, to ensure the system functions properly. We have reviewed this plan and recommend that NEXUS file a revised *Drain Tile Mitigation Plan* with the Commission for review and approval prior to construction that would require a depth of burial of four feet in cultivated or rotated croplands, if requested by the landowner.

The NGT Project crosses four certified organic farms and several specialty crop lands. The TEAL Project does not cross any certified organic farms or specialty crop lands. NEXUS developed an *Organic Farm Protection Plan* to address prohibitions on substances allowed on farm property (both during construction and operation); soil handling procedures; erosion control and buffers; off right-of-way water migration; noxious weed and invasive species control; mitigation/restoration methods; post-construction monitoring; compensation for construction-related damages; and damages due to decertification. We have reviewed this plan and find it acceptable. Operation of the NGT Project would affect 96.8 acres of specialty crops. NEXUS would compensate landowners for any project-related damages and lost production on organic farms and specialty crop lands.

The NGT Project crosses several parcels of land enrolled in the CAUV program, the OFTL program, or are protected by conservation easements. The NGT Project also crosses a number of areas enrolled in a variety of FSA enrolled land including CRP/CREP lands. On program lands where tree clearing is necessary, NEXUS would reimburse the landowner the fair market value for any loss of crop or timber for any area disturbed due to the construction of the pipeline. Also, NEXUS would work with landowners and local program officials to determine how the crossing of enrolled lands by the NGT Project affects the continued participation in the program by landowners. We recommend that NEXUS file with

the Commission for review and approval its revised *E&SCPs* to commit to ensuring lands crossed that are under conservation practices, such as CRP lands, would be restored to pre-construction conditions, or in accordance with the landowner's request. The TEAL Project would not cross any land enrolled in a conservation program.

The NGT Project would directly affect numerous trails, conservation and recreation areas, sports facilities, state parks and forests, nature and heritage areas, municipal parks, and federal- and state-designated recreation areas. The TEAL Project would not cross or be located within 0.25 mile of any public or private lands that support recreation or special interests. In general, effects of the NGT Project on recreational and special interest areas would be temporary and limited to the period of active construction, which typically lasts several days to several weeks in any one area. These effects would be minimized by implementing the measures in NEXUS' *E&SCP* and site-specific crossing plans. Both the Iron Horse Trail and the NCNST would be temporarily closed during construction. However, site-specific mitigation measures, such as a detour, have not yet been identified. Therefore, we recommend that NEXUS file with the Commission for review and approval prior to construction site-specific crossing plans for these trail that identifies the location(s) of a detour, public notification procedures, signage, and consideration of avoiding days of peak usage.

Portions of the NGT Project are subject to a federal Coastal Zone Consistency Review in Ohio; designated coastal zones in Michigan would not be affected. A consistency determination was received from the ODNR on April 8, 2016 concurring that the NGT Project is consistent with the CZMA.

The NGT Project would be within 0.25 mile of 127 sites listed as potential or known sources of contamination and hazardous wastes. Based on the facility type, regulatory status, distance from the construction work area, and other site-specific information, the potential to encounter contamination that may be associated with 124 of the 127 sites during Project construction is low. Contamination may be encountered at 3 sites: Country View Apartment Complex, the Ford Motor Company – Rawson Plant, and the RACER site. There are no properties within 0.25 mile of the TEAL Project facilities that are listed as potential or known sources of contamination. In the event that construction activities encounter contaminated or hazardous wastes, NEXUS has committed to develop construction practices that include proper handling of contaminated soil and groundwater that may be encountered during construction in compliance with Part 201 of Michigan's Natural Resources and Environmental Protection Act of 1994. Additionally, we recommend that NEXUS file with the Commission for review and approval prior to construction an updated *SPCC Plan* and *E&SCP* that address pre-existing contamination at Country View Apartment Complex, the Ford Motor Company – Rawson Plant, and the RACER site. NEXUS also would file a report detailing the July 2016 investigation of the RACER site workspaces, including a comparison of the sampling results to applicable regulatory standards. We also recommend that NEXUS coordinate with the landowner(s) near MP 51.2, where the dumping of unknown contaminants occurred, and file with the Commission a site-specific plan to properly manage any contaminated soil or groundwater in compliance with applicable regulations or demonstrate that a site-specific plan is not needed.

Impacts on visual resources would be greatest where the pipeline routes parallel or cross roads and the pipeline rights-of-way may be seen by passing motorists; from residences where vegetation used for visual screening or for ornamental value is removed; and where the pipelines are routed through forested areas. A portion of pipelines (about 45 percent) would be installed within or parallel to existing rights-of-way. As a result, the visual resources along this portion of the Projects have been previously affected by other similar activities. In other areas, the visual effects of construction in forests would be permanent on the maintained right-of-way where the regrowth of trees would not be allowed, and would be long term in the temporary workspaces. After construction, all disturbed areas, including forested areas, would be restored in compliance with NEXUS and Texas Eastern's *E&SCPs*; federal, state, and local permits; landowner agreements; and easement requirements. Generally this would include seeding the restored areas

with grasses and other herbaceous vegetation, after which trees would be allowed to regenerate within the temporary workspaces.

Visual effects also would occur at rivers, trails, railroads, roads, and historic properties that are valued for their scenic quality. These include the Maumee River, NCNST, Cuyahoga Valley Scenic Railroad, America's Byway, Lincoln Highway Historic Byway, Maumee Valley Scenic Byway, and the Abbott-Page house. Visual impacts on these areas would be minimized by co-location with an existing corridor or use of HDD or bore construction method.

NEXUS has designed aboveground facilities to preserve existing tree buffers within purchased parcels to the extent practicable. To further mitigate visual impacts, NEXUS would install perimeter fences, directionally controlled lighting, and slatted fencing at its compressor station sites. Several residents expressed concern about the visual impacts of the Hanoverton, Wadsworth, and Waterville compressor stations. NEXUS has developed visual screening plans for these stations. We have reviewed these plans and find them acceptable.

5.1.9 Socioeconomics

Construction of the Projects would not have significant adverse impacts on local populations, housing, employment, or the provision of community services. There would be temporary increases in demand for housing such as hotels, motels, and other rental units due to the influx of construction workers. Also, there would be temporary increases in traffic levels due to the commuting of the construction workforce to the areas of the Projects, as well as the movement of construction vehicles and delivery of equipment and materials to the construction right-of-way. To address and mitigate traffic impacts related to in-street construction, NEXUS and Texas Eastern would coordinate with local officials to avoid traffic interruptions and ensure the safety of pedestrians, motorists, and emergency vehicles in the Project areas.

We received comments concerning the potential effect of the Projects on property values, mortgages, and property insurance. We assessed available studies regarding property values and have not been able to document adverse effects of pipelines on property values, mortgages, or the ability of landowners to obtain mortgages for similar projects. In addition, we have no insurance industry data to suggest that the Projects would adversely affect homeowners' insurance rates, the ability to acquire a new homeowner's insurance policy, or that insurance policies would be discontinued due to the presence of a natural gas pipeline on a property.

We received comments expressing concern about potentially adverse impacts on environmental justice populations in the Project areas. Based on our research and analysis, there is no evidence that the Projects would result in disproportionately high and adverse health or environmental effects on minority or low-income communities.

The long-term socioeconomic effects of the Projects are likely to be beneficial, based on the increase in tax revenues that would accrue in the counties affected by the Projects.

Overall, we conclude that the Projects would not have a significant adverse effect on the socioeconomic conditions of the Project areas.

5.1.10 Cultural Resources

NEXUS and Texas Eastern conducted archival research and archaeological and architectural resource surveys for the Projects to identify previously recorded historic aboveground resources and

locations with the potential for prehistoric and historic archaeological sites. Surveys have been completed for about 95 percent of the NGT Project area and 100 percent of the TEAL Project area.

The applicants identified 212 archaeological sites within the study areas. Of the sites, 10 are recommended as eligible for listing on the NRHP, 197 are recommended as not eligible, and 5 were not assessed. The applicants also identified 230 historic architectural properties within the study areas. Of the properties, 3 are NRHP-listed districts, 42 are recommended as eligible for listing on the NRHP, 184 are recommended as not eligible, and 1 was not assessed. Consultation with the Ohio and Michigan SHPOs is ongoing.

Both we and NEXUS consulted with 42 federally recognized Native American tribes, as well as several other non-governmental organizations, local historical societies, historic preservation and heritage organizations, conservation districts, and other potential interested parties to provide them an opportunity to comment on the proposed Projects. TEAL consulted with 8 of the 42 federally recognized Native American tribes that we also contacted. Michigan's Washtenaw County Office of Community and Economic Development requested information on three historic properties within proximity to the NGT Project. NEXUS confirmed all three properties would not be affected. Several tribes requested additional consultation or information, and the Delaware Nation, Miami Tribe of Oklahoma, Peoria Tribe of Indians of Oklahoma, Delaware Tribe of Indians, and Nottawaseppi Huron Band of the Potawatomi requested notification if unanticipated discoveries are encountered during construction. The Chippewa-Cree Indians of the Rocky Boy's Reservation responded with a request to be consulted on the NGT Project due to the potential to affect properties of traditional and cultural significance. We will continue to consult with the tribes.

The applicants have planned the Projects to avoid impacting NRHP-eligible resources. If NRHP-eligible resources are identified that cannot be avoided, the applicants would prepare treatment plans. Implementation of a treatment plan would only occur after certification of the Project(s) and after the FERC provides written notification to proceed. Compliance with Section 106 of the NHPA has not been completed for the Projects. To ensure that our responsibilities under Section 106 of the NHPA are met, we recommend that applicants not begin construction until any additional required surveys are completed, survey reports and treatment plans (if necessary) have been reviewed by the appropriate parties, and we provide written notification to proceed. The studies and impact avoidance, minimization, and measures proposed by NEXUS and Texas Eastern, and our recommendation, would ensure that any adverse effects on cultural resources would be appropriately mitigated.

5.1.11 Air Quality and Noise

Air Quality

Air quality impacts associated with construction of the Projects would include emissions from fossil-fueled construction equipment and fugitive dust. Local emissions may be elevated, and nearby residents may notice elevated levels of fugitive dust, but these would not be significant, and air quality impacts would be temporary and localized. NEXUS and TEAL would implement their respective *Fugitive Dust Control Plans*. We have reviewed this plan and find it acceptable. In nonattainment and maintenance areas, estimated construction emission would not exceed general conformity applicability thresholds.

Operation of the Projects would result in long-term air emissions from stationary equipment (e.g., turbines, emergency generators, and heaters at compressor and M&R stations), including emissions of NO_x, CO, particulate matter, SO₂, VOCs, GHGs (including fugitive methane), and HAPs. The proposed and modified compressor stations and M&R stations would be a minor source of air emissions under federal air quality programs and would not have a significant impact on local or regional air quality.

Commenters requested that all compressor stations associated with the NGT Project be considered a single source with respect to federal air quality permitting. Michigan and Ohio have been delegated authority by the EPA to implement federal air quality regulations. NEXUS and Texas Eastern submitted air quality applications to MDEQ and OEPA in accordance with federal and state requirements.

We received comments requesting that we consider cumulative air quality impacts while taking into account the Ohio E-Check requirements. As discussed in section 4.12.1, the E-Check system was established specifically for passenger vehicles and would not be applicable to industrial-type projects.

We received comments expressing concern with public health impacts resulting from operation of the Waterville Compressor Station, including blowdowns. The Waterville Compressor Station, along with all the compressor stations associated with the NGT and TEAL Projects, would be a minor source of air emissions under all federal air quality programs. The station would also comply with the NAAQS, which were established to protect human health. Methane, the primary component of natural gas, would be released during a blowdown event. Blowdown events are infrequent aspects of compressor station operation and can last for several minutes. However, methane is a GHG, which tend to have less localized effects. The estimated GHG emissions are relatively minor, because blowdowns occur infrequently (i.e., not part of normal, everyday operation), and we conclude they would not have a significant impact on air quality or public health.

Based on the analysis in the EIS and compliance with federal and state air quality regulations, we conclude that operational emissions would not have a significant impact on local or regional air quality.

Noise

Noise would be generated during construction of the pipeline and aboveground facilities. Construction noise associated with the pipeline would be spread over the length of the pipeline route and would not be concentrated at any one location for an extended period of time, except at the proposed HDD sites. Construction noise associated with aboveground facilities would be more concentrated in the vicinity of compressor and M&R stations and would extend for several months, but would vary depending on the specific activities taking place at any given time.

At HDD sites, construction activity and noise may be prolonged (several days to several weeks depending on site-specific conditions) and extend overnight. However, noise impacts on surrounding NSAs are not expected to be significant because mitigated noise levels attributable to the proposed HDDs are anticipated to be below the FERC 55 dBA L_{dn} sound criterion at all NSAs within a 0.5-mile radius of the HDD entry and exit points. Further, NEXUS indicated that landowners within 0.5 mile of the NGT Project would be notified in advance of planned nighttime HDD construction activities. We further recommend that NEXUS and Texas Eastern file the results of noise measurements for each HDD entry and exit site at the start of drilling operations. If the noise measurements exceed 55 dBA or results in a noise increase greater than 10 dB over ambient levels, NEXUS and Texas Eastern should implement additional mitigation measures to attenuate noise below those levels.

The Projects would likely require blasting in some areas of the proposed route to dislodge bedrock resulting in potential noise and vibration impacts. NEXUS' and Texas Eastern's *Blasting Plans* include mitigation measures related to blasting activity. Blasting would be conducted in accordance with applicable agency regulations, including advance public notification and mitigation measures as necessary.

To ensure that the noise levels during operation of the compressor stations and M&R stations do not exceed the FERC 55 dBA L_{dn} sound criterion, we recommend that NEXUS and Texas Eastern file noise surveys at full load conditions and install additional noise controls if the levels are exceeded.

We received comments regarding the potential for low frequency vibrations from compressor stations to cause or exacerbate health issues. FERC regulations require that applicants show that proposed compressor station facilities shall not result in a perceptible increase in vibration at any NSA. This would apply to both the NGT and TEAL Project compressor stations. FERC staff would investigate noise and vibration complaints and, to the extent that a violation is documented, each company would be required to address the issue.

We received comments about potential impacts on residents due to low frequency sounds waves generated by high pressure natural gas flowing through a pipeline. This type of noise is typically associated with reciprocating engines. The proposed compressor units at all compressor stations are turbines, and this issue would not occur.

Based on the analyses conducted, the proposed mitigation measures, and our recommendations, we concluded that construction and operation of the Projects would not result in significant noise impacts on residents and the surrounding environment.

5.1.12 Safety and Reliability

The pipeline and aboveground facilities associated with the Projects would be designed, constructed, operated, and maintained to meet the DOT Minimum Federal Safety Standards in 49 CFR 192 and other applicable federal and state regulations. These regulations include specifications for material selection and qualification; minimum design requirements; and protection of the pipeline from internal, external, and atmospheric corrosion. Each compressor station would be enclosed within a chain-linked fence and equipped with security cameras, an alarm system, ventilating equipment, automatic shutdown systems, and relief valves. Several commenters expressed concern about how the pipeline would be maintained over time and the long-term safety of operations. The DOT rules require regular inspection and maintenance, including repairs as necessary, to ensure the pipeline has adequate strength to transport the natural gas safely. Based on NEXUS' and Texas Eastern's compliance with federal design and safety standards and their implementation of safety measures, we conclude that constructing and operating the pipeline facilities would not significantly impact public safety.

We received several comments about the safety of homes, schools, hospitals, etc., within the potential impact radius for the NGT Project. The potential impact radius for the NGT Project would be 1,100 feet. For the NGT Project compressor stations, the potential impact radius would be 943 feet. DOT safety standards specify more rigorous safety requirements for populated areas and areas where a gas pipeline accident could do considerable harm to people and their property (e.g., near multiple residences, schools, churches, retirement homes, airports). The pipelines and aboveground facilities associated with the Projects must be designed, constructed, operated, and maintained in accordance with these safety standards.

NEXUS would develop a *Public Awareness Program* for its system, which would provide outreach measures to the affected public, emergency responders, and public officials. NEXUS would also mail informational brochures to landowners, businesses, potential excavators, and public officials along the pipeline system each year to inform them of the presence of the pipeline and instruct them on how to recognize and react to unusual activity in the area. Texas Eastern already has a similar program in place.

We received comments regarding the potential for accidents resulting from pipeline leaks, particularly leaks near electric power lines. Pipeline leaks typically occur at valve sites, fittings, etc., where the gas disperses into the atmosphere (e.g., the gas does not accumulate as it would in an enclosed space). As a result, the concentration of gas is not likely to result in impacts on power lines.

5.1.13 Cumulative Impacts

Three types of projects (past, present, and reasonably foreseeable projects) could potentially contribute to a cumulative impact when considered with the proposed Projects. These projects include Marcellus Shale development (wells and gathering systems); FERC-jurisdictional natural gas pipelines; other natural gas facilities that are not under the Commission's jurisdiction; and other actions including electric transmission and generation projects, transportation projects, and residential and commercial developments. The region of influence for cumulative impacts varied depending on the resource being discussed. Specifically, we included:

- minor actions, such as residential development, small commercial development, and small transportation projects within 0.5 mile of the Projects;
- major actions, such as large commercial, industrial, transportation, and energy development projects within 10 miles of the Projects. This includes natural gas well permitting and development projects;
- major actions within watersheds that would be crossed by the Projects; and
- actions with potential to result in longer-term impacts on air quality (for example, natural gas pipeline compressor stations) located within an AQCR crossed by the Projects.

A majority of the impacts associated with the proposed Projects in combination with other projects such as residential developments, wind farms, utility lines, and transportation projects, would be temporary and relatively minor overall, and we included recommendations in the EIS to further reduce the environmental impacts associated with the Projects. However, some long-term cumulative impacts would occur on wetland and forested vegetation and associated wildlife habitats. Also, some long-term cumulative benefits to the community would be realized from the increased tax revenues, jobs, wages, and purchases of goods and materials. Emissions associated with the Projects would contribute to cumulative air quality impacts. There is also the potential, however, that the Projects would contribute to a cumulative improvement in regional air quality if a portion of the natural gas associated with the Projects displaces the use of other more polluting fossil fuels.

We received comments regarding the NGT and TEAL Projects' impacts on climate change. We also received comments stating that our climate change analysis should include a lifecycle analysis of the NGT and TEAL Projects, including upstream and downstream emissions. The Commission staff's longstanding practice is to conduct an environmental review for each proposed project, or a number of proposed projects that are interdependent or otherwise interrelated or connected. NEPA does not, however, require us to engage in speculative lifecycle analyses or provide information that will not meaningfully inform the decision-making process. As such, we do not find upstream or downstream emissions to be causally connected to the Projects and are not considered indirect impacts. However, this EIS discloses the GHG emissions from end-use combustion of the gas, using reasonably available EPA methodology. Stakeholders and interested parties should review the U.S. DOE's National Energy Technology Laboratory's May 29, 2014 report *Life Cycle Analysis of Natural Gas Extraction and Power Generation*. The report looks at the lifecycle of natural gas from various sources and compares the lifecycle GHG emissions to other fuels used for energy production (most notably coal). For a typical (baseload) case, the report indicates that the lifecycle emissions of electricity from natural gas are less than half that of coal. Further, a report by the USGCRP explains that natural gas projects in the Midwest region may result in the displacement of some coal use or encourage the use of lower carbon fuel for new growth areas, thereby regionally offsetting some GHG emissions.

We received comments stating that the proposed Projects are not in line with the U.S. goal of GHG reduction and that FERC must ensure national GHG goals are met. Regulations at 40 CFR 60 indicate that available strategies include, but are not limited to, increasing use of existing natural gas-fired electric generating units and lower use of existing coal-fired generators. The EIA projects that the power sector CO₂ emissions would fall to about 1,500 million metric tpy by 2025, a level not seen since the early 1980s, in the Base Policy case from its 2015 Annual Energy Outlook (EIA, 2015).

We received comments concerning the development of natural gas reserves in the Marcellus and Utica Shale. Development of the Marcellus and Utica Shale natural gas resource is not the subject of this EIS nor is the issue directly related to the Projects. Production and gathering activities, and the pipelines and facilities used for these activities, are not regulated by FERC but are overseen by the affected region's state and local agencies with jurisdiction over the management and extraction of the Marcellus Shale gas resource. Production and gathering activities that fell within the cumulative geographic scope were analyzed accordingly. FERC's jurisdiction is further restricted to facilities used for the transportation of natural gas in interstate commerce and does not typically extend to facilities used for intrastate transportation.

5.1.14 Alternatives

We evaluated the no-action alternative, system alternatives, major route alternatives, aboveground facility site alternatives, minor route variations, and alternative compressor station locations as alternatives to the proposed action. While the no-action alternative would eliminate the short- and long-term environmental impacts identified in the EIS, the stated objectives of the applicants' proposals would not be met.

Our analysis of system alternatives included an evaluation of whether existing or proposed natural gas pipeline systems could meet the Projects' objectives while offering an environmental advantage. We determined that six existing and three proposed systems potentially could be used in various combinations to transport natural gas to and from the markets served by the Projects. However, none of existing pipelines have capacity available for transporting the required volumes of natural gas proposed by the applicants, nor do they service all the required receipt and delivery points. Consequently, there are no practicable existing or proposed system alternatives that are preferable to the proposed Projects.

During project planning, NEXUS incorporated many route alternatives and variations into its original route. In total, NEXUS adopted a total of 239 route changes totaling about 231 miles (91 percent of the pipeline route) for various reasons, including landowner requests, avoidance of sensitive resources, or engineering considerations. Texas Eastern did not incorporate route alternatives or variations because nearly all the pipeline is loop line.

We evaluated 15 major route alternatives to the proposed pipeline route, which include three versions of the City of Green Route Alternative. We found that none of these would offer a major environmental advantage over the proposed route, and we eliminated them from further consideration. We did not evaluate major route alternatives to the TEAL pipeline route because nearly all the pipeline is loop line and we did not receive stakeholder comments on the loop line route.

We evaluated 27 minor route variations to the proposed pipeline route, which include four versions of the Chippewa Lake Route Variation, two versions of the Butler Road Route Variation, two versions of the Luckey Road Route Variation, and two versions of the Wadsworth Road Route Variation. We determined that 25 of these minor route variations would not offer an environmental advantage over the proposed pipeline route and eliminated them from further consideration. We concluded that 1 of the minor route variation may have an environmental advantage and recommend that NEXUS incorporate the

variation into its route. We also concluded that 1 of the minor route variation, which consists of minor centerline adjustments and workspace modifications at a series of locations along the proposed route, be incorporated into the proposed route because the centerline adjustments and workspace modification have insignificant environmental impacts and were proposed by NEXUS to respond to landowner requests, reduce environmental impacts, and/or address engineering constraints. We did not evaluate minor route variations to the TEAL pipeline route because nearly all the pipeline is loop line and we did not receive stakeholder comments on the loop line route.

Numerous stakeholders commented that the pipeline should be routed in less populated areas farther to the south to minimize the risk of a pipeline incident on the public. DOT safety standards are intended to ensure adequate protection of the public, including more stringent design requirements in increasingly populated areas. Regardless of population density, pipelines must be designed, constructed, operated, and maintained in accordance with these safety standards. Further, we find that the likelihood of an incident is very low at any given location, regardless of population density. Instead, a relevant issue for consideration in the various alternative analyses is with respect to residential land use impacts, which is a factor considered for the alternatives.

The City of Green submitted an alternative route to the south of the proposed NEXUS pipeline route that would minimize the impacts of the pipeline on development in the vicinity of the city. During the draft EIS comment period, both NEXUS and city officials suggested revisions to the alternative. We conclude that the proposed route and all three variations of the City of Green Route Alternative are environmentally acceptable, although we do not find that any of the three versions of the alternative provide a significant environmental advantage when compared to the corresponding segment of the proposed route.

NEXUS proposes to construct four new compressor stations, and Texas Eastern proposes to construct one new compressor station. We reviewed two or more alternative sites for each new compressor station and did not find a substantial environmental advantage over the proposed site in any of the cases; therefore, the alternative sites were eliminated from further consideration. We reviewed one alternative site for metering and regulation station, MR06, and recommend that NEXUS incorporate the alternative site into the NGT Project plans in order to minimize the agriculture land permanently taken out of services.

We received comments suggesting that some of the compressor stations should be relocated to less populated area because of concerns about air and noise pollution; however, our analyses concluded that locating the compressor stations at the proposed sites would not have a significant impact on air quality or noise.

Construction and modifications of other aboveground facilities would primarily occur within or directly adjacent to existing facility sites or the pipeline right-of-way and either no new permanent land would be required or no sensitive resources we be affected; therefore, no alternative sites were identified or evaluated.

5.2 FERC STAFF'S RECOMMENDED MITIGATION

If the Commission authorizes the Projects, we recommend that the following measures be included as specific conditions in the Commission's Order. We conclude that these measures would further mitigate the environmental impacts associated with the construction and operation of the Projects.

1. NEXUS and Texas Eastern shall follow the construction procedures and mitigation measures described in its application and supplements (including responses to staff data requests) and as identified in the EIS, unless modified by the Order. NEXUS and Texas Eastern must:
 - a. request any modification to these procedures, measures, or conditions in a filing with the Secretary;
 - b. justify each modification relative to site-specific conditions;
 - c. explain how that modification provides an equal or greater level of environmental protection than the original measure; and
 - d. receive approval in writing from the Director of OEP **before using that modification.**
2. The Director of OEP has delegated authority to take whatever steps are necessary to ensure the protection of all environmental resources during construction and operation of the Projects. This authority shall allow:
 - a. the modification of conditions of the Order; and
 - b. the design and implementation of any additional measures deemed necessary (including stop-work authority) to assure continued compliance with the intent of the environmental conditions as well as the avoidance or mitigation of adverse environmental impact resulting from Projects construction (and operation).
3. **Prior to any construction**, NEXUS and Texas Eastern shall file an affirmative statement with the Secretary, certified by senior company officials, that all company personnel, EIs, and contractor personnel would be informed of the EIs' authority and have been or would be trained on the implementation of the environmental mitigation measures appropriate to their jobs **before** becoming involved with construction and restoration activities.
4. The authorized facility location(s) shall be as shown in the EIS, as supplemented by filed alignment sheets, and shall include the FERC staff's recommended route variations and facility site changes as identified in sections 3.4.11, 3.4.20, and 3.5.4.1 of the final EIS. **As soon as they are available, and before the start of construction**, NEXUS and Texas Eastern shall file with the Secretary any revised detailed survey alignment maps/sheets at a scale not smaller than 1:6,000 with station positions for all facilities approved by the Order. All requests for modifications of environmental conditions of the Order or site-specific clearances must be written and must reference locations designated on these alignment maps/sheets.

NEXUS' and Texas Eastern's exercise of eminent domain authority granted under NGA Section 7(h) in any condemnation proceedings related to the Order must be consistent with these authorized facilities and locations. NEXUS' and Texas Eastern's right of eminent domain granted under NGA Section 7(h) does not authorize them to increase the size of their natural gas facilities to accommodate future needs or to acquire a right-of-way for a pipeline to transport a commodity other than natural gas.
5. NEXUS and Texas Eastern shall file with the Secretary detailed alignment maps/sheets and aerial photographs at a scale not smaller than 1:6,000 identifying all route realignments or facility relocations; staging areas; pipe storage yards; new access roads; and other areas that would be used or disturbed and have not been previously identified in filings with the Secretary. Approval for each of these areas must be explicitly requested in writing. For each area, the request must include

a description of the existing land use/cover type, documentation of landowner approval, whether any cultural resources or federally-listed threatened or endangered species would be affected, and whether any other environmentally sensitive areas are within or abutting the area. All areas shall be clearly identified on the maps/sheets/aerial photographs. Each area must be approved in writing by the Director of OEP **before construction in or near that area.**

This requirement does not apply to extra workspace allowed by NEXUS and Texas Eastern's respective *E&SCPs* and/or minor field realignments per landowner needs and requirements that do not affect other landowners or sensitive environmental areas such as wetlands.

Examples of alterations requiring approval include all route realignments and facility location changes resulting from:

- a. implementation of cultural resources mitigation measures;
- b. implementation of endangered, threatened, or special concern species mitigation measures;
- c. recommendations by state regulatory authorities; and
- d. agreements with individual landowners that affect other landowners or could affect sensitive environmental areas.

6. **Within 60 days of the acceptance of the Certificate and before construction begins,** NEXUS and Texas Eastern shall file their respective Implementation Plans with the Secretary for review and written approval by the Director of OEP. NEXUS and Texas Eastern must file revisions to their plans as schedules change. The plans shall identify:

- a. how NEXUS and Texas Eastern would implement the construction procedures and mitigation measures described in its application and supplements (including responses to staff data requests), identified in the EIS, and required by the Order;
- b. how NEXUS and Texas Eastern would incorporate these requirements into the contract bid documents, construction contracts (especially penalty clauses and specifications), and construction drawings so that the mitigation required at each site is clear to on-site construction and inspection personnel;
- c. the number of EIs assigned per spread and how the company would ensure that sufficient personnel are available to implement the environmental mitigation;
- d. the number of company personnel, including EIs and contractors, who would receive copies of the appropriate material;
- e. the location and dates of the environmental compliance training and instructions NEXUS and Texas Eastern would give to all personnel involved with construction and restoration (initial and refresher training as the Projects progress and personnel change), with the opportunity for OEP staff to participate in the training session(s);
- f. the company personnel (if known) and specific portion of NEXUS and Texas Eastern's organization having responsibility for compliance;
- g. the procedures (including use of contract penalties) NEXUS and Texas Eastern would follow if noncompliance occurs; and

- h. for each discrete facility, a Gantt or PERT chart (or similar project scheduling diagram) and dates for:
 - i. the completion of all required surveys and reports;
 - ii. the environmental compliance training of on-site personnel;
 - iii. the start of construction; and
 - iv. the start and completion of restoration.
7. NEXUS and Texas Eastern shall employ a team of EIs (i.e., two or more or as may be established by the Director of OEP) per construction spread. The EI(s) shall be:
- a. responsible for monitoring and ensuring compliance with all mitigation measures required by the Order and other grants, permits, certificates, or other authorizing documents;
 - b. responsible for evaluating the construction contractor's implementation of the environmental mitigation measures required in the contract (see condition 6 above) and any other authorizing document;
 - c. empowered to order correction of acts that violate the environmental conditions of the Order, and any other authorizing document;
 - d. a full-time position, separate from all other activity inspectors;
 - e. responsible for documenting compliance with the environmental conditions of the Order, as well as any environmental conditions/permit requirements imposed by other federal, state, or local agencies; and
 - f. responsible for maintaining status reports.
8. **Beginning with the filing of the Implementation Plans**, NEXUS and Texas Eastern shall each file updated status reports with the Secretary on a weekly basis until all construction and restoration activities are complete. On request, these status reports would also be provided to other federal and state agencies with permitting responsibilities. Status reports shall include:
- a. an update on NEXUS and Texas Eastern's efforts to obtain the necessary federal authorizations;
 - b. the construction status of each spread, work planned for the following reporting period, and any schedule changes for stream crossings or work in other environmentally sensitive areas;
 - c. a listing of all problems encountered and each instance of noncompliance observed by the EIs during the reporting period (both for the conditions imposed by the Commission and any environmental conditions/permit requirements imposed by other federal, state, or local agencies);
 - d. a description of the corrective actions implemented in response to all instances of noncompliance, and their cost;
 - e. the effectiveness of all corrective actions implemented;

- f. a description of any landowner/resident complaints that may relate to compliance with the requirements of the Order, and the measures taken to satisfy their concerns; and
 - g. copies of any correspondence received by NEXUS and Texas Eastern from other federal, state, or local permitting agencies concerning instances of noncompliance, and NEXUS and Texas Eastern's response.
9. NEXUS and Texas Eastern shall develop and implement an environmental complaint resolution procedure. The procedure shall provide landowners with clear and simple directions for identifying and resolving their environmental mitigation problems/concerns during construction of the Projects and restoration of the right-of-way. **Prior to construction**, NEXUS and Texas Eastern shall each mail the complaint procedures to each landowner whose property would be crossed by the Projects.
- a. In its letter to affected landowners, NEXUS and Texas Eastern shall:
 - i. provide a local contact that the landowners should call first with their concerns; the letter shall indicate how soon a landowner should expect a response;
 - ii. instruct the landowners that if they are not satisfied with the response, they should call NEXUS' and Texas Eastern's Hotline; the letter shall indicate how soon to expect a response; and
 - iii. instruct the landowners that if they are still not satisfied with the response from NEXUS' and Texas Eastern's Hotline, they should contact the Commission's Landowner Helpline at 877-337-2237 or at LandownerHelp@ferc.gov.
 - b. In addition, NEXUS and Texas Eastern shall include in their weekly status report a copy of a table that contains the following information for each problem/concern:
 - i. the identity of the caller and date of the call;
 - ii. the location by milepost and identification number from the authorized alignment sheet(s) of the affected property;
 - iii. a description of the problem/concern; and
 - iv. an explanation of how and when the problem was resolved, would be resolved, or why it has not been resolved.
10. **Prior to receiving written authorization from the Director of OEP to commence construction of any project facilities**, NEXUS and Texas Eastern shall file with the Secretary documentation that it has received all applicable authorizations required under federal law (or evidence of waiver thereof).
11. NEXUS and Texas Eastern must receive written authorization from the Director of OEP **before placing its respective Project into service**. Such authorization would only be granted following a determination that rehabilitation and restoration of the right-of-way and other areas affected by the Project are proceeding satisfactorily.
12. **Within 30 days of placing the authorized facilities in service**, NEXUS and Texas Eastern shall file an affirmative statement with the Secretary, certified by a senior company official:

- a. that the facilities have been constructed in compliance with all applicable conditions, and that continuing activities would be consistent with all applicable conditions; or
 - b. identifying which of the Certificate conditions the applicant has complied with or would comply with. This statement shall also identify any areas affected by their respective Projects where compliance measures were not properly implemented, if not previously identified in filed status reports, and the reason for noncompliance.
13. **Prior to construction**, NEXUS shall incorporate into its plans the proposed centerline adjustments and workspace modifications identified in Attachment 4 – Response 14a-2 of its August 26, 2016 filing to the Commission (see FERC accession number 20160826-5230). (*Sections 3.4.11 and 3.4.20*)
14. **Prior to construction**, NEXUS shall re-site the metering and regulating station at MP 159.7 (MR06) as depicted on figure 3.5.4-1 of the final EIS. NEXUS shall, in consultation with the landowner, redesign the permanent access road to MR06 either by extending the currently proposed road or by designing a new road that would abut the adjacent railroad easement. NEXUS shall file for review and written approval of the Director of the OEP updated site plans incorporating these minor design changes. (*Section 3.5.4.1*)
15. **Prior to construction**, NEXUS shall file with the Secretary, the results of its geophysical surveys to detect previously unidentified karst features. If previously unidentified karst features are found, NEXUS shall also file for review and written approval of the Director of the OEP its plans to avoid or mitigate the features. (*Section 4.1.5.5*)
16. **Prior to construction**, NEXUS shall conduct a geophysical investigation at Summit County parcel number 2400603 and file a report with the Secretary for review and written approval of the Director of the OEP. The report shall identify, as necessary, measures that NEXUS will implement to avoid or mitigate subsidence areas. (*Section 4.1.5.6*)
17. **Prior to construction**, NEXUS shall file with the Secretary an *AIMP* detailing construction and restoration measures to be implemented on the NGT Project to address agricultural issues unique to Ohio and Michigan. Specifically, the *AIMP* shall address plans for segregating topsoil in areas where the depth of topsoil is greater than 12 inches; triple stripping topsoil, subsoil, and substratum; and ensuring that excess spoil removed from the right-of-way during backfilling consists of substratum, and then, if needed, subsoil. For construction and restoration measures in Ohio, NEXUS shall consult with the ODA on construction procedures to be used in agricultural land in Ohio and shall file with the Secretary any measures that result from coordination with the ODA. Any comments received from ODA shall also be filed with the Secretary. (*Section 4.2.2*)
18. **Prior to construction**, NEXUS shall file with the Secretary a 5-year post-construction monitoring program to evaluate crop productivity in areas impacted by the construction of the Project. NEXUS shall include in the program a commitment to file with the Secretary quarterly reports for a period of 5 years following construction documenting any crop-related problems and describing any corrective action taken to remedy those problems. The program shall stipulate that if any landowner agrees that revegetation and crop productivity are successful prior to the 5-year requirement, NEXUS shall provide documentation in its quarterly reports indicating which landowners have agreed that monitoring is no longer necessary. This documentation shall include the landowner name, tract number, and the date of agreement. (*Section 4.2.2*)

19. NEXUS shall repair or replace the water supply of any springs that are damaged by construction, or otherwise compensate the owner of the spring. NEXUS shall file a report with the Secretary **within 30 days** of placing the facilities in service, discussing whether any complaints were received concerning spring yield or water quality and how each was resolved. (*Section 4.3.1.2*)
20. Texas Eastern shall offer to conduct pre- and post-construction testing of water quality and yield at all springs within 150 feet of the TEAL construction workspace, and repair or replace the water supply of any springs that are damaged, or otherwise compensate the owner of the spring. Texas Eastern shall file a report with the Secretary **within 30 days** of placing the facilities in service, discussing whether any complaints were received concerning spring yield or water quality and how each was resolved. (*Section 4.3.1.2*)
21. **Prior to construction**, NEXUS shall consult with water suppliers in the WHPAs crossed by the Project and file with the Secretary for review and written approval by the Director of OEP any water supplier recommended mitigation that NEXUS will implement during construction. Where recommended mitigation is not implemented, NEXUS shall demonstrate that the mitigation is not needed. (*Section 4.3.1.2*)
22. In the event of an unsuccessful HDD, NEXUS shall prepare an alternative construction plan for crossing the area that was to be drilled. This shall be a site-specific plan that includes scaled drawings identifying all areas that would be disturbed by construction. If the alternative plan affects a wetland or waterbody, NEXUS shall file the alternative plan with the Secretary concurrent with submission of its application to the USACE for a permit to construct using this alternative plan. The Director of OEP must review and approve any plan in writing **before construction of the crossing**. (*Section 4.3.2.2*)
23. **Prior to construction**, NEXUS and Texas Eastern shall file with the Secretary a copy of its final Wetland Mitigation Plan, including any comments and required approvals from the USACE, MDEQ, and OEPA, as applicable. (*Section 4.4.3.1*)
24. **Prior to construction**, NEXUS and Texas Eastern shall provide a plan describing the feasibility of incorporating plant seeds that support pollinators into the seed mixes used for restoration of construction workspaces. This plan shall also describe NEXUS and Texas Eastern's consultations with the relevant federal and/or state regulatory agencies. (*Sections 4.5.6.1 and 4.5.6.2*)
25. NEXUS shall not begin construction activities **until**:
 - a. the staff receives comments from the FWS regarding the proposed actions;
 - b. the staff completes formal consultation with the FWS; and
 - c. NEXUS has received written notification from the Director of OEP that construction or use of mitigation may begin. (*Section 4.8.1.3*)
26. **Prior to construction**, NEXUS and Texas Eastern shall file with the Secretary any additional mitigation measures for state-protected species in Ohio developed in consultation with the applicable state agencies. (*Section 4.8.2*)
27. **Prior to construction**, NEXUS shall provide updated consultation documentation from FirstEnergy regarding coordination of construction activities where the NGT Project and FirstEnergy's transmission lines would cross. (*Section 4.9.1.1*)

28. **Prior to construction**, NEXUS shall file with the Secretary, for review and written approval by the Director of OEP, evidence of landowner concurrence with the site-specific *RCPs* for all locations in appendix K-2 of the EIS where the NGT Project construction work areas will be within 10 feet of a residence. (*Section 4.9.4.1*)
29. **Prior to construction**, NEXUS shall provide an update on consultations with developer(s) regarding construction timing and any requested mitigation measures for any planned developments that are crossed by the NGT Project and listed in appendix K-3 of the EIS. (*Section 4.9.4.2*)
30. **Prior to construction**, NEXUS shall file with the Secretary, for review and written approval of the Director of OEP, its revised *E&SCP* to identify where it will implement measures to ensure that conservation lands crossed by the NGT Project, such as CRP lands, will be restored to pre-construction conditions, or in accordance with the landowner's request. (*Section 4.9.5.3*)
31. **Prior to construction**, NEXUS shall file with the Secretary, for review and written approval of the Director of OEP, a revised Drain Tile Mitigation Plan to require a depth of burial of 4 feet in cultivated or rotated croplands, if requested by the landowner. (*Section 4.9.5.4*)
32. **Prior to construction**, NEXUS shall file with the Secretary site-specific crossing plans for the NCNST at MP 3.5 and the Iron Horse Trail at MP 17.0 that identify the location(s) of detours, public notification procedures, signage, and consideration of avoiding days of peak usage. The crossing plans shall be developed in consultation with the landowner and trail managing agencies. (*Sections 4.9.7.3 and 4.9.7.4*)
33. **Prior to construction**, NEXUS shall file with the Secretary, for review and approval of the Director of OEP, an updated *SPCC Plan* and *E&SCP* that acknowledge the potential to encounter pre-existing contamination during construction, and specifically identifies the Country View Apartment Complex, the Ford Motor Company – Rawson Plant, and the RACER site as areas with increased potential to encounter pre-existing contamination. The updated *SPCC Plan* and *E&SCP* shall also detail site-specific measures NEXUS would implement to avoid exacerbating existing contamination, if encountered. (*Section 4.9.9*)
34. **Prior to construction**, NEXUS shall coordinate with the landowner(s) near MP 51.2, where the dumping of unknown contaminants occurred, and file with the Secretary a site-specific plan to properly manage any contaminated soil or groundwater in compliance with applicable regulations or demonstrate that a site-specific plan is not needed. (*Section 4.9.9*)
35. NEXUS shall not begin implementation of any treatment plans/measures (including archaeological data recovery); construction of facilities; or use staging, storage, or temporary work areas and new or to-be-improved access roads **until**:
 - a. NEXUS files with the Secretary:
 - i. the Michigan SHPO's comments on the Michigan Addendum II report, and the Ohio SHPO's comments on the Ohio supplemental information dated September 23, 2016 and Addendum II report;
 - ii. all outstanding survey reports, special studies, evaluation reports, and avoidance/treatment plans; and

- iii. comments on survey reports, special studies, evaluation reports, and avoidance/treatment plans from the Michigan and Ohio SHPOs, as applicable, as well as any comments from federally recognized Indian tribes;
- b. the ACHP is afforded an opportunity to comment on the undertaking if historic properties would be adversely affected; and
- c. the FERC staff reviews and the Director of OEP approves all cultural resources reports and plans, and notifies NEXUS in writing that treatment plans/mitigation measures may be implemented and/or construction may proceed.

All material filed with the Commission that contains **location, character, and ownership** information about cultural resources must have the cover and any relevant pages therein clearly labeled in bold lettering “**CONTAINS PRIVILEGED INFORMATION – DO NOT RELEASE.**” (*Section 4.11.4*)

- 36. NEXUS shall file **in its weekly construction status reports** the following for each HDD entry and exit site:
 - a. the noise measurements from the nearest NSA for each drill entry/exit site, obtained at the start of drilling operations;
 - b. the noise mitigation that NEXUS implemented at the start of drilling operations; and
 - c. any additional mitigation measures that NEXUS would implement if the initial noise measurements exceeded an L_{dn} of 55 dBA at the nearest NSA and/or increased noise is greater than 10 dBA over ambient conditions. (*Section 4.12.2.1*)
- 37. NEXUS shall file a noise survey with the Secretary **no later than 60 days** after placing the new M&R stations into service. If the noise attributable to the operation of all of the equipment at each M&R station exceeds 55 dBA L_{dn} at the nearest NSA, NEXUS shall file a report on what changes are needed and shall install the additional noise controls to meet the level **within 1 year** of the in-service date. NEXUS shall confirm compliance with the above requirement by filing a second noise survey for each station with the Secretary **no later than 60 days** after it installs the additional noise controls. (*Section 4.12.2.2*)
- 38. NEXUS and Texas Eastern shall file a noise survey with the Secretary **no later than 60 days** after placing each of their respective Project compressor stations in service. If a full load condition noise survey is not possible, NEXUS and Texas Eastern shall instead file an interim survey at the maximum possible hp load and file the full load survey **within 6 months**. If the noise attributable to the operation of all of the equipment at any station under interim or full hp load exceeds 55 dBA L_{dn} at any nearby NSA, NEXUS and Texas Eastern shall file a report on what changes are needed and shall install the additional noise controls to meet the level **within 1 year** of the in-service date. NEXUS and Texas Eastern shall confirm compliance with the 55 dBA L_{dn} requirement by filing a second noise survey with the Secretary **no later than 60 days** after it installs the additional noise controls. (*Section 4.12.2.2*)