NEXUS GAS TRANSMISSION PROJECT

RESOURCE REPORT 10
Alternatives

FERC Docket No. PF15-10-000

Pre-Filing Draft
June 2015

NOTICE TO PUBLIC STAKEHOLDER REVIEWERS

This Resource Report for the NEXUS Gas Transmission Project ("Project") is being filed as part of the Federal Energy Regulatory Commission's ("FERC's") pre-filing process. The pre-filing process allows interested stakeholders, FERC, and regulatory agency staff to engage in early dialogue to identify affected stakeholders, facilitate early issue identification and resolution, provide multiple opportunities for public meetings (e.g., open houses), and support the preparation of high-quality environmental Resource Reports and related documents that describe the Project, assess its potential impacts, identify measures to avoid and mitigate impacts, and analyze alternatives to the Project.

Since the initial filing of Draft Resource Report 1 (Project Description) and 10 (Alternatives) on January 23, 2015, NEXUS hosted eight Open Houses along the proposed pipeline route to inform stakeholders about the proposed Project and to answer questions. FERC staff also hosted six independent Public Scoping Meetings along the proposed route in April and May of 2015, as part of the National Environmental Policy Act ("NEPA") compliance process. This Draft Resource Report may contain items that are highlighted in grey that will be filed when NEXUS files its NGA 7(c) Certificate Application with the Commission in November 2015.

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Filing Requirement	**Location in Environmental Report**
☒ Address the "no action" alternative. For large projects, address the effect of energy conservation or energy alternatives to the project.	Section 10.2
☒ Identify system alternatives considered during the identification of the project and provide the rationale for rejecting each alternative.	Section 10.3
☒ Identify major and minor route alternatives considered to avoid impact on sensitive environmental areas (e.g., wetlands, parks, or residences) and provide sufficient comparative data to justify the selection of the proposed route.	Section 10.5 and 10.6
☒ Identify alternative sites considered for the location of major new aboveground facilities and provide sufficient comparative data to justify the selection of the proposed site.	Section 10.7

RESPONSE TO FERC MARCH 24, 2015 COMMENTS ON NEXUS RESOURCE REPORT 10 – ALTERNATIVES

FERC COMMENTS ON DRAFT RESOURCE REPORT 10	LOCATION OR RESPONSE TO COMMENT
1. Please provide maps of the system alternatives discussed in Section 10.3.1 and the major route alternatives discussed in Section 10.5.	Figures 10.3-1 and 10.3-2. Figures 10.5-1 through 10.5-12.
2. Section 10.3.2 describes other planned or proposed pipeline systems but does not include an evaluation of whether these projects could meet the demands of NEXUS' customers. Describe this and include what modifications could be made to these systems to accommodate the increased volumes associated with NEXUS.	Section 10.3.2.
3. Provide updates of any consultations with the Ohio Department of Natural Resources (ODNR) regarding alternatives to minimize impacts to properties managed by ODNR.	Sections 10.5.2.1 and 10.5.2.5
4. Based on information received during the pre-filing scoping period, prepare an analysis of route variations that would avoid or minimize impacts on: a. Dotwood Road at milepost 31.5; b. the Green Soccer Association soccer fields at milepost 35.5; c. the Girl Scout camp at milepost 98.0; and d. the eagle nest and landowner walking paths at milepost 88.7.	Section 10.6-3.
5. For each alternative compared in table 10.5-1, include a comparison of: a. groundwater resources (groundwater wells, sole-source aquifers, wellhead protection areas); b. wildlife habitat (forested land, designated or proposed critical habitat, known endangered species sties, waterfowl production areas, wildlife management areas); c. cultural resources (sites on the National Register of Historic Places); d. geologic hazards (faults, areas of potential subsidence, areas of high landslide potential) e. rugged terrain (steep slopes, areas of side slope construction); f. special interest areas (national and state parks and forests); g. land ownership (public land, private land, tribal land); and h. road crossing (bored versus open cut).	Tables 10.5-1 through 10.5-10.
6. Identify in a footnote in table 10.5-1 the criteria for a route being considered "Parallel/Adjacent to Existing ROW."	Tables 10.5-1 through 10.5-10.
7. Include a subheading in section 10.5 of RR 10 that analyzes the route alternatives filed on March 23, 2015 by the City of Green, as well as any subsequent southern route alternatives that NEXUS develops in response to the filed routes.	Section 10.5.1.2.

ACRONYMS AND ABBREVIATIONS

ACEEE	American Council for an Energy Efficient Economy
AEPS	Alternative Energy Portfolio Standard
AWEA	American Wind Energy Association
Bcf/d	billion cubic feet per day
BTU	British Thermal Units
Certificate	Certificate of Public Convenience and Necessity, FERC Certificate
CO2	carbon dioxide
DTE	DTE Energy Company
EIA	U.S. Department of Energy, Energy Information Administration
EOPUS	Executive Office of the President of the United States
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
GHG	greenhouse gasses
GIS	geographic information system
GW	gigawatts
HDD	horizontal directional drill
hp	horsepower
kg	kilogram
kWh	kilowatt hours
MMBtu	one million BTU
MP	Milepost
MW	megawatts
NEPA	National Environmental Policy Act
NEXUS	NEXUS Gas Transmission, LLC
NEXUS Project or Project	NEXUS Gas Transmission Project
NGA	Natural Gas Act
NHD	National Hydrography Data
NLEB	northern long-eared bat
NO2	nitrogen dioxide
NRC	U.S. Nuclear Regulatory Commission
NRCS	Natural Resources Conservation Service
NWI	U.S. Fish and Wildlife Service National Wetland Inventory mapping
ODNR	Ohio Department of Natural Resources
Ohio EPA	Ohio Environmental Protection Agency
PJM	PJM Interconnection, LLC
$PM_{10/2.5}$	particulate matter less than 10 and 2.5 microns in diameter
ROW	right-of-way
RPS	Renewables Portfolio Standard
RTO	regional transmission organization
SO_2	sulfur dioxide
Spectra or Spectra Energy	Spectra Energy Partners, LP
system alternatives	natural gas transportation system alternatives
Texas Eastern	Texas Eastern Transmission, LP or Texas Eastern pipelines
U.S.	United States
USCG	U.S. Coast Guard
USDOE	U.S. State Department of Energy
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service

USGS	U.S. Geological Survey
Vector	Vector Pipeline, LP
WNPA	World Nuclear Power Association

10.0 RESOURCE REPORT 10 – ALTERNATIVES

10.1 Introduction

NEXUS Gas Transmission, LLC ("NEXUS") is seeking a Certificate of Public Convenience and Necessity ("Certificate") from the Federal Energy Regulatory Commission ("FERC") pursuant to Section 7(c) of the Natural Gas Act ("NGA") authorizing the construction and operation of the NEXUS Gas Transmission Project ("NEXUS Project" or "Project"). NEXUS is owned by affiliates of Spectra Energy Partners, LP ("Spectra" or "Spectra Energy") and DTE Energy Company ("DTE" or "DTE Energy"). The NEXUS Project will utilize greenfield pipeline construction and capacity of third party pipelines to provide for the seamless transportation of 1.5 billion cubic feet per day ("Bcf/d") of Appalachian Basin shale gas, including Utica and Marcellus shale gas production, directly to consuming markets in northern Ohio and southeastern Michigan, and to the Dawn Hub in Ontario, Canada ("Dawn"). Through interconnections with existing pipelines, shippers on the NEXUS Project will also be able to reach the Chicago Hub in Illinois and other Midwestern markets. The United States portion of the NEXUS Project will traverse Pennsylvania, West Virginia, Ohio and Michigan, terminating at the U.S./Canada international boundary between Michigan and Ontario. The Canadian portion of the Project will extend from the U.S./Canada international boundary to Dawn. A more detailed description of the Project is set forth in Draft Resource Report 1.

This pre-filing draft of Resource Report 10 provides a description of alternatives identified and evaluated by NEXUS during the initial siting and refinement stages of the proposed Project. The primary objectives in evaluating alternatives for facility siting are to avoid, minimize, and if necessary, mitigate potential adverse effects on the natural and human environment while satisfying the Project's Purpose and Need. A detailed description of the Project's Purpose and Need is provided in Draft Resource Report 1. Four principal types of alternatives are evaluated in this Draft Resource Report:

- No-action alternative;
- Existing natural gas transportation system alternatives;
- Pipeline route alternatives; and
- Aboveground facility siting alternatives.

A checklist showing the FERC filing requirements for Draft Resource Report 10 is included following the table of contents of this Resource Report.

10.2 No-Action Alternative

The NEXUS Project will provide critical access to the abundant, emerging, domestic natural gas supplies from various U.S. supply areas including Marcellus and Utica shale gas producing area and will provide energy consumers in the U.S. Midwest and eastern Canadian regions with reliable, affordable, cleaner-burning natural gas to help meet the growing need for cleaner power generation and home heating. The "no-action" alternative would avoid the temporary and permanent, short- and long-term environmental impacts associated with construction and operation of the NEXUS Project. However, by not constructing the proposed Project there would be no ability to provide the natural gas transportation service requested by the project shippers to meet energy demands beginning in 2017. In addition, NEXUS anticipates continued growth in demand for natural gas in Ohio that largely reflects future usage from electric power producers as well as Ohio's industrial users (*see* the Ohio Natural Gas Market Study - Prepared for the NEXUS Gas Transmission Project provided in Appendix 1C4 of Draft Resource Report 1).

Given this demonstrated need to transport large quantities of abundant, domestically produced natural gas to the U.S. Midwest and eastern Canadian regions, other natural gas transmission companies would be required to increase their capacity on existing systems and/or construct new facilities. Such actions likely would result in the transfer of environmental impacts from one location to another, but would not

eliminate or significantly reduce net environmental impacts in the region. If the No-Action Alternative were to be selected, prospective NEXUS customers would be required to find a different natural gas transmission source or sources to transport the necessary volume to meet the market demand to be supplied by the Project.

Without an increase in the capacity to transport abundantly available natural gas to this region, markets in need of additional supplies of natural gas will need to: 1) seek other sources of fuel for energy; 2) forego meeting their natural gas demand needs until energy conservation measures stabilize or decrease demand, possibly limiting their growth and the growth of the local economies they serve; and/or, 3) depend on the future development of other projects with unknown and unpredictable schedules and environmental impacts. As described in more detail below, if existing natural gas transmission systems are not expanded or new natural gas transmission systems are not created, existing and anticipated demand for natural gas would not be met. Not building the NEXUS Project could also jeopardize plans and anticipated schedules for converting or replacing existing power generation facilities currently burning oil or coal (which emit more greenhouse gases and other pollutants) to an environmentally proposed fuel, clean burning natural gas.

10.2.1 Regional Electricity Demand Projections

PJM Interconnection LLC ("PJM") is the regional transmission organization ("RTO") that coordinates the delivery of electricity through much of the NEXUS Project area and includes parts of Delaware, Illinois, Indiana, Kentucky, Maryland, Michigan, New Jersey, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia and the District of Columbia. Based on PJM's 2014 Load Forecast Report, the summer peak electric load for power generation in the region is projected to grow an average 1.0 percent per year over the next 10 years, and 0.9 percent annually over the next 15 years. The PJM RTO summer peak load is forecasted to be 173,729 megawatts ("MW") in 2024, a 10-year increase of 16,450 MW, and reaches 180,017 MW in 2029, a 15-year increase of 22,738 MW. Annualized 10-year summer peak demand growth rates for individual zones (within the PJM service area) range from 0.4 percent to 1.8 percent. Winter peak load growth is projected to average 0.9 percent per year over the next 10-year period, and 0.8 percent over the next 15-years. The PJM RTO winter peak load in 2023/24 is forecasted to be 144,359 MW, a 10-year increase of 12,640 MW, and reaches 148,303 MW in 2028/29, a 15-year increase of 16,584 MW. Annualized 10-year winter peak demand growth rates for individual zones range from 0.3 percent to 1.7 percent (PJM, 2014).

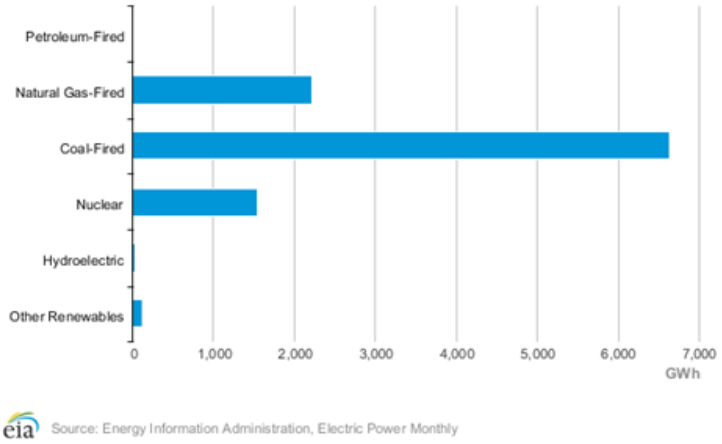
The Chief Executive Officer of PJM announced at a PJM Grid 20/20 conference in Washington, D.C. in October 2014, that the RTO's current fuel mix for electric power generation is 40 percent coal, 30 percent natural gas, 19 percent nuclear and 11 percent other, which includes renewables. But he said those percentages were changing as the power industry shifts toward natural gas. Natural gas is on pace to surpass coal as its primary source fuel for PJM by May 2015 (PJM, 2013).

Unlike coal that can be stored onsite or near power generation facilities, natural gas needs to be transported to power generation facilities by infrastructure such as pipelines. The NEXUS Project will support the anticipated shift in power generation to natural gas in the region, and could supply a significant portion of the natural gas needed to meet the projected increase in the demand for electricity in the northwest portion of the PJM service area.

10.2.2 Regional Electricity Generation by Source

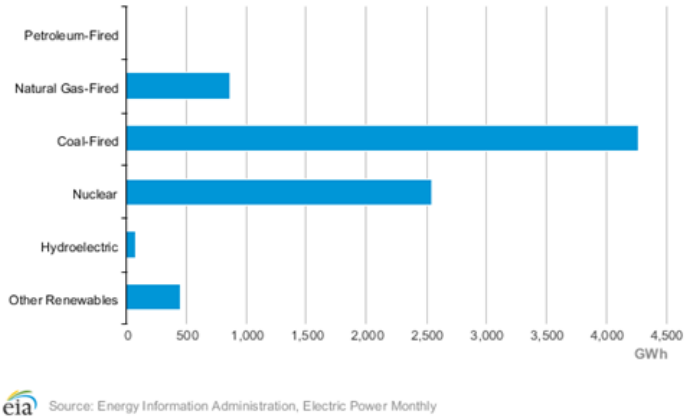
Based on the U.S. Department of Energy, Energy Information Administration's ("EIA") *State Profiles and Energy Estimates*, Ohio is currently the third largest coal-consuming state in the nation (after Texas and Indiana) and about 90 percent of the coal consumed in Ohio is used for electric power generation. In addition, coal fueled 63 percent of Ohio's net electricity generation in 2013, natural gas contributed 21 percent, and nuclear energy added another 15 percent, while renewables contributed approximately 1 percent, and petroleum and hydroelectric power generation contributed less than 1 percent (EIA, 2014a).

Exhibit 10.2-1 Ohio Net Electric Generation by Source, September 2014



Coal fueled 52 percent of net electricity generation in 2014, nuclear energy supplied 31 percent (with three nuclear power plants and four reactor units), natural gas supplied 11 percent, renewables (led by wood biomass providing 42 percent of Michigan's net renewables generation capacity) provided 6 percent, and petroleum and hydroelectric provided less than 1 percent of net electricity generation in Michigan in 2014 (EIA, 2014b).

Exhibit 10.2-2 Michigan Net Electric Generation by Source, September 2014



10.2.3 U.S. Energy Policy and Regulations

U.S. energy policy and regulations in the past decade have resulted in diversification in the U.S. energy portfolio through incentivizing development of alternative energy sources, supporting energy efficiency, and advocating conversion of power generation using fuels with high greenhouse gas emissions, such as coal, to cleaner burning, and domestically produced fuels, like natural gas.

In 2005, the U.S. Congress passed the Energy Policy Act ("EPAct") (Public Law 109-58) that provided regulatory guidelines to diversify America's energy supply and reduce dependence on foreign sources of energy; increase residential and business energy efficiency and conservation (Energy Star Program); improve vehicular energy efficiency; and modernize the domestic energy infrastructure.

In 2007, the Energy Independence and Security Act (Public Law 110-140), was enacted to move the U.S. toward greater energy independence and security; to increase the production of clean renewable fuels; to protect consumers; to increase the efficiency of products, buildings, and vehicles; to promote research on and deploy greenhouse gas capture and storage options; and to improve the energy performance of the Federal Government.

In addition, in June of 2014, the U.S. Environmental Protection Agency's Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Generating Units Standards, were published in the Federal Register [79 FR 34829]. These EPA carbon emissions guidelines, also referred to as the Clean Power Plan, target reduction of carbon dioxide emissions in the power generation sector. In these new regulations, EPA has set a unique target emissions rate for each state to hit by 2030. To develop this target, EPA first determined a carbon emissions baseline (using 2012 data) based on each state's level of CO2 emissions from fossil-fired power plants divided by its total electricity generation (including fossil-fired generation, renewable generation, and nuclear generation). Targets for 2030 were then established based on the capacity of each state to achieve reductions using the following four "building blocks" identified by EPA:

- Make coal-fired power plants more efficient;
- Use low-emitting natural gas combined cycle plants more where excess capacity is available;
- Use more zero- and low-emitting power sources such as renewables and nuclear; and
- Reduce electricity demand by using electricity more efficiently.

Based on current EPA guidelines, Ohio would be required to reduce baseline [based on 2012 data] power sector emission rates by 28 percent by 2030; Michigan would be required to reduce baseline [based on 2012 data] power sector emission rates by 31 percent by 2030 (USEPA 2014).

As currently proposed, the NEXUS project will be in-service by November 2017 and available as one of the EPA identified "building blocks" for compliance to support Ohio and Michigan in meeting its goals for power sector emissions reductions (28 percent and 31 percent respectively) by 2030.

Furthermore, based on All-of-the-Above Energy Strategy as a Path to Sustainable Economic Growth (EOPUS, 2014), published in May 2014 by the Executive Office of the President of the United States, from 2005 through 2011 (the last year of available data), the U.S. reduced its total carbon pollution more than any other nation, in part because of a shift in the U.S. toward cleaner natural gas and an increasing role for renewables. Natural gas has the lowest carbon dioxide ("CO2") emissions per unit of usable energy produced of any fossil fuel. Based on the President's All of the Above energy report, switching from fuels with a greater carbon footprint to natural gas has played a vital role in decarbonizing the energy sector, and will continue to do so for the coming decades. Meeting the U.S. goals and projections for further decarbonizing the energy sector in coming decades could be jeopardized if the NEXUS Project is not built.

10.2.4 Energy Conservation

Reducing the need for additional energy usage is the preferred alternative for meeting future growth in energy demand. Conservation of energy reduces the demand for the finite and over-utilized reserves of fossil fuels that emit problematic greenhouse gases and other air pollutants, and for the use of nuclear power generation that has environmental costs associated with management of radioactive wastes. Energy conservation has been strongly advocated by both federal and state regulatory policies and incentives in recent years.

Based on the EIA's Annual Energy Outlook 2014 (EIAAEO, 2014), electricity demand in the U.S. fell in only three years between 1950 and 2007, but it declined in four of the five years between 2008 and 2012 (the largest drop occurring in 2009). One contributing factor was the steep economic downturn from late 2007 through 2009, which led to a large drop in electricity sales in the industrial sector. However, other

contributing factors cited include efficiency improvements associated with new appliance standards in the buildings sectors and overall improvement in the efficiency of technologies powered by electricity. Based on EIAAEO 2014 projections, the share of purchased electricity consumption used for lighting is expected to decline from 20.7 percent in 2012 to 14.7 percent in 2040, based on incentives created by the Energy Independence and Security Act of 2007. Both energy efficiency and improved technology have slowed electricity demand growth and may contribute to slower growth in the future, even as the U.S. economy continues its recovery. Nevertheless, EIAAEO 2014 also projects an increase in the U.S. demand for electricity of 29 percent from 3,826 billion kilowatt hours ("kWh") in 2012 to 4,954 kWh in 2040, an average of 0.9 percent per year. So, while the expected growth in residential consumption of electricity is weaker, the growth in industrial use is much stronger than earlier projections. The overall growth rate projection for electricity demand throughout the U.S. is similar to the regional rates projected by PJM, as cited in Section 10.2.1.

Energy conservation reduces the demand or growth in demand for natural gas and other energy sources. It is possible that the development and implementation of additional cost-effective conservation measures will have an effect on customer demands for natural gas. However, substantial new development in technology would be needed before the magnitude of energy conservation measures necessary to offset the electric generation fueled by the proposed Project could be implemented. Therefore, although energy conservation is likely to continue to be an important part of the U.S. energy strategy, it is not a viable alternative to meet the medium to short-term energy demands of the market.

10.2.5 Non-Gas Energy Alternatives

The NEXUS Project will increase gas transportation capacity to markets in Ohio, Michigan, and Ontario, Canada, providing consumers greater choice and access to the abundant Marcellus and Utica shale gas supplies. This encourages greater competition in fuel markets, creates economic incentives for power generators currently burning coal or oil, to convert to cleaner burning natural gas; and improves national security by reducing U.S. dependence on foreign energy supplies. As discussed below, if this demand for natural gas associated with heating, lighting, and power generation is not met, other energy sources such as non-gas-fired fossil fuel generation would need to be permitted, constructed, and operated.

Fossil Fuel Generation

Based on the EIAAEO 2014, the fossil fuel share of total U.S. energy use is projected to decline from 82 percent in 2012 to 80 percent in 2040. This is based on the assumption that the renewable energy share of total energy use (including biofuels) increases from 9 percent in 2012 to 12 percent in 2040 in response to the availability of federal tax credits for renewable electricity generation and capacity during the early years of the projection and in response to state renewable portfolio standard ("RPS") programs. In reality, the availability of federal tax credits and status of state RPS programs are likely to shift based on political and economic factors between now and 2040. Therefore, the use of fossil fuels as a dominant fuel source for the U.S. through 2040 is likely to remain in the range of 80 percent.

As cited in Section 10.2.2, Ohio and Michigan currently rely heavily on the use of coal to generate electricity. Continued use of coal (and oil) fossil fuels in the U.S. upper Midwest and eastern Canadian regions to supply the needs of the market could potentially result in adverse environmental impacts due to increased air emissions and associated impacts on natural resources that otherwise would be minimized through the use of natural gas. State and federal air pollution control regulations indirectly promote the use of clean fuels to minimize adverse air quality impacts. For example, proposed U.S. Environmental Protection Agency rules reducing the emissions from the Electric Utility sector, such as the Mercury and Air Toxics Standards (40 CFR Part 63, Subpart UUUUU), the proposed Standards of Performance for Greenhouse Gas Emissions From New Stationary Sources: Electric Utility Generating Units (Federal Register Volume 79, Issue 5, pp. 1429-1519), the proposed Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units (Federal Register, Volume 79, Issue 117,

pp. 34829-34958) and proposed Carbon Pollution Standards for Modified or Reconstructed Stationary Sources: Electric Utility Generating Units (Federal Register Volume 79, Issue 117, pp. 34959-34994), which is based on significant re-dispatching of existing coal-fired generation to natural gas-fired generation, will provide a driving force to use of natural gas as a fuel for power plants.[1]

These regulations are proposed and implemented to improve both air quality and quality of life by avoiding pollution-related environmental degradation. The Project would provide utilities access to the natural gas needed to build new power plants and re-power existing plants with natural gas as the primary fuel, enabling them to meet the U.S. Environmental Protection Agency's ("USEPA") latest standards, if promulgated. Moreover, non-gas fossil fuel alternatives would need to displace existing and proposed natural gas fired generation no later than 2017.

Combustion of natural gas to generate electricity results in lower emission rates of greenhouse gases ("GHG")and other pollutants (e.g., sulfur dioxide ["SO2"], nitrogen dioxide ["NO2"], particle matter less than 10 and 2.5 microns in diameter ["PM10/2.5"]) than all other fossil fuels (standardized to emissions per unit of energy consumed). Based on default CO2 emission factors for various types of fuel provided in Table C-1 of 40 CFR Part 98, Mandatory Greenhouse Gas Reporting, use of natural gas results in nearly half the GHG emissions as the use of coal, in terms of CO2 per unit of energy input (i.e., 53 kilograms ("kg") of CO2 per MMBtu of natural gas versus 93.3 kg CO2 per MMBtu of coal). Using natural gas in place of coal and oil to generate electricity minimizes emissions of nitrogen oxides, SO2, and PM10 and PM2.5, with virtually no emissions of other fuel-bound contaminants such as mercury. The large reduction in air emissions when switching to natural gas is, in part, a result of the composition of natural gas. Pipeline natural gas, as proposed for the Project pipeline, is at least 80 percent methane (typically much higher than this minimum specification), meaning that natural gas is less chemically complex than other fuels with multiple chemical constituents. Natural gas also contains significantly less impurities that react during combustion to form air pollutants (e.g., SO2 and mercury). The greater chemical consistency and lower impurities reduce the formation of air pollutants, but also yield higher combustion efficiency – further reducing the air emissions per unit of heat input. Use of natural gas fired combined cycle gas turbine power production leverages the emissions advantage over coal by nearly another 50 percent due to cycle efficiency.

To the extent the new supply of natural gas provided by the Project is used to displace electric generation using coal and oil, significant reductions in regional air emissions can be expected. Furthermore, it is probable that the permitting and subsequent construction of new, non-gas power plants would take substantially longer than that anticipated for the permitting and construction of the NEXUS Project, if they could be successfully permitted at all.

Although U.S. energy policy also advocates for "clean coal technologies," utilization of natural gas as the primary source of fuel for electric generation in this region currently offers the most cost effective, environmentally preferred alternative to both meeting the current market demands and meeting the goals of the President's All of the Above energy report to: 1) support economic growth and job creation; 2) enhance energy security; and 3) deploy low-carbon energy technologies and lay the foundation for a clean energy future (EOPUS, 2014).

[1] The U.S. Supreme Court has agreed to consider a challenge to the Mercury and Air Toxics Standards to review whether the USEPA "unreasonably refused to consider costs" when it determined that it was appropriate to regulate hazardous air pollution from power plants. The other proposed standards and guidelines are not final at this time, but are scheduled to be finalized in the summer of 2015.

Nuclear Energy

Nuclear energy power generation is considered an environmentally preferred alternative in terms of limiting air pollution, and because of the high energy output for relatively small land area required for generating facilities. However, following the Fukushima nuclear power plant incident in 2011, there has been a significant re-examination of nuclear safety and nuclear energy policy throughout the world. As a result, Germany decided to shut down eight nuclear reactors immediately and to shut down all remaining reactors in the country by 2022 (WNPA 2014a). Italy banned nuclear power generation facilities altogether (WNPA 2014b). In the U.S., the Nuclear Regulatory Commission ("NRC") and nuclear industry representative initiated an immediate coordinated response to the Fukushima accident, as well as implemented long-term actions intended to assure the safety of operating and planned reactors in the U.S. The ultimate cost of complying with NRC orders and proposed regulations and industry-led initiatives remains uncertain, as do the potential impacts on future nuclear power plant operations (EIAAEO, 2014).

Although nuclear power is also an important component of the EOPUS 2014, regulatory changes have the potential to introduce significant uncertainty in the timing and cost of both bringing new nuclear facilities into service and bringing existing facilities into compliance. As cited in Section 10.2.2, currently 15 percent of Ohio's, and 31 percent of Michigan's net electric energy generation is provided by nuclear reactors. Ohio currently has two operational nuclear power generating facilities; the Davis-Besse Nuclear Generation Station located in Oak Harbor, Ohio and the Perry Nuclear Generation Station located on Lake Erie in North Perry, Ohio. The Davis-Besse facility's nuclear operating license expires in April, 2017; the Perry facility's operating license expires in November, 2026 (NRC, 2014). If these nuclear power facilities do not receive authorization for relicensing, energy currently provided by these power plants would need to come from other sources, potentially as early as April of 2017.

Renewables

In 2008, Ohio created an Alternative Energy Portfolio Standard ("AEPS") that was part of broader legislation concerning the electric industry. The AEPS requires all of the state's retail electricity providers except municipal utilities and electric cooperatives to provide 25 percent of their retail electricity sales from alternative energy resources by the end of 2024. Unlike many other states, one-half of the standard can be met by "any new, retrofitted, refueled, or repowered generating facility located in Ohio," including those using fossil fuels. Therefore, the required renewables portion of the standard is 12.5 percent. The AEPS contains a carve-out for solar energy resources; the ultimate solar target is 0.5 percent of the total electricity supply. An Energy Efficiency Portfolio Standard separate and distinct from the AEPS was also created. It requires utilities to put in place energy efficiency and peak demand reduction programs that achieve a cumulative energy savings of 22 percent by the end of 2025 (EIA, 2014a).

The AEPS requires all of the state's retail electricity providers except municipal utilities and electric cooperatives to provide 25 percent of their retail electricity sales from alternative energy resources by the end of 2024. However, in 2014, Senate Bill 310 ("SB 310") instituted a two-year "freeze" of Ohio's renewable and efficiency standards, permanently repealed the "Buy Ohio" provision for renewable energy, created an exemption from the standards for large industries, and established an "Energy Mandates Study Committee" that is tasked with evaluating Ohio's standards and producing a report in 2015 (Ohio Chamber, 2014)

Michigan's Clean, Renewable, and Efficient Energy Act, enacted in 2008, requires that all electricity providers obtain at least 10 percent of their electricity supply from renewable energy resources by 2015. The act defines renewable energy resources as biomass; solar and solar thermal energy; wind energy; kinetic energy of moving water; geothermal energy; municipal solid waste; and landfill gas produced by municipal solid waste. Electricity generation from hydroelectric facilities at newly constructed dams does not count toward the 10 percent requirement, but generation from modified facilities at existing dams

does. The standard also allows electric utilities to use energy efficiency and advanced cleaner energy technologies to fulfill part of the requirement. The state's two largest investor-owned electric utilities have additional requirements called renewable energy capacity standards. Those capacity standards are based on the number of customers each of the two utilities served at the beginning of 2008. The energy produced from new facilities that meet the capacity standards may be counted towards the 10 percent required from renewable energy resources for each of those electric utilities. Michigan also offers tax incentives in Renewable Energy Renaissance Zones. Those zones were created to promote the development of a renewable energy manufacturing industry in the state (EIA, 2014b). In Michigan, where legislation was proposed in 2012 to repeal renewables and efficiency standards, opposition by businesses and organizations supporting the energy efficiency and renewable programs succeeded in averting any action (ACEEE, 2014).

Total renewable energy generating capacity in the U.S. is projected to grow by 52 percent from 2012 to 2040 (EIAAEO, 2014). Non-hydropower renewable capacity, particularly wind and solar, nearly doubles and accounts for almost all of the growth in renewable capacity in the projection period. Solar power leads the growth in renewable capacity, increasing from less than 8 gigawatts ("GW") in 2012 to more than 48 GW in 2040. Wind capacity increases from less than 60 GW in 2012 to 87 GW in 2040, the second-largest amount of new renewable capacity. Although geothermal capacity more than triples and biomass capacity nearly doubles in the projection, combined they account for less than 15 percent of renewable capacity additions. Wind is the top source of non-hydropower renewable energy capacity during the projection period, surpassing the hydropower share in 2036.

A summary of potential renewable energy alternatives in Ohio and Michigan is provided below.

Wind

In 2013, wind energy provided only 0.8 percent of Ohio's in-state energy production with 435 MWs of installed capacity. The state is currently ranked 25th in the nation with 32 wind projects online, but no wind projects currently under construction. Wind energy has historically been the renewable resource chosen to meet Ohio's RPS requirements, fulfilling 86 percent of RPS requirements through 2011, driving economic development in the state as a result (AWEA-OH, 2015).

In Michigan, wind energy provided 2.4 percent of all in-state electricity production in 2013. The state's wind resource is ranked as 18th in the nation and they are currently ranked 15th in the nation for installed wind capacity at 1,350 MWs. Michigan currently has 23 wind projects online and has 206 MW of wind energy capacity under construction (AWEA-MI, 2015). However, overall renewable power generation contributes only approximately 6 percent to Michigan's net electric power generation as stated in Section 10.2.

Of potential renewable energy alternatives considered, it is likely wind projects will continue to be a small but prominent component of the region's renewable energy portfolio, assuming that federal tax credits, state regulatory incentives, technological improvements, transmission and land availability, and public interest continue to support development of this technology. However, the land area required to produce the energy equivalent of what has been requested by NEXUS' prospective customers, in addition to the inherent intermittent nature of wind and its limitation for large scale power generation, in addition to inherent challenges with the regulatory permitting process for wind energy projects, make wind an infeasible alternative to the NEXUS Project by 2017.

Hydroelectric

Based on EIAAEO 2014, the predicted growth for hydroelectric capacity in the U.S. is only 0.01 percent annually through 2040. Currently, approximately 0.8 percent of net electricity generation in Ohio, and 0.3 percent in Michigan, is produced by hydroelectric generation facilities. Although efficiency upgrades at existing facilities may produce incremental additions to hydroelectric power in coming years, it is

unlikely that large-scale improvements or new facilities will contribute substantively to the region by 2017 because of the time required to design, license, and construct such facilities. Hydroelectric power generation will likely continue to be a small part of the region's renewable energy portfolio and is not considered a feasible alternative to meeting the NEXUS Project's Purpose and Need by 2017.

Biomass

Biomass from wood and wood waste, as well as municipal solid waste and landfill gas, has contributed to Ohio's net electricity generation from renewables. However, the total contribution of renewable energy sources to net electric generation in Ohio is less than 1 percent. Researchers are investigating the potential of native Ohio switchgrass for cellulosic ethanol production and the biofuel potential of giant miscanthus, a perennial grass native to Asia. Additionally, methane from manure generated on Ohio's many farms could be used to generate electricity using biodigesters (EIA, 2013a).

In Michigan, biomass accounted for approximately 42 percent of Michigan's renewable net electricity generation in 2013. The total contribution of renewable energy sources to net electric generation in Michigan is only approximately 6 percent (EIA, 2013b). Therefore, although it is likely that biomass power generation will continue to be part of the Midwest Region's renewable energy portfolio, biomass is not considered a feasible alternative to meeting the Purpose and Need of the NEXUS Project by 2017.

Solar

Solar power is not considered a feasible alternative to meeting the existing and future natural gas fuel supply needs of electric generators (by 2017) and the needs of other natural gas customers for the NEXUS Project. In addition solar power may be less practical due to developmental costs, reliability issues and availability at times of peak demand (solar power generation is intermittent, depending on the time of day and weather conditions), and the need for large expanses of land. Some of the largest completed solar photovoltaic power plants, also called solar parks or fields, have area efficiency of about 4.5 to 13.5 acres per MW (Solar by the Watt 2009). Assuming all 1.5 Bcf/d of gas that will be supplied by the NEXUS Project was used to generate electricity in typical natural gas-fired combined cycle power plants, over 9,400 MW of electricity could be generated per hour (i.e., the electric generation from a 9,400 MW power plant).[2] Therefore, it is estimated that the land requirements for a 9,400 MW solar project would range between 42,300 and 126,900 acres of permanent disturbance. Note that natural gas fired power plants can generate electricity at full capacity throughout a day while solar power is more intermittent; thus, a solar project would need to be much larger than 9,400 MW to reliably produce on a daily basis the equivalent amount of electricity produced from natural gas fired generation and be able to store energy in some manner for use during night periods.

As a result of these extensive land requirements, it is not reasonable to expect solar power to be developed at a pace that would provide for the projected energy needs of the Project market area. The proposed Project may cause initial or temporary earth disturbance, however, unlike solar parks or fields, the majority of the area will be restored, revegated, and the permanent ROW will be maintained in an herbaceous condition (rather than an impervious or shaded surface that would be found in a solar park or field) that can provide habitat for flora and fauna in the long term. While solar energy development will likely continue to be a component of the energy portfolio in the region, the land requirements needed for solar power to generate the amount of electricity that could be provided by the natural gas supplied by the NEXUS Project would be cost prohibitive. As such, solar power is not considered a feasible alternative to meeting the Purpose and Need of the NEXUS Project by 2017.

[2] Based on the default high heat value for natural gas of 1,026 Btu/scf from Table C-1 of 40 CFR Part 98 and the typical combined cycle facility heat rate of 6,798 Btu/kWh from Exhibit ES-2 of the United States Department of Energy's *Cost and Performance Baseline for Fossil Energy Plants* (USDOE, 2013).

10.2.6 No-action Alternative Conclusion

The no-action alternative would avoid all of the direct environmental impacts that would be associated with the proposed action. The increasing demand for energy supply would nonetheless need to be met through other natural gas pipeline infrastructure, energy conservation or some other energy alternative (e.g., increased use of other fossil fuels for electricity generation and by other industrial/commercial/residential users, some of which may come from foreign supplies), all of which have their own associated impacts. As described in Sections 10.2.4 and 10.2.5, above, energy conservation and the use of alternative energy strategies will not fully satisfy the market needs of targeted consumers. For these reasons, the no-action alternative was not found to be a feasible alternative for the Project since that alternative would not satisfy the Project's Purpose and Need.

10.3 Existing Natural Gas Transportation System Alternatives

Transportation system alternatives ("system alternatives") are alternatives to the proposed action that would make use of other existing, modified, or proposed pipeline systems to meet the stated objectives of the proposed Project. System options would involve the transportation of the equivalent amount of incremental natural gas. System alternatives would make it unnecessary to construct all or most of the proposed Project, although modifications or additions to other existing pipeline system(s) may be required to increase capacity, or another entirely new system may be required. Although these modifications or additions could result in environmental impacts, the impacts may be less, similar to, or greater than that associated with construction of the proposed NEXUS Project.

As stated in Draft Resource Report 1, Section 1.1.3, the Project is utilizing existing natural gas transportation systems to the extent practicable. Use of existing systems through contracting of capacity reduces the need for additional greenfield pipeline construction. Capacity will be contracted on Texas Eastern from certain receipt points located between Berne, Ohio and Braden Run, Pennsylvania to a delivery point at a new interconnection between Texas Eastern and NEXUS at Kensington, Ohio; on the DTE Gas system from Willow Run to the Vector-Milford junction interconnect (Milford Meter Station) between DTE Gas and Vector, as well as capacity on the DTE Gas system to the Belle River Mills interconnect with Vector and to the U.S./Canada border; and on Vector extending from Vector's Milford and Belle River Mills Meter Stations to the Union Gas Limited Dawn Hub in Ontario, Canada.

System alternatives that would result in significantly less environmental impact might be preferable to the project. However, only those alternatives that are reasonable and consistent with the underlying Project Purpose and Need are required to be considered under the NEPA. Consequently, a viable system alternative that is technically and economically feasible and practicable must also satisfy the project's purpose including the necessary contractual commitments made with the shippers supporting the development of the NEXUS Project.

10.3.1 Modification of Existing Pipeline Systems

There are three existing pipeline systems or system combinations within the broad area to be served by the NEXUS Project that were evaluated to consider rendering the same service as proposed by NEXUS (*see* Figure 10.3-1). They are:

- Texas Eastern and Panhandle Eastern Pipeline
- Dominion Transmission and Panhandle Eastern Pipeline
- Columbia Gas Transmission

Each pipeline system is evaluated below for suitability to render the same service as that proposed by the NEXUS Project.

10.3.1.1 Texas Eastern and Panhandle Eastern Pipeline

This transportation route contemplated utilizing existing pipeline systems to deliver gas from the Kensington Plant to the Dawn storage facility via expansions of the Texas Eastern and Panhandle Eastern systems for volumes up to 1 Bcf/d. To create 1.0 Bcf/d of capacity it would entail pipeline loop, new pipeline segments and compression. Higher projected capital cost, rate stacking and higher fuel retention when compared to a greenfield project led to the conclusion that this route did not meet the economic expectations for the transportation route, so it was not evaluated further.

10.3.1.2 Dominion Transmission and Panhandle Eastern Pipeline

This route is very similar to the Texas Eastern and Panhandle Eastern route in that it would involve moving gas from the Kensington area to Gas City, Ohio along Dominion's existing system as well as greenfield pipe into the Panhandle Eastern system. It was determined by comparison that this option presents similar concerns as the Texas Eastern/Panhandle Eastern alternative described above (i.e., increased looping, new pipeline segments and compression, higher projected capital cost, rate stacking and higher fuel retention when compared to a greenfield project). Therefore, this pipeline system was not evaluated further.

10.3.1.3 Columbia Gas Transmission

The Columbia Gas Transmission system has a segment of pipeline that extends from near Kensington to the Toledo, Ohio area, generally similar to a large portion of the proposed NEXUS route. Columbia's information portal indicates that the capacity on the Columbia Gas Transmission system into the Toledo area is approximately 200 mmcf/d. To create the ability to deliver 1.5 Bcf/d into the Toledo area or to DTE at Willow Run along Columbia would require incremental facilities similar to those already being proposed by NEXUS. Because the environmental and socio-economic impacts from such a project would be similar to that proposed by NEXUS, it was not evaluated further.

10.3.2 Proposed Pipeline Systems

There are three proposed pipeline systems within the broad regional area that would be served by the NEXUS Project. NEXUS evaluated whether the proposed Rover Pipeline Project (FERC Docket No. CP15-93-000), Leach XPress Project (FERC Docket No. PF14-23-000), or ANR East Pipeline Project could meet the demands of NEXUS' customers and avoid the need for the proposed NEXUS Project (*see* Figure 10.3-2). The following sections describe this analysis.

10.3.2.1 Rover Pipeline Project

Rover Pipeline, LLC ("Rover") is a subsidiary of Energy Transfer and proposes to construct a new natural gas pipeline system that would consist of approximately 711 miles of 24-inch, 30-inch, 36-inch and 42-inch pipelines. This would include ten Supply Laterals for a total of 237.3 miles and three Mainlines (Mainlines A [190.6 miles] and B [183.3 miles], and the Market Segment [100 miles]), nine compressor stations, and associated meter stations and other aboveground facilities that would be located in parts of West Virginia, Pennsylvania, and Ohio. Generally, the Supply Laterals will deliver gas from receipt points in the Marcellus and Utica shale supply areas in West Virginia, Pennsylvania, and Ohio to delivery points along Mainlines A and B, which will run parallel (for most of their length) from Harrison County, Ohio to the Midwest Hub in Defiance County, Ohio. The Market Segment will run from the Midwest Hub north to the interconnection with Vector in Livingston County, Michigan.

Rover announced plans to commence construction in January 2016, pending receipt of all applicable permits and clearances. In order to meet the production and delivery schedules of its shippers, a portion of the Supply Laterals and Mainlines A and B are scheduled to be placed in service in December 2016. The Market Segment and the remaining Supply Laterals are scheduled to be placed in service no later than June 2017.

Development of the Rover Pipeline is driven by increases in domestic natural gas production, specifically in the Marcellus and Utica regions. Rover has entered into precedent agreements with nine producers, so that the Project is currently subscribed through 15- and 20-year contracts to transport 3.1 Bcf/day of the 3.25 Bcf/day available capacity. As such, the Rover Project is nearly fully subscribed (95 percent), and Rover anticipates subscribing the remaining 0.15 Bcf/day of firm capacity in the near future (Rover, 2015).

The Rover Pipeline Project would provide a connection with producers in the Marcellus and Utica Shale areas of West Virginia, Pennsylvania, and Ohio, and would allow movement of their production to markets in the Gulf Coast, Midwest and Canada, including interconnections with Energy Transfer's existing Panhandle Eastern Pipeline and other Midwest pipeline interconnects near Defiance, Ohio, and a connection into the Canadian gas trading hub located in Dawn, Canada (Rover, 2015).

The Rover Project is not a suitable alternative to NEXUS because it serves a different, producer-driven purpose and need that does not include the markets served by NEXUS. The NEXUS Project is both a supply push and market pull pipeline project, meaning the Project targets transportation needs of both producers and end-use customers such as those in Ohio. In contrast to Rover, the majority of the market areas that the NEXUS Project would serve in Ohio are located in close proximity to Lake Erie, either directly adjacent to the lake or to the south. As shown on Figure 10.4-1, NEXUS has selected its proposed Ohio pipeline route to serve the gas needs of these Ohio markets and to minimize environmental impacts. The distance to those market areas would require Rover to build and operate substantial additional laterals beyond the ten that Rover already expects to require to meet its purpose and need. Moreover, even with laterals, Rover has virtually no available capacity to serve the Ohio market areas that NEXUS serves. Finally, substantially increasing the size of the Rover Project to accommodate the demonstrated demand for NEXUS would require extensive new analysis, new design, public review, and engagement of agency (and other) stakeholders by Rover. Such efforts would make the Rover Project substantially unlikely to fulfill the NEXUS commitment to customers for a November 1, 2017, in-service date. For these reasons, the proposed facilities associated with the Rover Pipeline Project do not meet the NEXUS Project's Purpose and Need and are not a reasonable alternative to NEXUS.

10.3.2.2 Leach Xpress Project

Columbia Gas Transmission, LLC ("Columbia") proposes to construct and operate the Leach Xpress facilities in West Virginia and Ohio to transport natural gas produced in northern West Virginia, southwestern Pennsylvania, and eastern Ohio westward to Columbia's existing pipeline system located in central Ohio. From this point, natural gas would flow south via Columbia's existing and the proposed project facilities for delivery to various market and interconnect points located on Columbia's system. The Leach Xpress Project is proposed to provide up to 1.5 Bcf/d of new firm transportation service through approximately 157 miles of new pipeline. The proposed in-service date is November of 2017. The project would involve the abandonment in place, of a segment of one existing natural gas pipeline (Columbia, 2014).

Columbia proposes to construct new 30- and 36-inch-diameter high pressure pipelines, along with associated compression and other appurtenant facilities, which would connect with its existing pipeline system and to third-party systems in the Majorsville, West Virginia and Clarington, Ohio areas before extending to a connection into Columbia's existing pipeline system near the Crawford Compressor Station in central Ohio. These new facilities are being proposed to provide portions of the new capacity from central Ohio via Columbia's existing pipeline system to the Ohio market as well for Columbia's other operational requirements (Columbia, 2014).

The Leach Xpress Project is not a suitable alternative to NEXUS because it has a different purpose and need, serving different markets. Leach Xpress runs west and south in order to bring natural gas from the Ohio/West Virginia border to central Ohio and parts south. In contrast, the purpose and need of the

NEXUS Project is to provide a seamless gas transportation path for Appalachian Basin gas to supply the growing markets in Ohio and Michigan; the Chicago Hub; and the Dawn Hub in Ontario, Canada. The Leach Xpress Project does not come close to Michigan or Canada, so it would require an additional greenfield pipeline to reach the markets served by NEXUS. Even in Ohio, the two projects serve different markets. In Ohio, the NEXUS Project would serve primarily market areas in close proximity to Lake Erie. To serve these Ohio markets, the Leach Xpress Project would require substantial laterals whose total mileage is [likely comparable to or greater than] its proposed mainline pipeline. Modifying the Leach Xpress Project so fundamentally through the addition of significant greenfield mainline and lateral pipelines would also jeopardize the commitment of the NEXUS Project to provide service to customers by November 1, 2017. For these reasons, the proposed facilities associated with the Leach Xpress Project do not meet the NEXUS Project's Purpose and Need and are not a reasonable alternative to NEXUS.

10.3.2.3 ANR East Pipeline Project

The ANR East Pipeline Project was originally announced by TransCanada with a targeted in-service date in the 3rd Quarter of 2017. However, the project appears to be in an early stage of development, and it has not yet entered the pre-filing process with the FERC. Accordingly, the contours of the project remain uncertain. As currently envisioned, the project appears to be a producer-driven pipeline intended to provide Utica and Marcellus shale producers and other interested parties access to the Gulf Coast and certain Midwest markets. The pipeline would consist of approximately 320 miles of large diameter, 1440 psig maximum allowable operating pressure pipeline and up to 140,000 hp of compression and is anticipated to have a capacity between 1.2 and 2.0 Bcf/d, depending upon contractual commitments, project scope and final design. In addition to receipt points at Cadiz, the ANR East Pipeline Project is proposed to provide receipt points at Tuscarawas with Dominion Transmission (TL-400) and Tennessee Gas Pipeline. The project would deliver gas into ANR's ML 3 tariff zone at Defiance and into ANR's Zone ML7 at the Joliet Hub in Lake County, Indiana (TransCanada, 2014a).

As currently conceived, the ANR East Pipeline Project is unsuitable as an alternative to the NEXUS Project because it is not sufficiently advanced in its details and regulatory status to achieve the in-service date requirements of NEXUS's customers. Moreover, it is not intended to fulfill the market demand served by NEXUS. No part of the ANR East Pipeline Project is anticipated to approach the market areas near and south of Lake Erie, which constitute the majority of the market areas that the NEXUS Project would serve in Ohio. For these reasons the proposed facilities associated with the ANR East Project do not meet the NEXUS Project's Purpose and Need and are not a reasonable alternative to NEXUS.

10.4 Facility Design and Siting of the NEXUS Facilities

The NEXUS Project is both a market pull and a supply push pipeline project, meaning the Project targets and has been tailored to meet the transportation needs of both end-users and producers, respectively. The NEXUS Project will provide a seamless path to transport Appalachian Basin shale gas, including Utica and Marcellus shale gas, directly to consuming markets in northern Ohio, southeastern Michigan, and in Dawn, Ontario. The region to be served by the NEXUS Project is in the midst of a sea change in natural gas supply and demand dynamics. Due to recent environmental policies and a focus on greater reliability, the region is experiencing significant pressure to invest in natural gas fired electric generation. At the same time, the traditional flow of natural gas to the region from the Gulf Coast and Western Canada is declining as exports from Canada have decreased and a number of pipelines that have served the area have been repurposed from gas to oil. For these reasons, the region to be served by the NEXUS Project is uniquely positioned to benefit from the abundance of clean burning and affordable Marcellus and Utica shale gas. The NEXUS Project is the pathway to restore the balance between natural gas supply and demand dynamics in the region.

NEXUS is proposing a combination of greenfield pipeline construction and capacity on other pipeline systems to meet the needs of the Project Shippers and the demands of NEXUS customers in a way that maximizes the overall efficient use of its system. The location of the proposed NEXUS facilities was determined by the contractual requirements of the service to be rendered by the Project and by the requirements of NEXUS' existing customers, as well as the need to serve the growing market in northern Ohio. The majority of the market areas that the NEXUS Project would serve in Ohio are located in close proximity to Lake Erie, either directly adjacent to the lake or to the south. NEXUS designed the Project facilities and route to serve the gas needs of these Northern Ohio market areas, as shown on Figure 10.4-1, and to minimize environmental impacts. These market areas are critical in anchoring the location of the NEXUS route.

NEXUS began the facilities siting process with an understanding of prospective customer needs and known receipt and delivery locations. In addition, NEXUS anticipates continued growth in demand for natural gas in Ohio that largely reflects future usage from electric power producers as well as Ohio's industrial users (*see* the *Ohio Natural Gas Market Study - Prepared for the NEXUS Gas Transmission Project* provided in Appendix 1C4 of Draft Resource Report 1). The process of siting pipeline facilities between these receipt and delivery points was initiated with a critical issues analysis that employed a Project-specific geographic information system ("GIS") for the evaluation of siting constraints. This project-specific GIS included U.S. Geological Survey ("USGS") topographic mapping; recently flown aerial photography, U.S. Fish and Wildlife Service ("USFWS") National Wetland Inventory ("NWI") mapping; Natural Resources Conservation Service ("NRCS") medium intensity soil surveys; National Hydrography Data ("NHD"); and public lands datasets obtained from the Ohio and Michigan state agencies.

Potential siting constraints were evaluated by a multidisciplinary team of professionals including representatives from engineering, environmental, land acquisition, regulatory, and construction disciplines. Each segment of the proposed pipeline route was evaluated carefully using GIS data, supplemented with field reconnaissance where necessary, to identify the least-constrained route that meets the Project's Purpose and Need. Once this initial route was identified, NEXUS deployed its multidisciplinary team to the field where access is available to further refine the route and to initiate communications with landowners; local, state, and federal public officials; and regulatory agencies. As described in Draft Resource Report 1, NEXUS held nine informational meetings along the proposed route to obtain public feedback on its initial siting of Project facilities within a 600-foot-wide study corridor. This public feedback and additional feedback received since the information meetings continue to be evaluated. Extensive regulatory agency outreach has also been initiated and will continue throughout the facilities siting process.

Determination of facilities and their proposed locations, detailed below, were further refined by considerations which include, but were not limited to, potential for impacts on the natural and human environment, proximity to major gas consumers, minimization of disturbance to local residents and businesses, access, suction pressure, discharge pressure, available horsepower, contract pressures and flows, site availability and site suitability for the proposed use.

In accordance with the FERC's pre-filing process, NEXUS is committed to continuing review of the pipeline route and above ground facility locations with stakeholders and working to accommodate their concerns. As NEXUS continues these ongoing efforts to refine the route alignment and site the new compressor stations, updates will be submitted to Commission Staff in future Resource Report filings.

10.5 Major Route Alternatives

Based on the FERC guidance, a major route alternative is an alignment that has the potential to meet the Project objective but would deviate significantly from the proposed route. In evaluating the routing alternatives for the Project, NEXUS strived to co-locate the pipeline right-of-way ("ROW") within or

adjacent to existing ROWs, including public and private roadways, railroads, and existing electric transmission line and pipeline corridors, to the maximum extent practicable. The use of co-location as a principal design element by NEXUS was necessitated, not only by Commission guidelines, which stress the corridor co-location concept, but also to avoid and minimize impacts on adjacent landowners to the extent practicable. Siting pipeline facilities along existing corridors and ROWs reduces the need to establish new maintained utility corridors in previously undisturbed areas and reduces the number of affected landowners.

This section examines major route alternatives that were identified and evaluated during the initial planning and siting stage of the Project and those that were incorporated into NEXUS' proposed route. Existing GIS data sources were evaluated by a multi-disciplinary team including engineering, environmental, lands and construction personnel. To ensure consistency across the evaluations, field data collected for the proposed route were not included in these evaluations since equivalent field data were not available for the alternative routes. Data sources include high resolution aerial photography, USGS topographic maps; Google Earth™; GIS databases from county, state and federal sources; NHD; USFWS, NWI maps; and state natural resource and public land use data layers. The following Major Route Alternatives are organized by milepost ("MP"), generally from east to west. Tables in the Tables Section provide a comparison of the Major Route Alternatives with the corresponding segment of the proposed route. Figures are located in the Figures Section.

10.5.1 Major Route Alternatives Evaluated for the NEXUS Project

The following Major Route Alternatives were evaluated for the NEXUS Project during the siting of the pipeline facilities to address stakeholder comments and determine if environmental and engineering impacts could be avoided or minimized.

10.5.1.1 Southern Route Alternative

Alternative Description

NEXUS evaluated the Southern Route Alternative to address stakeholder comments and to evaluate the environmental and engineering impacts of such a route in comparison to the proposed route in the State of Ohio (*see* Figure 10.5-1). The Southern Route Alternative deviates from the proposed route at MP 1.5 in Columbiana County, along the northern boundary of the proposed Hanoverton Compressor Station site. The alternative route heads in a westerly direction for approximately 9.6 miles and would cross a combination of forest, open, and agricultural land. The alternative route generally parallels an abandoned railroad and existing pipeline ROW between approximate MP 3.5 and MP 6.8. It would cross U.S. Highway 30 at MP 3.0, parallel and cross Sandy Creek at MP 3.5 and MP 7.9, respectively, and cross U.S. Highway 30 and the Ohio Central Railroad at MP 7.7. The alternative route would cross the Columbiana/Stark county line at MP 8.1. Between MP 9.6 and MP 13.2, the Southern Route Alternative heads in a southwesterly direction, parallels an existing pipeline ROW between MP 10.9 and MP 12.1, and would cross the Stark/Carroll county line at MP 10.8 and Sandy Creek at MP 12.6 and MP 13.2.

At MP 13.2, the Southern Route Alternative turns generally west extending to MP 95.5 and would cross a combination of forest, open and agricultural land. Between MP 13.2 and MP 21.7, it follows an existing transmission line ROW and would cross the Carroll/Stark county line at MP 17.9. The alternative route deviates from this ROW at MP 21.7 to avoid residential, steep sloped, and forested areas and would cross Nimishellin Creek at MP 24.5. The alternative route rejoins the transmission line ROW at MP 26.1 and it continues to follow the existing transmission line ROW. It would cross Sulphur Run at MP 28.0 and then deviate from the ROW between MP 31.4 and MP 36.5 to avoid residential areas. The alternative route would cross Interstate 77 at MP 29.4, the Tuscarawas River at MP 34.4, and remain south of the Town of Navarre.

At MP 36.5, the Southern Route Alternative turns north, rejoins and follows an existing transmission line ROW to MP 39.7 where it then deviates from the ROW and turns northwesterly to avoid residential areas north of the Village of North Brewster. The alternative route would cross the Stark/Wayne county line at MP 43.4. At MP 44.0, the alternative route follows an existing Wheeling and Lake Erie Railroad ROW for approximately 2.0 miles and then begins to follow an existing transmission line ROW from MP 47.7 to MP 54.3. Between MP 54.3 and MP 55.8, the alternative route deviates from the ROW and continues in a north and west direction to avoid residential areas west of the East Union Township. Once the alternative route rejoins the ROW it remains east and north of the City of Wooster and would cross U.S. Highway 30 at MP 56.8 and Spring Run at MP 58.5.

The Southern Route Alternative deviates from the existing transmission line ROW between MP 65.6 and MP 70.4 to avoid residential, steep sloped, and forested areas. It would cross Killbuck Creek and the Baltimore and Ohio Railroad at MP 67.7 and then deviate from the ROW between MP 73.2 and MP 78.2 to avoid residential areas and the Rowsburg community. It would cross the Wayne/Ashland county line at MP 74.4. From MP 78.2, the alternative route follows an existing pipeline ROW to MP 86.4 and turns in a northerly direction where it begins to parallel an existing transmission line ROW at MP 88.4 and remains south and west of the City of Ashland and nearby residential areas. The alternative route would cross the Ashland/Richland county line at MP 91.5.

The Southern Route Alternative follows an existing transmission line ROW to MP 95.5 and then continues in a westerly direction where it leaves the ROW and follows an existing pipeline ROW to its terminus. Within this area, it would cross mostly open and agricultural land, the Sandusky River and Sandusky Scenic River State Access Area at MP 143.0, and the Portage River at MP 161.0. The alternative route would cross the Richland/Crawford county line at MP 110.3, Crawford/Huron county line at MP 114.4, Huron/Seneca county line at MP 117.1, Seneca/Sandusky county line at MP 140.9, and the Sandusky/Wood county line at MP 159.7 and extends to approximate MP 168 where it rejoins the proposed route at MP 165.4 of the proposed route.

Market Deliveries

On January 9, 2015, the FERC approved NEXUS' request to use the pre-filing review process for the NEXUS Project. As stated in the FERC's April 8, 2015, Notice of Intent to Prepare an Environmental Impact Statement for the Planned NEXUS Gas Transmission Project and Texas Eastern Appalachian Lease Project ("NOI"), "the purpose of the pre-filing process is to encourage early involvement of interested stakeholders and to identify and resolve issues before the FERC receives an application."

As part of the on-going pre-filing process, NEXUS is in various stages of engineering design and siting of the NEXUS Project system and discussions/negotiations with markets in Ohio, which are interested in gas transportation or interconnects (taps) on the proposed NEXUS Project system. The majority of the market areas in Ohio are located in proximity to Lake Erie, either directly adjacent to the lake or to the south in counties including Medina, Lorain, Erie, and Lucas counties. NEXUS is also in various stages of discussions/negotiations with markets located south of Lake Erie, in Columbiana County. NEXUS has signed precedent agreements for the majority of the capacity to be created by the Project. During the pre-filing process, NEXUS has continued to secure additional customer commitments and anticipates that additional capacity will be committed under binding, long-term contracts before NEXUS files its Certificate Application. NEXUS will include executed agreements for these customers in its Certificate Application that will be filed in November of 2015.

NEXUS has selected its proposed pipeline route to serve the gas needs of these Northern Ohio market areas and minimize environmental impacts as shown in Figure 10.4-1.

Compressor Station Relocations

If the Southern Route Alternative were adopted as NEXUS' preferred route, two of the proposed compressor stations along the proposed route would have to be relocated to the alternative pipeline route. To maintain hydraulic requirements, specific distances between compressor stations are required. As a result, compressor stations for the NEXUS Project must be located at approximate 60-mile intervals.

The proposed Wadsworth Compressor Station site in Medina County (approximate MP 60.3 of the proposed route) would be relocated to approximate MP 61.3 of the Southern Route Alternative. This would place the compressor station site near dense residential and commercial areas along the north-northeast side of the City of Wooster in Wayne County.

The proposed Clyde Compressor Station in Sandusky County (approximate MP 129.5 of the proposed route) would be relocated to approximate MP 121.3 of the Southern Route Alternative. This would place the compressor station site in an open/agricultural area near residences southwest of Caroline, an unincorporated community in Venice Township in Seneca County.

Environmental and Engineering Comparison

As shown in Table 10.5-1, the primary environmental advantages of the Southern Route Alternative, without factoring in impacts associated with required laterals, are that it would affect 13.4 acres less wetlands, cross two fewer waterbodies, affect 61.9 acres less forest land, be within 50 feet of 134 fewer residential structures during construction, and cross three less railroads than the corresponding segment of the proposed route. The primary environmental disadvantages of the Southern Route Alternative are that it would require approximately 61.2 more miles of lateral pipeline to deliver to NEXUS customers located along the current route, including an additional 741.8 acres of temporary construction workspace and 370.9 acres more permanent ROW (*see* Figure 10.4-1). In addition, the Southern Route Alternative mainline pipeline would be 2.7 miles longer and would require 40.9 acres more land disturbance during construction and 16.5 acres more land during operations of the Project. Cumulatively, impacts of the Southern Route Alternative, including laterals, would require 63.9 more miles of pipeline construction. The impacts associated with the laterals required to meet the Project purpose and need would result in additional impacts on wetlands (13.7 additional acres affected), waterbodies (98 additional crossings), and forest land (44.6 additional acres affected). Construction and operations impacts from the Southern Route Alternative would be even greater once laterals are sited to deliver gas to customer connection points in the Medina, Lorain, Erie, and Lucas market areas. In addition, the alternative route would cross 6.4 more miles of areas of potential subsidence, 8.4 more miles of areas of high landslide potential, and cross eight more roads than the corresponding segment of the proposed pipeline route.

The primary engineering advantages of the Southern Route Alternative are that it would cross 2.37 miles less high and 7.8 miles less medium population density areas than the corresponding segment of the proposed route. The primary disadvantages of the Southern Route Alternative are that it would require laterals. The Southern Route Alternative would require four more laterals than the corresponding segment of the proposed route that would result in 61.2 more miles of pipeline installation and effects on 741.8 more acres of land during construction and 370.9 more acres of land during operation (*see* Table 10.5-1). In addition, as previously stated, two of the proposed compressor stations sites along the proposed route would have to be relocated to the alternative pipeline route in the vicinity of the City of Wooster and the Community of Caroline.

Schedule and Cost

The Project's proposed scheduled in-service date is November 1, 2017. The Southern Route Alternative's in-service date could not occur until late 2018. The in-service date delay is due to several factors including a complete reengineering of the Project facilities; new stakeholder and landowner outreach along the alternative route, laterals, and new compressor station sites; initiation of new federal, state, and

local consultation; additional biological and cultural field surveys; additional public open houses and scoping meetings; and a rework of the current Resource Reports and application filings. NEXUS has executed agreements with the majority of the Project's capacity. These customers are depending upon NEXUS to provide natural gas transmission services in 2017 in order for them to meet their demands. Use of the Southern Route Alternative would not allow customers to meet their energy needs starting in 2017.

The total cost associated with the Southern Route Alternative would be approximately $175 million, which is approximately $32 million more than the corresponding segment of the NEXUS Project preferred route.

Conclusion

The Southern Route Alternative is not located in the market areas identified by NEXUS that are in close proximity to Lake Erie, either directly adjacent to the lake or to the south. The majority of the market areas that the NEXUS Project would serve in Ohio are located in proximity to Lake Erie, either directly adjacent to the lake or to the south (*see* Figure 10.4-1). These market areas that would be served by the NEXUS Project are reflected in the location of the proposed pipeline facilities. The Southern Route Alternative was not considered to be a reasonable alternative in light of the environmental, engineering, schedule and cost disadvantages associated with the Southern Route Alternative, and the associated laterals, which would involve a longer pipeline length; greater overall impact on the environment during pipeline construction and operation; crossing of more wetlands, forest land, and roads; greater effects on more residences; and greater effects due to the increased number and total length of laterals, and the relocation of two compressor station sites.

10.5.1.2 City of Green Alternative

Introduction

NEXUS performed a detailed analysis of the City of Green Alternative submitted to the FERC's docket via letter dated March 23, 2015. In this letter, the City of Green states …"we make this request based upon the principals of minimizing impacts of the proposed pipeline to both human and environmental features"… In an effort to determine if the City of Green Alternative minimizes impacts to the natural and human environment, NEXUS evaluated the following metrics for both the City of Green Alternative and the corresponding segment of the NEXUS pipeline route: total pipeline length, percent pipeline paralleling existing rights-of-ways; total acres of temporary construction disturbance; total acres of permanent easement; laterals required to deliver gas to current NEXUS customers; total length of laterals including temporary and permanent easements in acres; total number of forested, scrub-shrub, emergent wetlands crossed and total acres of wetlands affected; total number of waterbodies crossed, and total crossing distances, and number of major waterbodies crossed (i.e., greater than 100 feet wide); groundwater resources including groundwater wells, sole source aquifers and wellhead protection areas; wildlife habitats including acres of forested habitat, designated critical wildlife habitats, waterfowl production areas, and wildlife management areas; cultural resources including properties listed on the National Register of Historic Places; geologic hazards including faults, areas of potential subsidence and areas of high landslide potential; areas of rugged terrain requiring sidehill construction methods and expanded construction ROW; national and state parks and forests; public conservation lands; an assessment of land ownership including public, private, and tribal lands; residential structures within 50 feet of the proposed construction right of way; and total road crossings including those that would need to be crossed using the horizontal bore, open cut, and horizontal directional drill crossing methods; and number of railroad crossings. A summary of this analysis is provided in Table 10.5-2, *Comparison of the City of Green Alternative to the Corresponding Section of the Proposed Route* (*see* Tables section) at the end of this report.

Analysis Methods

In order to perform the above described detailed analysis of the City of Green Alternative, and after requests for electronic files from the City of Green were denied, NEXUS created an electronic representation of the City of Green Alternative from the USGS maps attached to the City of Green's letter to the FERC. It is important to clarify that the NEXUS pipeline route shown on the City of Green's maps and evaluated by the City of Green is an outdated pipeline alignment dated January 2015. The *Comparison of the City of Green Alternative to the Corresponding Section of the Proposed Route,* summarized in Table 10.5-2, is based on an updated [March 2015] NEXUS pipeline route that incorporated numerous line changes resulting from stakeholder and landowner feedback (summarized in Section 10.6 of this report) and depicted in Project alignment sheets included as Appendix 1A to Draft Resource Report 1. Maps showing the City of Green Alternative and the corresponding segment of the NEXUS pipeline route are provided as Figure 10.5-2 (*see* Figure section – Maps 1 of 33 through 33 of 33, City of Green Alternative).

Additionally, the impact assessments performed by NEXUS are based on FERC guidance and on a proposed 100-foot-wide nominal construction ROW (i.e., temporary construction disturbance) in uplands and, pursuant to the FERC *Wetland and Waterbody Construction and Mitigation Procedures* (May 2013 version), a 75-foot-wide temporary construction ROW when crossing wetlands. In contrast, the analysis cited in the letter from the City of Green indicates that its wetland and waterbody impact assessments were based on "wetland and open water within 100 feet of either side of the pipeline" (i.e., a 200 foot construction disturbance) resulting in a more than double approximation of potential wetland and waterbody impacts. In addition, the City of Green analyses cite use of the National Hydrography Dataset from the USGS for the purpose of estimating wetland and waterbody impacts, as opposed to the USFWS NWI dataset which is recommended by the FERC Guidance. The impact assessment performed by NEXUS uses FERC guidance and performs an "apples to apples" comparison of the City of Green Alternative and the corresponding segment of the current NEXUS pipeline route using the USFWS's NWI dataset to calculate wetland impacts and National Hydrography datasets for calculating waterbody impacts.

In addition to the environmental evaluation of the City of Green Alternative, NEXUS performed a detailed engineering evaluation based on desk top analyses, high resolution aerial photography, and GIS assessments. These analyses are summarized below following a description of the City of Green Alternative.

Alternative Description

The City of Green Route Alternative deviates from the proposed route at MP 1.8 in Columbiana County, approximately 0.23 mile north of the northern boundary of the proposed Hanoverton Compressor Station site. It heads in a westerly direction for approximately 65 miles, turns north for approximately 40 miles, and rejoins the proposed route at MP 95.5 in Lorain County (*see* Figure 10.5-2).

The City of Green Alternative would generally follow existing utility ROW and cross a combination of open, agricultural, and forest land. Based on our review of the submitted alternative, it would be located south of the cities of Canton, Massillon, and Wooster, and cross major roadways including U.S. Highway 30, Interstate 77, U.S. Highway 62, U.S. Highway 250, Interstate 71, and U.S. Highway 20. The City of Green Alternative would cross several (four) strip mine areas, residential neighborhoods, and waterbodies, and would be along the western edge of the Camden Cemetery located southeast of the Village of Kipton. The City of Green Route Alternative would cross five counties in Ohio including Columbiana, Stark, Wayne, Medina, and Lorain.

Compressor Station Relocation

If the City of Green Alternative were adopted as NEXUS' preferred route, the proposed Wadsworth Compressor Station currently sited along the proposed NEXUS pipeline route would have to be relocated to the alternative pipeline route. To maintain hydraulic requirements, specific distances between compressor stations are required. As a result, compressor stations for the NEXUS Project must be located at approximate 60-mile intervals.

The proposed Wadsworth Compressor Station site in Medina County (approximate MP 60.3 of the proposed route) would be relocated to approximate MP 59.4 of the City of Green Alternative in Wayne County. This would place the new compressor station site in a congested residential area in the vicinity of Millbrook Road along the southwestern boundary of Wooster and southeastern boundary of Plain in Wayne County. Current land use in this area includes residential properties, mature forest, and agricultural lands.

Environmental and Engineering Comparison

As shown in Table 10.5-2, based on a comparison of the proposed NEXUS pipeline route without customer delivery laterals, the City of Green Alternative would affect 12.4 acres less wetlands and cross 0.22 fewer miles of state parks and 0.26 fewer miles of public or conservation lands than the corresponding segment of the proposed route. It would also cross 24.6 fewer miles of steep side slope areas and require 9.3 miles less side hill construction. Without considering impacts associated with laterals, the City of Green Alternative would be 9.9 miles longer and affect 164.9 more acres during construction and 60.8 more acres during operations than the corresponding segment of the proposed route. It would cross 10 more waterbodies, including six more major waterbodies, affect 39.3 more acres of forest land, and cross 0.51 and 2.3 more miles of areas of potential subsidence and high landslide potential, respectively.

The primary engineering advantages of the City of Green Alternative without considering laterals, are that it would be within 50 feet of 57 fewer residential structures during construction, cross 35 fewer roads and seven fewer railroads. The primary engineering disadvantages are that the City of Green Alternative would require two customer delivery laterals not required by the current route. The laterals that would be required for the City of Green Alternative would result in 47.1 more miles of pipeline installation and would impact 505.5 more acres of land during construction and 252.8 more acres of land during operations (*see* Table 10.5-2). The impacts associated with the laterals would result in additional impacts on wetlands (15 additional wetlands crossed and 11.4 additional acres affected), waterbodies (91 additional crossings, 5 additional major waterbody crossings greater than 100 feet wide, and an additional 2,814.1 linear feet of waterbody crossing length), and forest land (32.4 additional acres affected). In addition, five more wellhead protection areas would be within a 300-foot area centered over the alternative route centerline.

NEXUS also conducted a desktop engineering/construction review of the City of Green Alternative to evaluate potential constraints along the route. Following is a summary of this review, Figure 10.5-2 shows the referenced locations.

Between MP 0.5 and MP 1.2, the City of Green Alternative route would cross multiple shallow pipelines and a large wetland complex. It deviates from an existing utility ROW between approximate MP 2.0 and MP 4.2 and would be located within a rural residential area between MP 5.0 and MP 5.5. Several reroutes would be required within these areas to avoid and/or minimize potential impacts on the shallow pipelines, wetlands, and residences.

Between MP 8.2 and MP 9.2 the alternative route follows the centerline of an abandoned railroad bed. It would not be constructible in this area and would require a reroute approximately 200 feet to the south to avoid the railroad bed. The City of Green Alternative route traverses a deep ravine between MP 10.0 and

MP 11.0 and would require the use of the horizontal directional drill ("HDD") method to avoid potential impacts in this area. It would cross the Minivera Airfield at MP 11.3, a ravine and wetland complex at MP 12.5, and a wetland area at MP 14.5. Between MP 17.0 and 23.0, the alternative route would encroach on strip mining areas and steep side slopes, parallel a waterbody, and encroach on roads and an additional strip mining area. NEXUS would attempt to reroute around each of these features to avoid and/or minimize potential impacts.

At MP 24.0, the City of Green Alternative rejoins an existing utility ROW and between MP 25.0 and 29.9 it would cross a steep side slope area, residential areas, a KOA Campground, landfill, and quarry, all of which NEXUS would attempt to avoid by implementing several additional reroutes. Between MP 30.0 and MP 33.0 the alternative route crosses the Tuscarawas River, railroad ROW, roads, and would be near residences. A substantial HDD (approximate 4,300 feet in length) in an area of steep side slopes and terrain would be required to cross the Tuscarawas River. Steep side slopes, wetlands, and residences also exist between MP 33.5 and 37.0.

Between MP 45.1 and 53.4, several reroutes would be required along the City of Green Alternative route to avoid and/or minimize potential impacts on forested areas, structures, and residences. The alternative route would not be constructible between MP 56.9 and MP 60.0 because it traverses barrow pits, wetlands, a quarry, and is surrounded by residences and state parks lands. Several other reroutes would be required between MP 60.0 and 75.5 along the alternative route to avoid and/or minimize potential impacts wetlands, residences, and forested areas. In addition, Interstate 71 at MP 75.4would be crossed using the HDD method. Between MP 78.0 and MP 80.0 the alternative route would be in proximity to an airport, at MP 81.5 the HDD method would be implemented to cross a railroad, ravine, and Highway 224. Shallow pipelines exist between MP 90.0 and 95.0, a railroad would be crossed at MP 96.0, and between MP 102.5 and MP 103.0 an additional railroad, pipelines, a quarry, and wetlands would be encountered, all of which would require reroutes to avoid and/or minimize potential impacts to each of these features.

Market Delivery Laterals

If the City of Green Alternative were adopted as NEXUS' preferred route, two laterals would be required to deliver natural gas to serve committed NEXUS market area connections located along proposed route (*see* Figure 10.4-1). The overall increased length of the pipeline and the addition of potential future laterals originating from the City of Green Alternative to reach markets in northern Wayne, Medina, and Summit Counties (*see Figure 10.4-1*) would result in greater overall environmental impacts than the proposed route. In addition, if the City of Green Alternative were adopted as NEXUS' preferred route, one of the proposed compressor stations along the proposed route would have to be relocated to the alternative pipeline route to maintain hydraulic requirements. The proposed Wadsworth Compressor Station site in Medina County (approximate MP 60.26 of the proposed pipeline route) would be relocated to Wayne County in an area southwest of the City of Wooster along the City of Green Alternative route.

In summary, when impacts associated with the required customer delivery laterals are factored into total impacts, the City of Green Alternative would require 51.6 more miles of pipeline construction, 670.4 more acres of temporary construction land disturbance, and 313.6 more acres of permanent easement.

Schedule and Costs

The NEXUS Project in-service date is November 1, 2017 and is required to meet the firm transportation service requirements of the Project shippers. The City of Green Alternative's in-service date would likely be late 2018. The in-service date delay is due to several factors including a substantive reengineering of the Project facilities; new stakeholder and landowner outreach; initiation of new federal, state, and local consultation; initial biological and cultural field surveys along the alternative route; route adjustments based on constraints revealed during field surveys; additional NEXUS open houses and informational meetings for new landowners; additional FERC public NEPA Scoping Meetings; and extensive

recalculation of potential project impacts; new agency consultations; and revision to Resource Reports and Certificate Application filings.

NEXUS has executed agreements with the customers shown on Figure 10.4-1 and is in ongoing confidential negotiations with additional potential customers located in the market areas shown on Figure 10.4-1. These customers are depending upon NEXUS to provide incremental natural gas transmission services beginning in November of 2017 in order for them to meet their increasing electric generation and market demands. Use of the City of Green Alternative as NEXUS' preferred route would not allow NEXUS to meet customer commitments by November of 2017.

Additionally, the estimated cost of the City of Green Alternative would be approximately $107 million, which is approximately $28 million more than the corresponding segment of the proposed NEXUS pipeline route.

Lastly, the purpose and need of the Project is to provide for the seamless gas transportation path of Appalachian Basin shale gas, including Utica and Marcellus shale gas production, directly to consuming markets in northern Ohio and southeastern Michigan, and to the Dawn Hub in Ontario, Canada. NEXUS has been in commercial discussions with other end-users along the proposed pipeline. Adopting the City of Green Alternative would preclude NEXUS' ability to efficiently serve a majority of these growing markets.

Conclusion

The City of Green Alternative is not located in the market areas identified by NEXUS and identified customers located along the current route shown in Figure 10.4-1 and, therefore, does not accomplish the Project's purpose and need. If the City of Green Alternative were implemented NEXUS would not be able to meet contractual agreements with customers to be in-service by November of 2017. In addition, when impacts associated with the required customer delivery laterals are factored into total impacts, the City of Green Alternative would require 51.6 more miles of pipeline construction; 670.4 more acres of temporary construction land disturbance; would require 313.6 more acres of permanent easement, and relocation of one compressor station. Without considering impacts associated with laterals, the City of Green Alternative would be 9.9 miles longer and affect 164.9 more acres during construction and 60.8 more acres during operations and require relocation of one compressor station, compared to the corresponding segment of the proposed route. It would also cross 10 more waterbodies, including six more major waterbodies, affect 39.3 more acres of forest land, and cross 0.51 and 2.3 more miles of areas of potential subsidence and high landslide potential, respectively. Therefore, implementing the City of Green alternative would not meet the stated objectives of City of Green for minimizing impacts to the natural and human environment.

Most importantly, the purpose and need of the Project is to provide for the seamless gas transportation path of Appalachian Basin shale gas, including Utica and Marcellus shale gas production, directly to consuming markets in northern Ohio and southeastern Michigan, and to the Dawn Hub in Ontario, Canada. NEXUS has been in commercial discussions with other end-users along the proposed pipeline. Adopting the City of Green Alternative would preclude NEXUS' ability to efficiently serve a majority of these growing markets. Given this alternative does not meet the Project purpose and need and because of the environmental, engineering, schedule and cost disadvantages associated with the City of Green Alternative, this alternative was not considered to be a reasonable alternative to the proposed route.

10.5.1.3 Electric Transmission Line Alternative

Alternative Description

NEXUS evaluated the Electric Transmission Line Alternative to address stakeholder comments and determine if an alternative route that parallels existing utility ROW for its entire length would result in fewer environmental impacts than the proposed route. The Electric Transmission Line Alternative

deviates from the proposed route at MP 1.8 in Columbiana County, approximately 0.29 mile north of the northern boundary of the proposed Hanoverton Compressor Station site. It heads in a southwesterly direction and follows U.S. Highway 30 and State Highway 9 for approximately 2.7 miles. It then turns westerly and follows Marble Road NE for approximately 1.8 miles and Andora Road NE, Ridge Road, and Mantle Road NE for approximately 1.1 miles. Once the Electric Transmission Line Alternative intersects with an existing powerline ROW it follows this ROW for approximately 22.0 miles and rejoins the proposed route at MP 29.0 in Stark County (*see* Figure 10.5-3).

The Electric Transmission Line Alternative would cross a combination of open, agricultural, and forest land. It would be located northeast of the Village of Minivera and cities of Louisville and North Canton and cross major roadways including U.S. Highway 30, State Highway 9, and U.S. Highway 62. The Powerline Route Alternative would cross Big Dawg's Golf Course, Brocklehurst Lake, a reclaimed strip mine area, residential neighborhoods, and waterbodies. It would cross three counties in Ohio including Columbiana, Carroll, and Wayne.

Environmental and Engineering Comparison

As shown in Table 10.5-3, the primary environmental advantages of the Electric Transmission Line Alternative are that it would affect 1.2 acres less wetlands and 19.9 acres less forest land than the corresponding segment of the proposed route. The primary environmental disadvantages of the Electric Transmission Line Alternative are that it would be 0.3 mile longer than the corresponding segment of the proposed route, affect 9.5 more acres during construction and 3.9 more acres during operation, cross 16 more waterbodies, including seven more major waterbodies, cross four more wellhead protection areas, and cross 0.13 and 2.9 more miles of areas of potential subsidence and high landslide potential, respectively. It would also cross approximately 252.95 more feet of public and conservation lands and be within 50 feet of 113 more residential structures during construction. The primary engineering advantages of the Electric Transmission Line Alternative are that it would cross 12 less roads and one less railroad than the corresponding segment of the proposed route.

Conclusion

The Electric Transmission Line Alternative was not considered a preferred alternative to the current route because of the associated environmental and engineering disadvantages, including that it would be 0.3 mile longer than the corresponding segment of the proposed route, would affect 9.5 more acres during construction and 3.9 more acres during operation, cross 16 more waterbodies, including seven more major waterbodies, cross four more wellhead protection areas, and cross 0.13 and 2.9 more miles of areas of potential subsidence and high landslide potential, respectively, and would also cross approximately 252.95 more feet of public and conservation lands and be within 50 feet of 113 more residential structures during construction.

10.5.1.4 Lake Erie Crossing Alternatives

During the initial routing stages of Project development, NEXUS evaluated two wide routing corridors (eastern and western) for a major route alternative that would cross Lake Erie. The distance across the lake for these corridors ranges between 45 and 60 miles. Once NEXUS identified potential pipeline routes within the eastern and western study corridors, including the selection of potential preferred landfall locations, a more refined scale environmental resource review was conducted and focused on data pertinent to the feasibility of the routes. The evaluation of each route consisted of a 10-mile wide study corridor (5 miles to the east and west of each pipeline route) and focused on the feasibility of crossing Lake Erie and on land environmental resources in a general area within approximately 1 mile of preferred landfall/HDD locations. Preferred landfall locations are identified as Site 11 and Site 17 for the Lake Erie East Alternative and Site 5 and Site 13 for the Lake Erie West Alternative (*see* Figures 10.5-4 and 10.5-5, respectively). The parameters that were evaluated included bathymetry, sediments and geology, circulation/water quality, contamination, shipwrecks, utilities/intakes/disposal sites, navigation features,

ice scour, aquatic resources, terrestrial resources, special status species, land use/cultural resources, recreation areas, timing windows, and potential construction equipment/methods.

The Lake Erie East Alternative extends from the Willoughby to Ashtabula shoreline area in Ohio (including preferred landfall location Site 11) across the lake to east of Rondeau Park, in Ontario, which is located south-southeast of preferred landfall location Site 17 (*see* Figure 10.5-4).

The Lake Erie West Alternative extends from the Huron to Lorain shoreline area in Ohio (including preferred landfall location Site 5) across the lake to east of Pt. Pelee Park, in Ontario, which is located south-southeast of preferred landfall location Site 13 (*see* Figure 10.5-5).

With regard to the environmental resources considered for the Lake Erie East and West Alternative corridors, those relative to bathymetry features included water depths and associated issues with ice scour and protection of the pipeline and long term maintenance and reliability of the pipeline. The Lake Erie West Alternative corridor would cross bathymetric features that are more regular and consist of deeper water while the Lake Erie West Alternative corridor would cross features that are more varied and irregular and it would cross the Pelee-Lorain Ridge, which could influence pipeline burial and backfilling methods.

The lakebottom sediments along the Lake Erie East Alternative corridor contain glacial till in the northernmost two miles of the corridor, approaching the shoreline and otherwise contain predominately mud across most of the lake except for a band of sand mud and bedrock near the southern shore. The Lake Erie West Alternative corridor is more heterogeneous and has extensive areas of glacial till near both shorelines and in areas scattered throughout the southern portion of the corridor along with sand, gravel and mud. A significant consideration throughout the region is that the shoreline areas in Lake Erie experience erosion that leads to recession rates that have been measured at approximately 1 meter per year or less (Li et al, 2001).

Depending on the types of construction equipment and methods employed, each of the alternatives would result in some degree of sediment disturbance resulting in resuspension and transport of sediments. Elevated levels of fine particle size sediment could have harmful effects on fish and other aquatic organisms, effect water withdrawals at shoreline intakes and result in elevated contaminant levels if disassociation from sediment particles occurs. Sediment disturbance could also result in the remobilization of nitrogen and phosphorous into the water column, both of which can result in increased phytoplankton production. In addition, given the industrial and agricultural activities that occur within the watershed of Lake Erie, sediments in the lake have become contaminated to varying degrees. Resuspension and transport of contaminated sediments would be a concern for pipeline installation along either the Lake Erie East or West Alternative corridors.

Routing a pipeline across Lake Erie would need to consider the locations of shipwrecks, underwater natural gas pipelines and wells, water intakes, and offshore [dredged material] disposal sites and potential impacts on these features during construction. Coordination with the U.S. Coast Guard ("USCG") through Notice to Mariner requirements would be required to ensure that construction activities would not impede navigating vessels, recreational lake users, commercial boating facilities, or coastal public access sites.

The Lake Erie East Alternative would cross mostly unmapped fishery habitat with the exception of habitat areas closer to shore, while the Lake Erie West Alternative would be entirely within mapped fishery habitat. Potential impacts on these resources could include re-mobilization of sediment bound contaminants, accidental spills or discharges of fuels, lubricants, or other fluids during construction and alteration of benthic conditions for bottom spawning or feeding fish. Use of the HDD method could be used to avoid the shallower portions of this habitat; however, given the seasonal requirement to construct during ice out periods, avoidance of Ohio and Ontario agency in-water work restriction periods may not be possible (*see* below). In addition, the preferred landfall locations sites would need to be surveyed for

submerged aquatic vegetation habitat and if such habitat would be affected by construction, mitigation could be required.

Proper USCG protocols would need to be adhered to with regard to ballast water exchange and the potential to move invasive species from one part of the lake to another, thereby exacerbating the spread of invasive species within the lake. Impacts on the Lorain Artificial Reef Complex, located within the Lake Erie West Alternative corridor, would need to be avoided and impacts on wetlands near the preferred landfall location sites would also need to be avoided or minimized.

In addition, it is likely that Ohio and Michigan regulatory agencies would impose timing restrictions for in-water construction activities to protect early spawning walleye. The beginning of the window would likely be March 15 to protect the larval development stage, as well as the spawning of other species such as yellow perch; the window would likely extend to June 30. In Ontario, Ministry of Natural Resources has the responsibility for time of year restrictions for in-water construction activity ("timing window") guidelines. Lake Erie would be considered a part of the Southern Region of Ontario which has combined timing windows that would occur from March 15 to July 15 during spring, and September 15 to May 31.

NEXUS considered the type of construction equipment or methodology that would be used to install a pipeline within either the Lake Erie East or West Alternatives corridors. The use of the HDD method for the shoreline crossings could be used to avoid direct disturbance of the shoreline and the shallow water habitats to the 20 or 25 foot contour of the lake. Either the mechanical plow or jetting method could be used to install a pipeline across the lake bottom; however, as with other recent Spectra Energy offshore pipeline projects there can be tradeoffs between the two methods. For instance, mechanical plowing method could result in less than desired burial depth and the need to place a large distance of armoring backfill, this may be viewed as less desirable than the increased amount of suspended sediments that are typically produced using the jetting method to lower and backfill the pipeline.

More importantly, the Lake Erie East or West Alternatives are not located in the market areas identified by NEXUS that are served by the current pipeline route (*see* Figure 10.4-1) Therefore, the Lake Erie crossing alternatives do not fully achieve the Project Purpose and Need. Because the environmental and engineering disadvantages associated with the Lake Erie East or West Alternatives would involve greater overall impacts on the offshore and onshore environments during pipeline construction and operation; and more importantly these alternatives are not located in the market areas identified by NEXUS in Lucas, Sandusky, Erie, Medina, Stark, and Columbiana counties, these alternatives are not considered to be reasonable alternatives to the proposed NEXUS pipeline route.

10.5.2 Major Route Alternatives Incorporated into the NEXUS Project

The following Major Route Alternatives were evaluated for the NEXUS Project during the early stages of siting the pipeline facilities to address stakeholder comments and to determine if environmental and engineering impacts could be avoided or minimized. Because the route changes were necessitated to avoid and minimize environmental and engineering constraints, these Major Route Alternatives are now part of the proposed route and the original route is described as the "alternative route." The main determinants used to select the proposed route over the alternative routes focused on minimizing adverse environmental impacts, minimizing the number of affected landowners, ensuring constructability, and meeting NEXUS' desire to limit the extent of disruption on the communities potentially being affected during construction.

10.5.2.1 Nimisila Reservoir Alternative

Alternative Description

The Nimisila Reservoir Alternative deviates from the proposed route at approximate MP 36.2 in Summit County, Ohio, heads west/northwest for approximately 7.0 miles, and rejoins the proposed route at MP 45.7 (*see* Figure 10.5.-6). This alternative route would cross Portage Lakes State Park, managed by the

Ohio Department of Natural Resources ("ODNR"), for approximately 5,500 feet and would involve an approximately 3,870 foot open water crossing of the Nimisila Reservoir, which is contained within the state park. It rejoins the proposed route at MP 45.7.

Portage Lakes State Park is a 411-acre park located in Akron, Ohio and contains some of the highest points of elevation in Ohio and lies on a major watershed divide where water drains into both Lake Erie and the Ohio River (ODNR, 2015). The Portage Lakes formation was a direct result of glacial activity. Some of the lakes were created to maintain the surrounding canal system in the early 1900s. In 1949, the Portage Lakes were acquired by the ODNR Parks and Recreation Division. The park is a valued recreational resource and offers trail hiking, camping, swimming, boating, fishing, hunting, winter recreation, and picnicking amenities.

Because of the extent of impacts associated with the public land and major waterbody crossings, NEXUS identified and evaluated a preferred route, which would continue to parallel existing utility corridors to the maximum extent practicable, while also minimizing the length of the Portage Lakes State Park crossings and the width of the Nimisila Reservoir crossing. ODNR land crossings have been avoided or minimized by NEXUS to the maximum extent practicable. On October 14, 2014, NEXUS met with ODNR staff to introduce the Project and discussed the Portage Lakes State Park and Nimisila Reservoir crossings. The results of these consultations have resulted in a preferred route which is mutually acceptable to both the ODNR and NEXUS.

Environmental and Engineering Comparison

The proposed route would cross the southern end of the Nimisila Reservoir and approximately 40 feet of open water, Portage Lakes State Park for approximately 1,150 feet, and approximately 4,134 fewer feet of waterbodies than the alternative route (*see* Table 10.5-4). The Nimisila Reservoir Alternative would be 2.5 miles shorter and affect 25.5 less acres during construction and 15.1 less acres during operation, and affect 15.2 fewer acres of forest land than the proposed route. The primary environmental disadvantages of the alternative route are that it would affect 4.1 acres more wetland, and cross approximately 4,134 more feet of waterbodies, including approximately 3,830 additional feet of the Nimisila Reservoir (i.e., open water), and approximately 4,350 additional feet of Portage Lakes State Park.

The primary engineering advantage of the proposed route south of the Nimisila Reservoir is that it avoids a large open water crossing and would cross a narrow extremity of the reservoir. The crossing methodology for this area has not yet been determined; however, NEXUS is conducting geotechnical evaluations of the proposed reservoir crossing location and will work with the ODNR to identify a preferred location for crossing the park and the reservoir.

From an engineering perspective, the primary disadvantage of the Nimisila Reservoir Alternative is the approximately one-mile, open water crossing of the reservoir, which would likely require a more complex crossing method and associated additional construction workspace (i.e., horizontal directional drill ["HDD"] or push/pull). Another advantage of the proposed route is that it would affect fewer residential structures (25) within 50 feet of the construction workspace than the alternative route (33). Much of the alternative route (4.6 of 7.0 miles) is co-located along existing powerline ROWs; however, to minimize the public lands crossing and length of the reservoir crossing, routing the pipeline to the south was preferred even though it reduced co-location of the proposed route within existing pipeline ROWs to 3.4 miles of the 9.4 total miles. The proposed route would cross14 roads, which is four more than the alternative route. Neither route crosses any railroads.

10.5.2.2 Hubbard Valley Park Alternative

Alternative Description

The Hubbard Valley Park Alternative deviates from the proposed route at approximate MP 60.7 in Medina County, Ohio and heads west/northwest for approximately 3.6 miles. It rejoins the proposed

route at MP 64.4 (*see* Figure 10.5-7). This alternative route would cross Hubbard Valley Park for approximately 3,000 feet and approximately 630 feet of a parcel of land held under conservation easement by the Western Reserve Land Conservancy.

Hubbard Valley Park was established as a flood-control project on Chippewa Creek in Guilford Township. Chippewa Subdistrict constructed the dam at Hubbard Lake and while doing so acquired additional land to permit the development of a permanent reservoir. The reservoir is approximately 21 acres and non-motorized boating is allowed. In the park, visitors have access to hiking trails, wildlife viewing areas, fishing, picnic amenities, playground, and winter recreation capabilities. This park is managed by the County of Medina (Medina County Park District, 2015). The Cox parcel is 62 acres of private land encumbered by a conservation easement and is managed by the Western Reserve Land Conservancy, which is a non-governmental organization ("NGO") (McDonald, personal communication, 2015).

Because of the impacts associated with these public and conservation land crossings, NEXUS' identified and evaluated a preferred route which would eliminate the crossing of Hubbard Valley Park and Cox parcel conservation easement.

Environmental and Engineering Comparison

The primary disadvantage of the alternative route is that it crosses Hubbard Valley Park and the Cox parcel for a total of approximately 2,906 feet, which are public lands or lands held under a conservation easement. No public lands or lands encumbered by conservation easements would be crossed by the proposed route. Furthermore, the proposed route would avoid crossing forested wetland, cross 182.8 fewer feet of waterbodies, and affect 13.9 less acres forest land than the alternative route (*see* Table 10.5-5). The alternative route would cross one less wetland and affect 0.4 acre less wetland.

The proposed route has slightly more engineering complexity than the alternative route. It is 0.1 mile longer than the alternative route and would cross three more roads. Each route would be within 50 feet of one residential structure.

10.5.2.3 Edison Woods Preserve and Apple Orchard Alternative

Alternative Description

The Edison Woods Preserve and Apple Orchard Alternative deviates from the proposed route at approximate MP 100.6 in Erie County, Ohio and heads west for approximately 7.8 miles. It rejoins the proposed at MP 108.5 (*see* Figure 10.5-8). This alternative route would cross approximately 3,155 feet of Edison Woods Preserve and approximately 2,750 feet of an existing apple orchard.

The Edison Woods Preserve is located in Berlin Heights and is an important ecological area and Audubon Important Bird Area. It includes headwaters to a tributary to Old Woman Creek and about 550 acres of wetland habitats, 300 acres of restored native grasslands, sandstone cliffs, and an escarpment of the Appalachian Plateau. Edison Woods is one of northern Ohio's largest native grassland restoration projects and it contains 20 miles of natural surfaced trails for pedestrians and horseback riders and a 0.5-mile-long boardwalk. (Erie MetroPark, 2015). The Preserve is managed by Erie MetroParks.

This alternative route would have additional impacts associated with the public land crossing, impacts on landowners from crossing the apple orchard, and costs to the Project for reimbursing the landowners for the loss of apple trees. NEXUS' identified and evaluated a preferred route which would minimize the length of public lands and apple orchard crossed.

Environmental and Engineering Comparison

The main advantages of the proposed route are that it would it minimize the crossing length of an apple orchard to approximately 125 feet and it would cross the southwestern corner of Edison Woods Preserve

thereby minimizing the crossing length to approximately 130 feet. In addition, as shown in Table 10.5-6, the proposed route would cross 11 fewer waterbodies, affect 2.7 acres less forest land, approximately 1,489 feet less pubic and conservation lands, and two less roads. The alternative route would affect 1.6 more acres of wetland and be within 50 of ten more residential structures during construction than the proposed route.

Both routes are similar from an engineering perspective. The alternative route would be co-located along existing powerline corridor ROWs; however, to minimize the public lands and apple orchard crossings, routing to the south was preferred and thereby reduced co-location of the corresponding segment of the proposed route with existing pipeline ROWs..

10.5.2.4 Black Swamp Land Conservancy and Sandusky River Alternative

Alternative Description

The Black Swamp Land Conservancy and Sandusky River Alternative deviates from the proposed route at approximate MP 136.4 in Sandusky County, Ohio and heads west/northwest for approximately 8.7 miles. It rejoins the proposed at MP 145.2 (*see* Figures 10.5-9). This alternative route would cross approximately 3,030 feet of the Miller Peninsula Farm which is located on the western side of the Sandusky River and is held under conservation easement by the Black Swamp Land Conservancy. The Miller Peninsula Farm has historical significance in the region because in 1781, the Wyandot Native American tribe gave this land to James and Elizabeth Whittaker, the first white settlers north of the Ohio River between Pittsburgh and Detroit (Black Swamp Conservancy, 2015). In 2001, Don Miller and Black Swamp Conservancy signed a perpetual land conservation agreement which restricts future use of the land for conservation purposes. Consultation with the Black Swamp Land Conservancy's director indicated that their easements prohibit pipeline crossings. Because of the potential impacts associated with conservation easement crossing, NEXUS' identified and evaluated a route alternative which would continue to parallel existing infrastructure corridors to the maximum extent practicable, while also avoiding crossing any public conservation or conservation easement encumbered lands.

Environmental and Engineering Comparison

The main environmental advantage of the proposed route is that it avoids crossing through the Miller Peninsula Farm. Additional advantages of the proposed route are that it would affect 0.4 less acres of wetlands, cross one less waterbody, affect 2.6 fewer acres of forest land, and would be within 50 feet of three fewer residential structures than the alternative route (*see* Table 10.5-7). Both of the routes would cross one forested wetland and the Sandusky River. The main environmental disadvantage of the alternative route is that it would cross through the Miller Peninsula Farm.

The proposed and alternative route are similar from an engineering perspective. Much of the alternative route would be co-located along existing pipeline corridor; however, to avoid crossing the Black Swamp Land Conservancy easement, routing the pipeline to the north was favored and it reduced co-location of the proposed route with Interstates 80 and 90 to 3.8 miles of the 7.5 total miles. Both routes would cross one railroad and the proposed route would cross four more roads.

10.5.2.5 Maumee State Forest Alternative

Alternative Description

The Maumee State Forest Alternative was evaluated early in the route development process (*see* Figure 10.5-10) based on initial consultations with ODNR regarding potential impacts to the Maumee State Forest. The original route alternative in this vicinity would have crossed approximately 9,155 feet of the Maumee State Forest. Since the original route was evaluated and based on feedback received from the ODNR, NEXUS implemented a revised alternative in this area that further minimizes impacts to the Maumee State Forest and relocates the proposed pipeline further west of the Oak Openings Metro Park.

The revised alternative the supersedes the original Maumee State Forest Alternative filed in January 2015, and is depicted in Figure 10.6.1-62 and is described in Section 10.6.1 as a Route Variation Incorporated into the Project at MP 181.0.

10.5.2.6 Washtenaw County School Complex Alternative

Alternative Description

The Washtenaw County School Complex Alternative deviates from the proposed route at approximate MP 236.5 in Washtenaw County, Michigan and heads northeast/east for approximately 5.1 miles to where it rejoins the proposed route at MP 241.6 (*see* Figure 10.5-11). The alternative route is in closer proximity to an elementary school, two neighborhoods, a church, and a cemetery and would require approximately 3.6 miles of in-street construction along Bemis Road. The proposed route avoids these features and would not require in-street construction; however, the proposed route would still be in relatively close proximity to residences and waterbodies.

Environmental and Engineering Comparison

As shown in Table 10.5-9, both routes would cross three wetlands; however, the proposed route would affect 0.4 acre more wetland. The proposed route would cross approximately 1,340 less feet of public and conservation land and be within 50 feet of ten fewer residential structures during construction than the alternative route. The proposed route would cross six waterbodies with a total waterbody crossing length of 46.5 feet.

The primary advantage of both routes is that they would involve minimal in-street construction (approximately 0.1 mile). The primary advantage of the proposed route over the alternative route is that the construction workspace would be within 50 feet of 10 fewer residential structures.

10.5.3 Additional Major Route Alternatives Evaluated

In addition to the major route alternatives discussed in Section 10.5.1 above, NEXUS evaluated an additional major route alternative that was identified by stakeholders during the pre-filing process. This additional major route alternative is evaluated below.

CORN Western Alternative

NEXUS evaluated the CORN Western Alternative to address stakeholder comments and determine whether the alternative route would provide substantial benefits with respect to the Oak Openings Region, the high water table in Swancreek Township, and present and future potable water supplies.

The segment of pipeline provided by CORN was approximately 16.5 miles long located parallel to NEXUS route and approximately 6.3 miles west of the NEXUS pipeline route. In order to evaluate a viable alternative to the corresponding segment of the NEXUS route, NEXUS sited mainline pipeline segments connecting the CORN route with the NEXUS route to the south and north.

The CORN Western Alternative deviates from the proposed route at MP 184.5 in Henry County and heads in an easterly direction for approximately 6.7 miles and would follow the Norfolk and Western Railroad and an existing powerline ROW. It then turns in northwest and north for approximately 18.0 miles and would parallel the Detroit, Toledo Ironton Railroad for much of its length. It deviates from the railroad approximately 4.0 miles south of the Ohio/Michigan state line. Once at the state line the CORN Western Alternative heads east-northeast for approximately 7.0 miles and rejoins the proposed route at MP 204.7 in Lenawee County, Michigan (*see* Figure 10.5-12).

Environmental and Engineering Comparison

As shown in Table 10.5-10, the primary environmental advantages of the CORN Western Alternative are that it would cross 2.1 miles less areas of potential subsidence, and cross three fewer railroads. The

primary disadvantages of the CORN Western Alternative are that it would be 11.1 miles longer and would temporarily affect approximately 135.7 acres more land during construction and would require 67.4 acres more acres of permanent easement during operations, than the corresponding segment of the NEXUS route. It would also affect 0.6 acre more wetlands, cross eight more waterbodies, affect 4.0 acres more forest land, and cross approximately 4,357 feet more public and conservation land. It would also be within 50 feet of three more residential structures during construction than the corresponding segment of the proposed route. The primary engineering disadvantages of the CORN Western Alternative are that it would cross 11 more roads, which would all need to be bored,

Conclusions

In summary, the CORN Western Route Alternative would require construction of 11.1 miles more pipeline; would involve 135.7 acres more temporary land disturbance during construction; and 67.4 acres more land in permanent easements during operations, would affect 0.6 acre more wetlands, cross eight more waterbodies, affect 4.0 acres more forest land, and cross approximately 4,357 feet more public and conservation land. It would also be within 50 feet of three more residential structures during construction than the corresponding segment of the proposed route and would involve 11 more bored road crossings. Based on these additional impacts during construction and operations, the CORN Western Alterative is unlikely to provide substantial benefits with respect to the Oak Openings Region, the high water table in Swancreek Township, and present and future potable water supplies.

10.6 Minor Route Variations

In general, minor route variations differ from system alternatives or major route alternatives in that they are identified to reduce impacts on specific localized features, are significantly shorter in length than major route alternatives, and do not always clearly display an environmental advantage other than reducing or avoiding impacts on specific features.

10.6.1 Route Variations Incorporated into the NEXUS Project

The following sections provide a summary of selected route variations identified by NEXUS and incorporated into the proposed pipeline route because they avoid engineering and/or environmental constraints and/or facilitate constructability. Table 10.6-1 (*see* Tables section) summarizes all of the minor route variations that were incorporated into the proposed mainline pipeline route and the reasons for their consideration. Figures depicting the minor route variations are included as Figures 10.6.11 through 10.6.-79 and are organized by starting MP (*see* Figures section). The Figures show with a red solid line the currently proposed mainline pipeline route (i.e., the pipeline route with the incorporated route variation), in red dashed-line the former mainline pipeline route that was filed with the FERC in January 2015, and in blue line the portion of the former mainline pipeline route or original route that was filed with the FERC in January 2015 but has been replaced with a route variation. NEXUS will continue to investigate and evaluate viable minor route variations throughout the pre-filing process.

MP 2.1: This route variation was developed to avoid a wellhead and to minimize the distance that the pipeline would run parallel to a perennial stream. The variation avoids the well and reduces the distance that the pipeline would parallel the perennial stream by approximately 240 feet and it reduces the distance the pipeline would traverse a Federal Emergency Management Agency ("FEMA")-mapped floodplain by approximately 30 feet and is approximately 120 feet shorter than the original route (*see* Figure 10.6.1-4).

MP 4.1: This route variation was incorporated at the request of the landowner to shift the proposed alignment around a stand of trees that the landowner has future plans to harvest for his own use. While the variation crosses more forested area than the original alternative, but neither route crosses wetlands or waterbodies (*see* Figure 10.6.1-5).

MP 5.4: This route variation was incorporated to avoid a pipeline crossing directly adjacent to a small manmade pond. Feasible alternatives for this route variation were limited due to existing powerline

infrastructure (i.e., towers), surrounding residential development, and the presence of large, mature forested uplands and wetlands in the vicinity of the alignment. The incorporated variation crosses the existing powerline and parallels the cleared utility corridor to the south, crosses Rochester Road and avoids the pond before it crosses the powerline again and rejoins the original route northwest of Rochester Road. The incorporated route is approximately 75 feet longer than the original route alternative, however, impacts on the pond and portions of an adjacent riparian forest will be avoided (*see* Figure 10.6.1-7).

MP 6.8: This route variation was incorporated to minimize forested and riparian vegetation impacts along a section of stream in West, Ohio. The impact avoidance was achieved by eliminating construction activities parallel with a stream (*see* Figure 10.6.1-8).

MP 7.3: This route variation was incorporated to avoid steep slopes, three ravines and to minimize crossing distance in a large ponded wetland system. The incorporated variation traverses an area where the slope is not as steep and the ravines are narrower, and deviates from the original route alternative to the south of the largest portion of a seasonally flooded forested wetland (*see* Figure 10.6.1-9).

MP 11.3: This route variation deviates to the south of the existing powerline corridor in order to avoid a large, flooded stream channel and associated forested floodplain wetland. This variation also utilizes a cleared agricultural field to avoid the stream channel, thus minimizing forested wetland conversion (*see* Figure 10.6.1-10).

MP 13.6: This route variation was implemented to create a right-angle crossing of Highway 183. The current route helps avoid existing pipeline infrastructure and reduces impacts associated with the highway crossing. The current route avoids needing to install a road-bore operation within or immediately adjacent to the confluence of two ditched streams east of the highway (*see* Figure 10.6.1-11).

MP 18.7: This route variation was incorporated to avoid a crude oil storage tank and a survey corner point installed by the Ohio State Survey. The incorporated variation takes advantage of existing cleared areas (field) in order to minimize tree clearing and it will avoid conversion of approximately 425 linear feet of forested upland and wetland versus the original alternative (*see* Figure 10.6.1-12).

MP 24.5: This route variation was incorporated to avoid a pond. The variation route also reduces wetland and upland forest crossing requirements by approximately 1,200 linear feet, avoids one stream crossing, minimizes the crossing distance through FEMA-mapped floodplain, avoids several proximal homesteads, and avoids at least five pump jacks and two sets of storage tanks in the vicinity of the pipeline route (*see* Figure 10.6.1-13).

MP 27.7: This route variation was incorporated to avoid crossing a forested wetland that is a Category 3 wetland, according to the Ohio Rapid Assessment Method for Wetlands administered by the Ohio Environmental Protection Agency. The variation reduced wetland crossing distance by 388 linear feet, and reduced overall alignment length by 66 feet (*see* Figure 10.6.1-14).

MP 30.4: This route variation was incorporated to avoid a pond. The current route in this location deviates from an existing powerline corridor, but by doing so it reduces forested wetland clearing and emergent and shrub/scrub wetland impacts, and moves the alignment further from several homes north of the corridor (*see* Figure 10.6.1-17).

MP 36.3: This route variation was incorporated per request of the landowner to avoid having the alignment cross through the property and instead run parallel with the property line. Following desktop and field review, the proposed variation was determined feasible (*see* Figure 10.6.1-118).

MP 49.0: This route variation was incorporated per a landowner request to shift the alignment further from two residential structures and to avoid clearing screen trees near a yard (*see* Figure 10.6.1-20).

MP 59.1: This route variation was incorporated per request of landowners made at an Open House Meeting held by NEXUS. The landowner request NEXUS to review alternatives to move the alignment

from between two homes. Following desktop and field review, the proposed variation was determined feasible (*see* Figure 10.6.1-23).

MP 74.3: This route variation was incorporated per a landowner request to shift the alignment further from a residential structure, and into an adjacent agricultural field. Following desktop and field review, the proposed variation was devised to move the alignment further from several developed lots, avoids a waterbody and wetland crossing and, per the landowner's request, avoids a mature American elm tree on the landowner's property (*see* Figure 10.6.1-25).

MP 79.8: This route variation was developed to avoid a pond and associated wetland. The incorporated variation also moves the alignment further from several homes west of the corridor (*see* Figure 10.6.1-26). The proposed pipeline route with this incorporated minor route variation and the alternative route at MP 79.6 are depicted in Figure 10.6-9.

MP 80.3: This route variation was incorporated to avoid crossing through an established pet cemetery at the request of landowners. The incorporated variation deviates from the existing powerline corridor and runs parallel and to the south of the powerline in order to both avoid the pet cemetery and increase the distance between the pipeline and several homes (*see* Figure 10.6.1-27).

MP 81.8: This route variation was incorporated to move the proposed pipeline further away from several homes and to minimize the crossing distance through Lorain County Metro Park District's "Chamberlain Road Property". The incorporated variation deviates from the existing powerline corridor for approximately two miles, traversing primarily through cleared agricultural lands, crossing Chamberlain Road and running northwest to create a single, right-angle crossing under the Black River (approximate MP 83) before re-connecting with the powerline west of the river (*see* Figure 10.6.1-29).

MP 82.6: This route variation is an extension of the variation incorporated at MP 81.5. The incorporated variation at MP 82.6 was devised per landowner request to avoid clearing within a maple farm. The incorporated variation minimizes upland forest conversion by utilizing existing cleared agricultural fields and does not increase wetland or stream crossings (*see* Figure 10.6.1-30).

MP 90.9: This route variation was incorporated to shift the pipeline to the south of the original alignment to avoid five existing pipelines that converge in this area. An initially proposed deviation in this area was slightly revised following review team analyses, and four points-of-inflection were added to the current alignment avoid a large forested wetland area within an ODNR conservation parcel (i.e., Black Swamp Woods). This conservation parcel also includes an ODNR-mapped conservation site (maple-ash-oak swamp), which the variation was implemented to avoid (*see* Figure 10.6.1-38).

MP 91.1: This route variation was incorporated to move the alignment and workspace more than 660 feet from an active bald eagle nest, noted during Project field studies (*see* Figure 10.6.1-36).

MP 96.4: This route variation avoids crossing through a large section of an ODNR-mapped rare habitat (beech-sugar maple forest), minimizes the crossing length through a conservation property owned by the Boy Scouts of America, avoids at least one stream crossing, and minimizes the area of upland and wetland forested conversion required for the Project. The incorporated variation collocates the route's stream, wetland and conservation land crossings with existing pipeline corridors (*see* Figure 10.6.1-40).

MP 109.0: This route variation was incorporated to avoid two barns that would have been proximal to the original alignment. Due to landscape and residential development, there are unavoidable wetlands and stream crossings in this vicinity, however the incorporated variation appears to maintain consistent wetland and stream crossing widths as the original alignment. The variation reduces the crossing length through a FEMA-mapped floodplain by approximately 290 feet (*see* Figure 10.6.1-42).

MP 114.2: This route variation was incorporated to avoid an active private shooting range. The incorporated variation has consistent natural resource crossing distances as the original alternative, albeit, with a slightly wider crossing of FEMA-mapped floodplain (*see* Figure 10.6.1-45).

MP 127.1: This route variation was incorporated to allow a safer, more constructible right-angle crossing of Interstate-90; the incorporated variation was also designed to cross Interstate-90 at a lower elevation than the original alternative. The incorporated variation has consistent natural resource crossing lengths as the original alternative (*see* Figure 10.6.1-48).

MP 134.5: This route variation was incorporated to avoid property owned by a wastewater management facility (the property has various test wells within its boundaries). The incorporated variation also avoids paralleling a large stream for approximately 830 feet, and reduces wetland crossing distance compared to the original alternative (*see* Figure 10.6.1-49).

MP 148.8: This approximately 0.9-mile variation avoids crossing through approximately 1,365 feet of a Black Swamp Conservancy easement property. The incorporated variation crosses one additional small stream than the original alternative, but avoids paralleling another small stream for approximately 1,164 linear feet and avoids several houses in the vicinity of the alignment. The incorporated variation also avoids crossing approximately 170 feet of FEMA floodplain (*see* Figure 10.6.1-52).

MP 150.1: This route variation was incorporated to avoid crossing through approximately 1,740 feet of a Black Swamp Conservancy easement property (*see* Figure 10.6.1-53).

MP 175.9: This route variation was incorporated to provide a right-angle approach and crossing for the proposed HDD under the Maumee River. West of the river, the route shifts from the original alternative to the south, avoiding approximately 1,100 linear feet of forested wetland by crossing through existing cleared fields. The incorporated variation also avoids traversing within 100-feet of a pond and residential subdivision access road (*see* Figure 10.6.1-60).

MP 178.0: This route variation was incorporated to provide a right-angle approach and crossings for Highway 24 and Hertzfeld Road. Based on desktop analysis, the variation has consistent natural resource crossing lengths as the original alternative (*see* Figure 10.6.1-61).

MP 181.0: This route variation was incorporated to avoid field-confirmed OEPA Category 3 wetlands, several possible road lays, the Town of Swanton, and relocates the proposed pipeline further west of the Oak Openings Preserve Metro Park (approximately 3.6 miles); Growing Hope Farms and Johnson Fruit Farms. NEXUS responded to concerns raised by managers of Growing Hope Farms, a facility/community for people with autism and Johnston Fruit Farm, growers of specialty crops and with a petting zoo as further described in Draft Resource Report 8.

The original pipeline route traversed the southwestern corner of Growing Hope Farms' property and crossed through a portion of the Johnston Fruit Farm planted with fruit trees. The minor route variation at MP 181.0 shifted the pipeline route approximately 0.9 miles to the west of the original alignment in this area; the reroute avoids both the Growing Hope Farms and the Johnston Fruit Farms. This route variation supersedes the Maumee State Forest major route alternative filed by NEXUS in January of 2015 which proposed a pipeline route approximately 2.4 miles southwest of the Oak Openings Preserve. This variation increases the length of forested wetlands crossed by 702 feet, but decreases the amount of emergent/shrub wetland by 2,219 linear feet, crosses fewer waterbodies than the current route, reduces Maumee State Forest crossing distance by 0.11 miles, and reduces forested upland crossed by 4,226 linear feet (*see* Figure 10.6.1-62).

MP 191.9: This route variation deviates from the powerline corridor in order to shift the alignment further away from several homes and yards. This incorporated variation was also devised to create a right-angle crossings of a stream and an active railroad, and to avoid an existing electrical substation. The

incorporated variation route also avoids 944 linear feet of forested upland crossing as compared to the original alternative (*see* Figure 10.6.1-63).

MP 208.8: This route variation was incorporated to avoid forested floodplain wetlands adjacent to the River Raisin. The incorporated variation also provides a right-angle crossing at the River Raisin and the adjacent Beamer Road (*see* Figure 10.6.1-69).

MP 231.2: This route variation was incorporated to reduce the amount of forested wetland and floodplains crossed adjacent to the Saline River and shifts the proposed pipeline further from residences (*see* Figure 10.6.1-74).

MP 246.1: This route variation was incorporated to avoid crossing through an existing junkyard. There do not appear to be any natural resources in the vicinity of the route in this location (*see* Figure 10.6.1-79).

10.6.2 Route Variations Eliminated from Further Consideration

The following sections provide a summary of route variations identified by NEXUS that were analyzed but ultimately eliminated from consideration into the proposed pipeline route. Variations were generally eliminated because they did not achieve a need (e.g., landowner or environmental impact avoidance); were not feasible from an engineering standpoint; created additional impacts to lands, landowners or natural resources than the original route; or they unnecessarily or unreasonably increased the length or complexity (i.e., number of angles) of the proposed mainline pipeline. Additionally, as outreach and fieldwork has identified further constraints and opportunities, many of the proposed variations were ultimately rendered unnecessary by variations implemented in the same areas for other reasons. Table 10.6-2 (*see* Tables section) summarizes all of the minor route variations that were eliminated from further consideration and the reasons for their elimination. Figures depicting these minor route variations are included as Figures 10.6.2-1 through 10.6.2-54 and are organized by starting MP (*see* Figures section).

MP 2.1: This route variation was reviewed as a result of a request by a landowner to shift the alignment further from a residential structure, to minimize tree clearing and to avoid utilities. However, the proposed shift would have increased wetland crossing distance by 550 feet and overall alignment length by approximately 349 feet (*see* Figure 10.6.2-2). Avoidance of the structure was achieved through the incorporated route variation at MP 2.4 described in Table 10.6-1.

Former Alignment South of MP 51.4: This variance was designed to shift alignment further from residences; however it would have added approximately 1,155 feet to the alignment, crossed four more waterbodies, 1,400 linear feet more upland forest and 1,016 linear feet more forested wetland than the current alignment (*see* Figure 10.6.2-7)

Former Alignment North of MP 53.7: This route variation was reviewed as a result of a request by a landowner to avoid stand of mature, native trees; the designed variation would have crossed approximately 1,490 additional linear feet of forested area and would add approximately 1,425 feet to the overall alignment length (*see* Figure 10.6.2-9). Avoidance and minimization of the constraints in this area was achieved by incorporating the reroute at MP 53.0 described in Table 10.6-1.

MP 61.1: This route variation was reviewed to avoid potential constructability concerns for an HDD under Interstate 71. The proposed variation would have crossed approximately 1,388 more linear feet of wetland and would have crossed a portion of Hubbard Valley Park (2,560 linear feet). After further evaluation, NEXUS determined that a road bore would be a preferable solution for this area and the variation was eliminated from further consideration (*see* Figure 10.6.2-14).

MP 64.4: This route variation was reviewed as a result of a request by a landowner to shift alignment off their property completely. The variation would have crossed additional forested wetland and upland areas

and an additional intermediate waterbody crossing compared with the existing alignment. The variation was eliminated from further consideration due to the increased impacts (*see* Figure 10.6.2-15).

MP 70.0: This route variation was reviewed to avoid pipeline installation parallel to a stream and to reduce temporary wetland impacts. The proposed variation would have increased forested upland crossing distance by over 1,000 linear feet in an area mapped as potential protected bat habitat, and was eliminated from further consideration due to the increased impacts (*see* Figure 10.6.2-16).

Former Alignment North of MP 88.4: This route variation was reviewed as a result of a request by a landowner to avoid empty parcels on which he has plans for future residential development. However, because the alignment in this area was shifted to relocate the pipeline construction area away from an eagle nest in this vicinity it was eliminated (*see* Figure 10.6.2-20). Avoidance of this area was achieved by incorporating the reroute at MP 88.4 described in Table 10.6-1.

Former Alignment Northeast of MP 106.4: This route variation was reviewed to avoid and minimize forested wetland crossing distance (*see* Figure 10.6.2-22). This variation was eliminated from further consideration following the incorporation of the variation at MP 100.6 described in Table 10.6-1.

MP 110.2: This route variation was reviewed to shift the alignment further from a residence and garage; however avoidance of this area was achieved through incorporation of the variance at MP 110.3 described in Table 10.6-1 (*see* Figure 10.6.2-25).

MP 159.2: This route variation was reviewed as a result of a request by a landowner to reroute the alignment off their property. The designed variation would cross more forested area and more residential lawns than the originally proposed alignment and would cross within 50-feet of two residential structures (*see* Figure 10.6.2-32).

Former Alignment Northeast of MP 174.4: This route variation was reviewed as a result of a request by a landowner to shift the alignment further from residence; the design variation would have added approximately 78 linear feet to the alignment (*see* Figure 10.6.2-36). This variation was rejected due to design of a preferable variation at MP 173.9 described in Table 10.6-1.

MP 241: This route variation was reviewed to determine feasibility of shifting the proposed alignment further from an elementary school, two densely populated neighborhoods, a church, and a cemetery; the variation would have included significant constructability issues associated with infrastructure constraints with street lay(*see* Figure 10.6.2-36). The variation was eliminated in favor of the preferable variation at MP 241.0 described in Table 10.6-1.

10.6.3 Route Variations Under Evaluation

The following sections provide a summary of route variations that the FERC requested NEXUS evaluate in its March 24, 2014 *Comments on Draft Resource Reports 1 and 10* and a route variation that was requested by stakeholders. These route variations are shown on Figures 10.6.3-1 through 10.6.3-4 and are organized by starting MP (*see* Figures section). In addition, NEXUS continues to evaluate additional route variations to address landowner and stakeholder requests, FERC requests, findings from ongoing archeological and environmental site inspections, and engineering and constructability constraints. NEXUS continues to coordinate with the stakeholders with respect to developing appropriate route variations and will provide the FERC with additional alignment revisions.

MP 30.2: NEXUS evaluated this route variation to minimized proximity to residential structures in the vicinity of Dotwood Road, an existing electric utility corridor, the Green Soccer Association soccer fields, and Portage Lakes Career Center. This route variation deviates from the proposed route at approximate MP 30.2 in Stark County, Ohio, heads southwest and then generally west through mainly agricultural, forested and open land, and extends into Summit County, Ohio; the total alternative route length is

approximately 7.9 miles. It rejoins the proposed route at MP 37.2 in Summit County (*see* Figure 10.6.3-1). The route variation increases the total pipeline length by 0.9 miles.

Numerous utilities including gas pipelines, storm water drains, sewer lines, forced water mains, cable, and phone utilities, were identified under and adjacent to Dotwood Road by civil survey crews along the proposed route from MP 31.7 –MP 32.2. The presence of these utilities makes the proposed street lay unconstructible. The proposed route variation enters an electric transmission line corridor to the west of Dotwood Road at MP 32.2 and runs between two FirstEnergy transmission lines to MP 33.4. Preliminary discussions with FirstEnergy indicate that the utility will not allow the NEXUS pipeline to be installed between their utility lines in this area. The proposed route crosses approximately 90 feet to the south of the Green Soccer Associated soccer fields, which are located on the Portage Lakes Career Center property at MP 35.6. The career center building is located approximately 660 feet to the north of the pipeline construction workspace. NEXUS has received comments from the City of Green and the Portage Lakes Career Board of Education regarding their opposition to the currently proposed pipeline location. In accordance with the FERC's pre-filing process, NEXUS is committed to continuing review this alternative route and working with stakeholders to accommodate their concerns. See Section 8.2 of Draft Resource Report 8, Existing Land Uses in the Project Area, for more information on the Portage Lakes Career Center. Other constraints associated with the proposed route include close proximity to residential structures, potential archaeological sites, and wetland and waterbody crossings.

The Dotwood Road and Green Soccer Fields Alternative route variation avoids: Dotwood Road; traversing an area between two FirstEnergy transmission lines; the Green Soccer Association soccer fields; and the Portage Lakes Career Center property. While the route variation passes through residential areas, most notably across Bletchley Avenue, the alternative route is feasible and constructible. The currently proposed route variation passes in very close proximity to two residential structures and a pond on/adjacent to Bletchley Avenue; this location will be crossed by an HDD, thereby minimizing residential and environmental impacts in this area.

The primary environmental advantages of this route variation are that it minimizes affects to potential archaeological sites, wetlands and waterbodies. This variation reduces potential effects on cultural resources, wetlands crossed by nearly 3,000 feet, and waterbodies crossed by six. The two documented historic structures are not evident from desktop aerial photography review; they may be still standing and obscured by vegetation or they may have been demolished. The primary engineering advantages of this route variation are that it provides a constructible route, it reduces the number of residential structures within 50 feet of the temporary construction ROW by 43, reduces the amount of residential land crossed by approximately 2,000 feet and commercial/industrial land by approximately 1,300 feet. The primary environmental disadvantage of this route variation is that it crosses approximately 9,700 additional feet of forested land than the proposed route. The route variation adds a 1,210-foot crossing of Singer Lake Preserve (entirely within an actively cultivated field), which is not crossed by the proposed route. See Section 8.2 of Draft Resource Report 8, Existing Land Uses in the Project Area, for more information on the Singer Lake Preserve.

NEXUS is still evaluating opportunities to refine this route variation to minimize potential landowner, cultural resource, wetland, and waterbody impacts. The current alternative route also traverses a segment of the Akron-Canton Airport. NEXUS will work with airport officials to ensure the siting of the pipeline does not interfere with airport operations. NEXUS will include an updated version of the pipeline route in this area its Certificate Application to be filed in November of 2015.

MP 63.0: NEXUS evaluated the Chippewa Lake Route Variation to address landowner and other stakeholder comments and to determine if an alternative route could avoid or minimize impacts on the Medina County Sanitary Engineer's water tower at the corner of Ryan Road and Chippewa Road, the Medina County Highway Engineer's Facility, the Medina County Home, and several neighborhoods

including Hidden Acres, Hunter's Run, Summerset Woods, Summer Ridge, and headwaters of Buck Creek, which feeds the Muskingum Conservancy Water District Structure II-A. The Chippewa Lake Route Variation is located in Media County, Ohio and deviates from the proposed route at MP 63.0. It heads in a northwesterly direction for approximately 5.9 miles and would cross a combination of open, agricultural, and forest land. It rejoins the proposed route at MP 68.7 (*see* Figure 10.6.3-2). The route variation would increase the total pipeline length by 0.2 miles.

Based on a preliminary desktop review of resources, the Chippewa Lake Route Variation would cross approximately 0.7 miles of Buckeye Woods Park and 0.01 mile of the Chippewa Rail Trail, affect archaeological sites, and cross wetlands and waterbodies. The primary environmental and engineering disadvantage of this route variation is that it crosses a large, potential Category 3 forested wetland within Buckeye Woods at the northwestern end of the route. This area would likely need to be crossed by HDD, which would modify the current construction methodology resulting in a cost of $13.3 million to construction this route variation. Furthermore, there is a mine located to the north of the potential Category 3 wetland which constrains the route variation. The route variation increases the amount of Buckeye Woods Park crossed by over 1,600 feet, crosses significantly more forested wetland than the proposed route (approximately 2,300 feet) and crosses seven additional archaeological sites over the proposed route. The primary environmental advantage of the route variation is that it crosses seven less waterbodies than the proposed route, avoids crossing a parcel which is protected by the Western Reserve Land Conservancy, and avoids crossing within 50 feet of the construction workspace of the Project of eight residential structures. Based on the increased environmental impacts and high construction costs, this route variation was not incorporated into the Project.

MP 88.0: NEXUS evaluated this route variation to minimize impacts on a bald eagle nest and walking paths in the vicinity. The Eagle Nest Variation is located in Lorain County, Ohio and deviates from the proposed route at MP 88.0. It heads in a westerly, then northwesterly direction for approximately 1.9 miles and crosses predominantly agricultural land. It rejoins the proposed route at MP 89.9 (*see* Figure 10.6.3-3).

The originally proposed route passed within approximately 400 feet of the bald eagle nest. Figure 10.6.3-3 shows buffer zones around the nest. The various buffer zones surrounding the nest site have different activity restrictions based on USFWS bald eagle management guidelines. Generally, pipeline clearing and construction operations typical for pipelines are restricted during the nesting period within 660 feet of an active nest. Certain activities such as blasting, or perhaps an HDD-type activity, are generally restricted within ½ mile during the nesting season. To avoid a time-of-year restriction typical for general clearing and construction, NEXUS developed this route variation to move the pipeline and associated workspace outside the 660-foot radius. This route variation has been incorporated into the route. Additional consultation with the USFWS will be conducted to determine construction requirements in this area, as the restrictions are subject to change on a site-specific basis as determined by USFWS.

This route variation also avoids a Lorain County Metro Parks tract, OH-LO-132.0000-SC, which contains a state- and federally-protected wetland mitigation site, which was crossed by the original route.

MP 92.9: NEXUS evaluated this route variation to avoid potential affects in the vicinity of an existing Girl Scout Camp and a Boy Scout Camp. The Girl Scout Camp Variation is located in Lorain County, Ohio and deviates from the proposed route at MP 92.9. It heads in a west, then northwesterly direction for approximately 9.9 miles through predominantly agricultural fields and rejoins the proposed route at MP 102.3(*see* Figure 10.6.3-4). The route variation increases the pipeline length by approximately 0.6 miles.

In addition to avoiding the camps, the primary environmental advantages of the Girl Scout Camp Variation are that it reduces wetland impacts by approximately 2,200 feet (most of which is a reduction to

forested wetland) and total forested crossing length by approximately 7,800 feet, compared to the proposed route. The route variation would also avoid three archaeological sites which are crossed by the proposed route. The primary environmental disadvantage is that the route variation crosses two more streams than the proposed route. Both routes have potential for deeply buried alluvial deposits.

NEXUS is continuing to investigate refinements to this route variation to minimize landowner, archaeological, wetland, and waterbody impacts.

10.7 Aboveground Facility Alternatives

NEXUS has conducted engineering evaluations to determine optimal siting and layout for aboveground facilities located along the Project route. The following sections describe the aboveground facilities siting process conducted to date.

10.7.1 Compressor Station Alternatives

NEXUS completed a hydraulic analysis to determine the optimum horsepower and compression to transport the new volumes of natural gas necessary to meet market demand and to accommodate the NEXUS Purpose and Need. The hydraulic analysis identified the need for up to four new compressor stations, all of which would need to be located in Ohio. The initial priority for finding suitable compressor station sites was to identify available, suitably-sized parcels of land located adjacent or close to the proposed Project mainline pipeline. The following site design considerations also influenced the analyses for finding acceptable sites for the new compressor stations:

- Pipeline Design: Compressor station sites were initially selected to be as evenly spaced along the mainline route as practical (i.e., approximate 60 mile intervals), taking into account system hydraulics, site availability and suitability, and proximity to sensitive land use or receptors.
- Land/workspace Requirements: Undeveloped parcels totaling approximately 40 acres or larger were prioritized for evaluation to accommodate the construction and operation of new compressor station facilities.
- Engineering, Design and Construction: Several engineering, design and construction factors were evaluated for selection of suitable sites, including property configuration (to maximize distance from adjacent properties), topography (parcels featuring relatively flat topography were preferred), and access to electric utilities and water supply.
- Road Access: NEXUS sought to maximize proximity of the new compressor station sites to existing public roads, thereby minimizing the need for new access roads, as well as minimizing the need for modifications or improvements to existing roads.
- Interconnecting Pipe: To minimize potential impacts on the surrounding community, the siting analysis favored properties closest to the proposed ROW so that they would minimize the need for suction and discharge piping or an extension of the mainline. This approach also minimizes the land requirements for the Project, thereby minimizing the number of affected property owners and potential environmental impacts.
- Land Use: Rural, agricultural, and/or undeveloped settings were preferred, since the landowners in these areas typically own multiple properties or large tracts of land.
- Environmental Effects: An initial evaluation of environmental resources was completed for each site based on a review of the project-specific GIS data generated from publically-available state and federal GIS datasets, including recently flown aerial photography, Lidar topographic contours, conservation land datasets, USGS/NHD/NWI mapping, and NRCS soils mapping. In addition, publicly available literature on environmental resources in the vicinity of each site was

reviewed and incorporated. Several factors were evaluated and compared for each potential site including:

- Existing Land Use: a comparison of the land use on each of the sites was completed, which included the following land use categories: forested, agricultural, open land, open water, residential, and commercial/industrial;
- Water Resources: the locations of major, intermediate, and minor waterbodies; presence of designated fisheries or natural and scenic rivers; and presence and type of wetlands on site were compared;
- Public and Private Properties: the proximity to residential or public lands and other Noise Sensitive Areas ("NSA"); e.g., schools, churches, nursing homes, etc., was evaluated;
- Protected Habitat: the potential for each site to provide critical habitat or habitat for federal and/or state-listed threatened or endangered species, based on lists of protected species and species of concern provided by state and federal agencies was identified; and
- Cultural or Historic Resources: each potential compressor station site was reviewed by the designated Cultural Resources Principal Investigator for the NEXUS Project to determine the likelihood of occurrence of historic or prehistoric cultural resources.

Following the desktop-level review, NEXUS performed a more in-depth analysis of the preferred alternative sites, including coordination with landowners to obtain field survey access. Following coordination with landowners, NEXUS performed detailed environmental resource field surveys including wetland and waterbody field delineations, land use cover-type mapping, and preliminary engineering evaluations including construction access, proximity to existing utilities, and topographic assessments. These sites were also reviewed for potential cultural resources. Table 10.7.1-1 provides a comparison of the NEXUS compressor station alternatives, which are further described below. Following detailed evaluations of alternative compressor station sites, NEXUS selected the preferred sites because they were deemed the least environmentally damaging practicable alternatives that meet the Project Purpose and Need, with landowners willing to allow survey access and enter into negotiations with NEXUS. Following receipt of landowner permission, NEXUS also performed Phase I Environmental Site Assessments for the proposed compressor station sites to determine if historic land uses, including farming, may have resulted in contamination. Results of all four Phase I ESAs indicated no reportable environmental conditions.

10.7.1.1 Hanoverton Compressor Station - CS 1 (Columbiana County)

Following the protocol described above, five site alternatives were evaluated for the Hanoverton Compressor Station - Compressor Station 1 ("CS1"). Following initial review, two of the sites were eliminated from consideration due to limiting property size or configuration and three alternatives were analyzed further to determine a proposed site. The currently proposed compressor station site (Alternative 1) and the two alternatives are discussed below and depicted in Figure 10.7.1-1; Table 10.7.1-1 provides a comparative analysis of the three final alternatives evaluated for the Hanoverton Compressor Station.

CS1 Alternative Site 1 (MP 1.25) – Currently Proposed Alternative

CS1 Alternative Site 1 is an approximately 116-acre parcel of land that intersects with the NEXUS mainline pipeline route at approximate MP 1.25. The property is located northeast of the intersection of State Highway 644 and Mechanicstown Road, in Hanover, Ohio. Existing land use within the proposed site is primarily agriculture (hayfields) with a small area of upland, hardwood forest on the northeastern boundary and small inclusions of forested and non-forested wetland. Preliminary engineering design suggests that the compressor station could be sited to avoid the forest and wetlands; however siting may

require significant grading to construct compressor station facilities. CS1 Alternative Site 1 has public road access, access to existing electric utilities, is located in close proximity to the proposed pipeline, and has a landowner who has shown initial willingness to discuss placement of a compressor station on this property.

CS1 Alternative Site 2 (MP 3.14)

CS1 Alternative Site 2 consists of an approximately 38-acre parcel located northeast of the NEXUS mainline alignment at approximate MP 3.14 in the Town of Hanover, Ohio. At its closest boundary, CS1 Alternative Site 2 is located approximately 200 feet north of the mainline alignment, on the opposite side of Buffalo Road. A new road crossing and a currently indeterminate length of mainline extension or suction discharge lines would be required for this site. Current land use on CS1 Alternative Site 2 is primarily agricultural (corn and pasture/hay) with a small section of upland, hardwood forest on the northwestern corner of the site. No wetlands or streams were identified during field review on this property. This alternative is smaller than the other potential CS1 sites, and the majority of the site is unscreened and visible from Buffalo Road. Preliminary engineering review indicates that due to topographic relief on this site, approximately 20 feet of cut-and-fill would be required to prepare the site for station construction. Additionally, no sources of municipal water were noted in the area, thus a new water well may be required for this alternative.

CS1 Alternative Site 3 (MP 3.25)

CS1 Alternative Site 3 consists of portions of four parcels, totaling approximately 55 acres located southwest of the NEXUS mainline alignment at approximate MP 3.25. CS1 Alternative Site 3 is located in the Town of Hanover. No wetlands or streams were identified during field review on this property. CS1 Alternative Site 3 will require a road crossing of Buffalo Road and approximately 140 feet of mainline extension or suction discharge lines to achieve connection with the alignment at its closest point. Due to the rolling nature of the topography of this alternative site, costly site grading would be necessary to construct proposed compressor station facilities. Land use on CS1 Alternative Site 3 is primarily agricultural (corn and pasture/hay) with three small areas of mature, hardwood forest (including two forested valleys in the field and a small strip of trees between the field and Buffalo Road). Access and development of the pipeline connection for this site would require removal of a section of the forested land between Buffalo Road and the open fields. Clearing mature forest in this area may require additional review by NEXUS as this area of Ohio is mapped by the USFWS as potential habitat for the northern long-eared bat ("NLEB") (*Myotis septentrionalis*), a species proposed for listing under the federal Endangered Species Act. NLEB may roost in mature trees within their home range, however, it is unlikely that the limited clearing associated with development of CS1 Alternative Site 3 would result in significant or adverse modifications to potential NLEB forested habitat. CS1 Alternative Site 3 has public road access, access to existing electric utilities, is in close proximity to the proposed pipeline, and has a landowner who has shown initial willingness to discuss placement of a compressor station on this property.

Hanoverton Compressor Station Alternatives Analysis Conclusions

Of the three remaining alternative sites evaluated for the Hanoverton Compressor Station, Alternative Site 1 was determined to be the proposed alternative because the existing land use within the proposed site is primarily agriculture (hayfields) with a small area of upland, hardwood forest along the northeastern and northwestern boundaries and small inclusions of forested and non-forested wetlands. Based on preliminary engineering designs (*see* Map 1 of 4 in Appendix 1A – Volume IV), the proposed compressor station facilities can be sited on this property to avoid both the existing forest and wetlands, although grading will be necessary due to existing topography. In addition, this site has good public road access, access to existing electric utilities, is located in close proximity to the proposed pipeline, and has a

landowner who has shown initial willingness to discuss placement of a compressor station on this property.

10.7.1.2 Wadsworth Compressor Station – Compressor Station 2 (Medina County)

In accordance with the process for analyses discussed in Section 10.7.1, eight sites were initially analyzed for Compressor Station 2 ("CS2"). Access permission for field surveys was denied for four of the alternative sites and these were removed from further consideration. A fifth site was dismissed because it was located very close to Buckeye Woods Park and on a busy public road. It was determined that the potential for noise and visual impact concerns was prohibitive at this location. The three remaining alternatives were analyzed further, and a proposed site was chosen. The currently proposed CS2 location and the two alternatives are discussed below and are depicted in Figure 10.7.1-2. Table 10.7.1-1 provides a comparative analysis of the three remaining alternatives evaluated for the Wadsworth Compressor Station and Map 2 of 4 (*see* Draft Resource Report 1, Appendix 1A – Volume IV) for the Site Plan for the Wadsworth Compressor Station showing the preliminary engineering design and facilities layout at the proposed site.

CS2 Alternative Site 1 (MP 60.1) – Currently Proposed Alternative

CS2 Alternative Site 1 is an approximately 75-acre parcel that intersects with the NEXUS mainline alignment at approximate MP 60.1. CS2 Alternative Site 1 is located east of Guilford Road and north of Route 76, in Guilford, Ohio. Existing land use within the site is primarily agriculture (hayfields) with a small area of mature, hardwood forest and two small wetlands on the eastern property boundary. Preliminary design suggests that the compressor station could be sited to avoid the forest and wetlands on the property. The proposed location has good public road access, access to electric utilities, is proximal to the pipeline alignment, and it has a landowner who has shown initial willingness to discuss placement of a compressor station on this property. There is currently a home and barns on the western boundary of the property adjacent to Guildford Road, however there are few homes in the area adjacent to Guilford Road.

CS2 Alternative Site 2 (MP 61.8)

CS2 Alternative Site 2 consists of an approximately 59-acre parcel that intersects with the NEXUS mainline alignment at approximate MP 61.8. The site is east of Guilford Road in the Town of Guilford, Ohio. There is no existing access to CS2 Alternative Site 2 and there are three houses located between the site and the nearest road. Land use on the CS2 Alternative Site 2 is primarily agricultural (row crops and pasture/hay) with a large component (approximately 22 percent of the entire property) of mature, hardwood forest on the northwest and northeast corners of the property. Preliminary engineering design and layout of facilities on this site are in the early stages of development. It is currently unknown if forest clearing would be necessary to build the compressor station at this site.

CS2 Alternative Site 3 (MP 62.9)

CS2 Alternative Site 3 consists of an approximately 36-acre parcel that intersects with the NEXUS mainline alignment at approximate MP 62.9. The site is north of Good Road and just west of Interstate 71 in the Town of Montville, Ohio. There is existing access to CS2 Alternative Site 3 via Good Road. Land use on the Alternative Site 3 is primarily agricultural (pasture/hay) with a small component of upland, hardwood forest on the northeast corner of the site. A large stream runs along the western border of the site, adjacent to the existing gravel access road. Additionally, the site has undulating topography, and construction of a compressor station at this location would require earth work and grading. There does not appear to be a municipal water supply in this area, and there is limited accessibility to electricity at this alternative site.

Wadsworth Compressor Station Alternatives Analysis Conclusions

Of the three remaining alternative sites evaluated for the Wadsworth Compressor Station, Alternative Site 1 was determined to be the proposed site because the existing land use within the site is primarily agriculture (hayfields) with an area of mature, hardwood forest and two small wetlands located in the eastern portion of the property. Preliminary engineering designs indicate the proposed compressor station facilities could be sited to avoid the forest and wetlands in the eastern side of the property (*see* Map 2 of 4, Draft Resource Report 1 Appendix 1A – Volume IV). This proposed location also has good public road access, access to electric utilities, is proximal to the pipeline alignment, and it has a landowner who has shown initial willingness to discuss placement of a compressor station on this property.

10.7.1.3 Clyde Compressor Station – Compressor Station 3 (Erie and Sandusky Counties)

Four alternative sites were analyzed for Compressor Station 3 ("CS3"). One of the sites did not provide adequate setback from property lines to facilitate construction of the compressor station. Three remaining alternatives were analyzed further, and a proposed site was chosen. The currently proposed CS3 location and the two alternatives are discussed below and are depicted in Figure 10.7.1-3. Table 10.7.1-1 provides a comparative analysis of the three remaining alternatives evaluated for the Clyde Compressor Station.

CS3 Alternative Site 1 (MP 124.2)

CS3 Alternative Site 1 is an approximately 54-acre parcel that intersects with the NEXUS mainline alignment at approximate MP 124.2. The site is west of Billings Road and north of Interstate-80/90 in the Town of Groton, Erie County, Ohio. Existing land use on the site is primarily agriculture (corn) with a small area of residential property (a farmhouse, barn and yard) on the western boundary of the site along Billings Road. There are currently two existing pipelines that traverse this site to the south, parallel with Interstate-80/90, and there is existing access to electric utilities. Mill Creek, a small perennial channel, abuts this site along the western property boundary. Preliminary engineering design indicates that the proposed compressor station could avoid the stream. However, the FEMA-mapped floodplain of Mill Creek extends across most of CS3 Alternative Site 1. CS3 Alternative 1 has good public road access, is proximal to the pipeline alignment, has been developed for pipeline corridors in the past, and it has a landowner who has shown initial willingness to discuss placement of a compressor station on this property.

CS3 Alternative Site 2 (MP 127.0)

CS3 Alternative Site 2 consists of an approximately 68-acre parcel that intersects with the NEXUS mainline alignment at approximate MP 127.0. The site is west of Northwest Road and north of Interstate-80/90 in the Town of Townsend, Sandusky County, Ohio. CS3 Alternative Site 2 intersects the pipeline alignment and access would be via Northwest Road. Current land use of the property is agriculture (corn and other row crops). The landowner of this parcel has rejected permission to access the property and is currently unwilling to negotiate a potential option with NEXUS.

CS3 Alternative Site 3 (MP 129.3) – Currently Proposed Alternative

CS3 Alternative Site 3 consists of an approximately 60-acre assemblage of three parcels that intersects with the NEXUS mainline alignment at approximate MP 129.3. The site is east of County Road 302 and south of Interstate 80/90 in the Town of Townsend, Sandusky County, Ohio. Based on site visits, there are no streams or wetlands on CS3 Alternative Site 3. Current land use of the property is agriculture (soybeans). There is good access to this site, it is relatively level and the landowners of this site have granted survey permission and have shown initial willingness to discuss placement of a compressor station on this property.

Clyde Compressor Station Alternatives Analysis Conclusions

Of the three remaining alternative sites evaluated for the Clyde Compressor Station, Alternative Site 3 was determined to be the proposed site because existing land use within the site is entirely agricultural (soybeans) and there is no forested land or protected wetlands or waterbodies that would be impacted by construction and operation of a compressor station (*see* Map 3 of 4, Draft Resource Report 1 Appendix 1A – Volume IV). In addition, there is good existing road access to this site, it is relatively level and the landowners of this site have granted survey permission and have shown initial willingness to discuss placement of a compressor station on this property.

10.7.1.4 Waterville Compressor Station – Compressor Station 4 (Lucas County)

Three alternative sites were analyzed for Compressor Station 4 ("CS4"). Following initial desktop review, these alternatives were analyzed further and a proposed site was chosen. The currently preferred CS4 site and the two alternatives are discussed below and are depicted in Figure 10.7.1-4. Table 10.7.1-1 provides a comparative analysis of the three remaining alternatives evaluated for the Waterville Compressor Station.

CS4 Alternative Site 1 (MP 177.7 – south side of alignment)

CS4 Alternative Site 1 is an approximately 40-acre parcel intersects with the NEXUS mainline alignment at approximate MP 177.7. The parcel is located at the southern end of an undeveloped, cul-de-sac named Moosman Drive. The site is west of US-24 in the Town of Waterville, Ohio. Existing land use within the proposed site is agriculture (corn). A ditched stream (named "Whitmeir Ditch") runs through a portion of the site, but preliminary design suggests that the compressor station can be sited to avoid this feature; however a pipeline extension would need to be constructed across the stream to reach CS4 (there is an existing box culvert crossing over the stream within the field). Preliminary analyses indicate municipal water is not available in the immediate vicinity of this site, therefore, a new water well may need to be installed if this site is selected. This site has good road access, access to electric utilities, is proximal to the pipeline alignment, and it has a landowner who has shown initial willingness to discuss placement of a compressor station on this property.

CS4 Alternative Site 2 (MP 177.7 – north side of alignment) – Currently Proposed Alternative

CS4 Alternative Site 2 consists of two parcels, totaling approximately 38 acres that intersect with the NEXUS mainline alignment at approximate MP 177.7. CS4 Alternative Site 2 is located at the southern end of an undeveloped, cul-de-sac named Moosman Drive and west of US-24 in the Town of Waterville, Ohio (north of CS4 Alternative Site 1). Existing land use within the site is agriculture (soybeans). A ditched stream ("Whitmeir Ditch") runs along the western and southwestern boundary of the site, but preliminary engineering design suggests that the compressor station could be sited to avoid this feature. CS4 Alternative Site 2 has good road access, access to electric utilities, is bisected by the pipeline alignment, and it has a landowner who has shown initial willingness to discuss placement of a compressor station on this property.

CS4 Alternative Site 3 (MP 181.0)

CS4 Alternative Site 3 is an approximately 79-acre parcel that intersects with the NEXUS mainline alignment at approximate MP 181.0. The site is located south of Neapolis Waterville Road and west of Berkey Southern Road (OH-295), in the Town of Providence, Ohio. Land use on the CS4 Alternative Site 3 is primarily agricultural (soybeans and corn) with a component of wetland forest on the western boundary of the site (the forest makes up approximately 20 percent of the site). There is also an intermediate, perennial waterbody that flows across the northern end of the site. Access from Neapolis Waterville Road would need to cross this stream to access the proposed mainline pipeline and the larger portions of the property. The preliminary design is inconclusive thus far as to whether the compressor station could be sited to avoid the stream or upland and wetland forest on this site. CS4 Alternative Site 3

is proximal to the pipeline alignment, and it has a landowner who has shown initial willingness to discuss placement of a compressor station on this property. However, CS4 Alternative Site 3 has no existing access to the pipeline without crossing a stream or traversing another property along the pipeline alignment from the east.

Waterville Compressor Station Alternatives Analysis Conclusions

Of the three remaining alternative sites evaluated for the Waterville Compressor Station, Alternative Site 2 was determined to be the proposed site because the existing land use within the site is entirely agriculture (soybeans) and there is no forested land that would be impacted by construction and operation of a compressor station at this site (*see* Map 4 of 4, Draft Resource Report 1 Appendix 1A – Volume IV). There is one ditched stream ("Whitmeir Ditch") runs along the western and southwestern boundary of the site, but preliminary engineering design indicate that the compressor station could be sited to avoid this feature. This site also has good road access, access to electric utilities, is bisected by the pipeline alignment, and it has a landowner who has shown initial willingness to discuss placement of a compressor station on this property.

10.7.2 Metering and Regulation Stations, Mainline Valves, and Other Aboveground Facilities

Proposed metering and regulation station locations reflect customer and system requirements and are shown on the Project alignment sheets submitted as Appendix 1A to NEXUS Draft Resource Report 1. The locations of proposed mainline valves are spaced along the pipeline in accordance with the spacing requirements of 49 CFR Part 192, Transportation of Natural or Other Gas by Pipeline: Minimum Federal Safety Standards. The locations of new valve sites were selected based on their proximity to existing all-weather roads, which would be utilized for maintenance access during operations. Smart pigging facilities were sited for efficient testing and cleaning of the pipeline and are co-located with other aboveground facilities to the maximum extent practicable, to minimize effects on the natural and human environment. These aboveground facilities are depicted on both Project USGS Quadrangle Map Excerpts and Project Alignment Sheets submitted as Appendix 1A of Draft Resource Report 1. The placement of communications towers proposed by NEXUS is still being evaluated and will be sited based on detailed engineering considerations with a clear objective to avoid and minimize potential impacts to the extent practicable.

10.8 Future Considerations Regarding Alternatives

NEXUS has and will continue to engage in extensive landowner and public agency outreach in the siting of the proposed pipeline and associated aboveground facilities. NEXUS understands that as the Project moves forward in the public permitting process and the routing is examined more closely by affected parties, additional suggestions, and issues may be raised and additional alignment changes and changes to the siting of aboveground facilities may be proposed. In addition, market opportunities and potential customer demands could also influence the location of various Project facilities. NEXUS remains open to the consideration of such alternatives and will continue to investigate and evaluate viable alternatives.

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TABLES

TABLE 10.5-1

Comparison of the Southern Route Alternative with the Corresponding Segments of the Proposed Route

County, State	Alternatives by Milepost MP Environmental / Engineering Factors	Unit a/	Alternative Route	Proposed Route
Multiple, OH	**MP 1.5 – SOUTHERN ROUTE ALTERNATIVE ***			
	Pipeline Length/ROW Summary			
	MP to MP b/	MP	1.5 to 168.1	1.5 to 165.4
	Total Length	mile	166.57	163.87
	Parallel/Adjacent to Existing ROW+	mile	109.4	87.6
	Construction ROW (based on a 100-foot-wide ROW)	acre	2523.7	2482.8
	Permanent ROW (based on a 50-foot-wide ROW)	acre	1009.5	993
	Laterals Summary			
	Laterals Required	no.	4	0
	Total Length of Laterals	mile	61.2	0
	Total Construction ROW for Laterals (based on a 100-foot-wide ROW)	acre	741.8	0
	Total Permanent ROW for Laterals (based on a 50-foot-wide ROW)	acre	370.9	0
	Total Wetlands Crossed c/	no.	18	0
	Forested	no.	8	0
	Scrub Shrub	no.	2	0
	Emergent	no.	5	0
	Scrub Shrub/Emergent	no.	1	0
	Total Wetlands Affected d/	acre	13.7	0
	Total Waterbodies Crossed e/	no.	98	0
	Total Length of Waterbodies Crossed e/	LF	2,736.7	0
	Major Waterbodies >100 feet e/	no.	4	0
	Groundwater Resources f/	---	---	---
	Groundwater Wells	no.	0	0
	Sole Source Aquifers	no.	0	0
	Wellhead Protection Areas	no.	5	0
	Wildlife Habitat g/	---	---	---
	Forested Land	acre	44.6	0
	Geologic Hazards i/	---	---	---
	Faults	no.	0	0
	Areas of Potential Subsidence	mile	23.3	0
	Areas of High Landslide Potential	mile	0.5	0
	Environmental Factors *			
	Total Wetlands Crossed c/	no.	41	55
	Forested	no.	11	17
	Scrub Shrub	no.	3	5
	Emergent	no.	7	10
	Scrub Shrub/Emergent	no.	7	12
	Total Wetlands Affected d/	acre	15.1	28.5
	Total Waterbodies Crossed e/	no.	241	243
	Total Length of Waterbodies Crossed e/	LF	3,357	3,569
	Major Waterbodies >100 feet e/	no.	5	5
	Groundwater Resources f/	---	---	---

TABLE 10.5-1

Comparison of the Southern Route Alternative with the Corresponding Segments of the Proposed Route

County, State	Alternatives by Milepost MP Environmental / Engineering Factors	Unit a/	Alternative Route	Proposed Route
	Groundwater Wells	no.	0	0
	Sole Source Aquifers	no.	0	0
	Wellhead Protection Areas	no.	5	7
	Wildlife Habitat g/	---	---	---
	Forested Land	acre	302.6	364.5
	Designated Critical Wildlife Habitat	no.	0	0
	Known Endangered Species Critical Habitat	no.	0	0
	Waterfowl Production Areas	no.	0	0
	Wildlife Management Areas	no.	0	0
	Cultural Resources h/	---	---	---
	Listed National Register Historic Places Sites	no.	0	0
	Geologic Hazards i/	---	---	---
	Faults	no.	0	0
	Areas of Potential Subsidence	mile	50.2	43.8
	Areas of High Landslide Potential	mile	15.6	7.2
	Rugged Terrain j/	---	---	---
	Areas of Steep Slopes	mile	8.45	6.58
	Areas of Sidehill Construction	mile	24	16
	National and State Parks and Forests k/	---	---	---
	State	mile	0.026	0.218
	Federal	mile	0	0
	Public Lands or Conservation Lands Crossed l/	LF	3,461.45 ft	26,491.86 ft
	Land Ownership (100' corridor)	---	1,002 tracts / 167.87 mi	1,222 tracts / 160.13 mi
	Public Land	no./mile	17 tracts / 0.66 mi	42 tracts / 5.02 mi
	Private Land	no./mile	985 tracts / 166.43 mi	1,180 tracts / 115.11 mi
	Tribal Land	no./mile	0	0
	Residential Structures within 50 feet of Construction ROW m/	no.	33	167
	Road Crossings	---	---	---
	Total Roads Crossed n/	no	266	258
	Construction in Roadways	mile	8.27	5.72
	Bored Road Crossings	no.	186	224
	Open Cut Road Crossings	no.	80	34
	HDD Road Crossings	no.	16	7
	Railroads Crossed	no.	22	25
	Engineering Factors*			
	Existing Infrastructure Crossed	---	---	---
	Natural Gas	no.	81	76
	Oil	no.	2	1
	Products	no.	Unknown	Unknown
	Electric	no.	49 AG / Unknown UG	80 AG/ 6 UG
	Telecommunication	no.	Unknown	24
	Hydraulic Studies:	---	---	---
	Pipeline Length	mile	166.57	163.87
	Pipeline Diameter	inch	36	36
	Pipeline Pressure	psig	1440	1440

TABLE 10.5-1

Comparison of the Southern Route Alternative with the Corresponding Segments of the Proposed Route

County, State	Alternatives by Milepost MP Environmental / Engineering Factors	Unit a/	Alternative Route	Proposed Route
	MAOP	psig	1440	1440
	Population Density (high, medium, low)	---	---	---
	High	mile	1.99	4.36
	Medium	mile	2.45	10.25
	Low	mile	162.13	149.26
	USDOT Class Locations	---	---	---
	Class 1	mile	139.57	102.54
	Class 2	mile	16.13	39.44
	Class 3	mile	1.58	17.86
	Class 4	mile	N/A	N/A

NOTES: TBD = To Be Determined. AG = Aboveground. UG = Underground. N/A = Not Applicable.

a/ MP = mile post; no. = number of features crossed; LF = linear feet crossed; acre = acreage of area within estimated workspace generally a 100-foot-wide nominal construction right of way ("ROW"), except 75-foot-wide construction ROW in wetlands.

b/ Each alternative route has distinct mile-posting; these MPs do not necessarily correlate to the MPs of the currently Proposed Route.

c/ Number of wetlands crossed calculated by intersecting centerline with U.S. Fish & Wildlife Service ("USFWS") National Wetland Inventory ("NWI") data.

d/ Estimated acres of wetland impact is based on a 75-foot-wide-construction ROW in wetlands based on NWI data.

e/ Total number of waterbodies, length of waterbodies, and number of major waterbodies crossed calculated by intersecting centerline with National Hydrography Data ("NHD") waterbodies and from review of aerial photography and waterbodies identified on U.S. Geological Survey ("USGS") topographic maps.

f/ Public wells, surface water protection areas, and sole source aquifers were identified using publicly available datasets from the Ohio Environmental Protection Agency ("OEPA"), Division of Drinking and Ground Water and the Michigan Department of Environmental Quality ("MDEQ"), Statewide Groundwater Database. Data presented are based on resources encountered within a 300-foot area centered over the pipeline centerline.

g/ Wildlife Management Areas crossed by the pipeline centerline based on Ohio Department of Natural Resources ("ODNR") and Michigan Department of Natural Resources ("MDNR") publicly available datasets. Critical Habitat/Endangered Species Area based on USFWS datasets. Waterfowl protection areas based on WPA Mapper. Forested land acreage based on 100-foot-wide construction ROW.

h/ Total number of sites based on the National Register of Historic Places crossed within a 300-foot area centered over the propose pipeline centerline.

i/ Numbers and lengths of geologic hazards based on fault lines, karst geology, and number of earthquake epicenters occurring within a 300-foot area centered over the proposed pipeline centerline based on USGS and ODNR datasets.

j/ Rugged terrain crossed includes areas of steep slopes and sidehill construction based on USGS topographic maps within a 300-foot area centered on the proposed pipeline centerline.

k/ Length of crossings of national and state parks and forests based on Ducks Unlimited dataset intersecting the centerline.

l/ Length of public lands or conservation lands crossed based on datasets from Ducks Unlimited, Black Swamp Conservancy easement data, Western Reserve Land Conservancy Protection Properties, and ODNR Conservation Areas intersecting the centerline.

m/ Number of residential structures includes houses, garages and sheds within 50 feet of the proposed construction ROW i.e., 100 foot distance on both sides of the pipeline centerline based on review of aerial photography/LIDAR data.

n/ Number of roads crossed includes federal, state and local roads, but does not include driveways.

\+ Parallel/Adjacent to Existing ROW is classified as any utility within 200 feet of the project workspace.

* Does not include impacts associated with the laterals required for delivery of gas.

TABLE 10.5-2

Comparison of the City of Green Alternative with the Corresponding Segments of the Proposed Route

County, State	Alternatives by Milepost MP Environmental / Engineering Factors	Unit a/	Alternative Route	Proposed Route
Multiple, OH	**MP 1.8 – CITY OF GREEN ALTERNATIVE ***			
	Pipeline Length/ROW Summary	---	---	---
	MP to MP b/	MP	1.8 to 105.4	1.8 to 95.5
	Total Length	mile	103.6	93.7
	Parallel/Adjacent to Existing ROW+	mile	TBD	TBD
	Construction ROW (based on a 100-foot-wide ROW)	acre	1254.9	1090.0
	Permanent ROW (based on a 50-foot-wide ROW)	acre	627.4	566.6
	Laterals Summary			
	Laterals Required	no.	2	0
	Total Length of Laterals	mile	41.7	0
	Total Construction ROW for Laterals (based on a 100-foot-wide ROW)	acre	505.5	0
	Total Permanent ROW for Laterals (based on a 50-foot-wide ROW)	acre	252.8	0
	Total Wetlands Crossed c/	no.	15	0
	Forested	no.	5	0
	Scrub Shrub	no.	2	0
	Emergent	no.	3	0
	Scrub Shrub/Emergent	no.	2	0
	Total Wetlands Affected d/	acre	11.4	0
	Total Waterbodies Crossed e/	no.	91	0
	Total Length of Waterbodies Crossed e/	LF	2,814.1	0
	Major Waterbodies >100 feet e/	no.	5	0
	Groundwater Resources f/	---	---	---
	Groundwater Wells	no.	1	0
	Sole Source Aquifers	no.	0	0
	Wellhead Protection Areas	no.	5	0
	Wildlife Habitat g/	---	---	---
	Forested Land	acre	32.4	0
	Geologic Hazards i/	---	---	---
	Faults	no.	0	0
	Areas of Potential Subsidence	mile	0	0
	Areas of High Landslide Potential	mile	0	0
	Environmental Factors	---	---	---
	Total Wetlands Crossed c/	no.	13	43
	Forested	no.	3	11
	Scrub Shrub	no.	1	4
	Emergent	no.	4	10
	Scrub Shrub/Emergent	no.	4	11
	Total Wetlands Affected d/	acre	9.9	22.3
	Total Waterbodies Crossed e/	no.	173	163
	Total Length of Waterbodies Crossed e/	LF	4,014.5	1,863
	Major Waterbodies >100 feet e/	no.	7	1
	Groundwater Resources f/	---	---	---

TABLE 10.5-2

Comparison of the City of Green Alternative with the Corresponding Segments of the Proposed Route

County, State	Alternatives by Milepost MP Environmental / Engineering Factors	Unit a/	Alternative Route	Proposed Route
	Groundwater Wells	no.	0	0
	Sole Source Aquifers	no.	0	0
	Wellhead Protection Areas	no.	4	4
	Wildlife Habitat g/	---	---	---
	Forested Land	acre	307.2	267.9
	Designated Critical Wildlife Habitat	no.	0	0
	Known Endangered Species Critical Habitat	no.	0	0
	Waterfowl Production Areas	no.	0	0
	Wildlife Management Areas	no.	0	0
	Cultural Resources h/	---	---	---
	Listed National Register Historic Places Sites	no.	0	0
	Geologic Hazards i/	---	---	---
	Faults	no.	0	0
	Areas of Potential Subsidence	mile	0.6	0.09
	Areas of High Landslide Potential	mile	9.3	7.0
	Rugged Terrain j/	---	---	---
	Areas of Steep Slopes	mile	7	31.6
	Areas of Sidehill Construction	mile	3.4	12.7
	National and State Parks and Forests k/	---	---	---
	State	mile	0	0.22
	Federal	mile	0	0
	Public Lands or Conservation Lands Crossed l/	LF	17,265.85 ft	18,635.69 ft
	Land Ownership (100' corridor)	---	690 tracts / 101.03	830 tracts / 91.38 mi
	Public Land	no./mile	24 tracts / 3.27 mi	33 tracts / 3.53 mi
	Private Land	no./mile	666 tracts / 97.76 mi	797 tracts / 87.85 mi
	Tribal Land	no./mile	0	0
	Residential Structures within 50 feet of Construction ROW m/	no.	80	137
	Road Crossings	---	---	---
	Total Roads Crossed n/	no	128	163
	Construction in Roadways	mile	0.7	2.2
	Bored Road Crossings	no.	125	161
	Open Cut Road Crossings	no.	0	0
	HDD Road Crossings	no.	3	2
	Railroads Crossed	no.	13	20

NOTES: TBD = To Be Determined.

a/ MP = mile post; no. = number of features crossed; LF = linear feet crossed; acre = acreage of area within estimated workspace generally a 100-foot-wide nominal construction right of way ("ROW"), except 75-foot-wide construction ROW in wetlands.

b/ Each alternative route has distinct mile-posting; these MPs do not necessarily correlate to the MPs of the currently Proposed Route.

c/ Number of wetlands crossed calculated by intersecting centerline with U.S. Fish & Wildlife Service ("USFWS") National Wetland Inventory ("NWI") data.

d/ Estimated acres of wetland impact is based on a 75-foot-wide-construction ROW in wetlands based on NWI data.

e/ Total number of waterbodies, length of waterbodies, and number of major waterbodies crossed calculated by intersecting centerline with National Hydrography Data ("NHD") waterbodies and from review of aerial photography and waterbodies identified on U.S. Geological Survey ("USGS") topographic maps.

f/ Public wells, surface water protection areas, and sole source aquifers were identified using publicly available datasets from the Ohio Environmental Protection Agency ("OEPA"), Division of Drinking and Ground Water and the Michigan Department

TABLE 10.5-2

Comparison of the City of Green Alternative with the Corresponding Segments of the Proposed Route

County, State	Alternatives by Milepost MP Environmental / Engineering Factors	Unit a/	Alternative Route	Proposed Route

of Environmental Quality ("MDEQ"), Statewide Groundwater Database. Data presented are based on resources encountered within a 300-foot area centered over the pipeline centerline.

g/ Wildlife Management Areas crossed by the pipeline centerline based on Ohio Department of Natural Resources ("ODNR") and Michigan Department of Natural Resources ("MDNR") publicly available datasets. Critical Habitat/Endangered Species Area based on USFWS datasets. Waterfowl protection areas based on WPA Mapper. Forested land acreage based on 100-foot-wide construction ROW.

h/ Total number of sites based on the National Register of Historic Places crossed within a 300-foot area centered over the propose pipeline centerline.

i/ Numbers and lengths of geologic hazards based on fault lines, karst geology, and number of earthquake epicenters occurring within a 300-foot area centered over the proposed pipeline centerline based on USGS and ODNR datasets.

j/ Rugged terrain crossed includes areas of steep slopes and sidehill construction based on USGS topographic maps within a 300-foot area centered on the proposed pipeline centerline.

k/ Length of crossings of national and state parks and forests based on Ducks Unlimited dataset intersecting the centerline.

l/ Length of public lands or conservation lands crossed based on datasets from Ducks Unlimited, Black Swamp Conservancy Easements, Western Reserve Land Conservancy Protection Properties, and ODNR Conservation Areas intersecting the centerline.

m/ Number of residential structures includes houses, garages and sheds within 50 feet of the proposed construction ROW i.e., 100 foot distance on both sides of the pipeline centerline based on review of aerial photography/LIDAR data.

n/ Number of roads crossed includes federal, state and local roads, but does not include driveways.

\+ Parallel/Adjacent to Existing ROW is classified as any utility within 200 feet of the project workspace.

* Does not include impacts associated with the laterals required for delivery of gas.

TABLE 10.5-3

Comparison of the Electric Transmission Line Alternative with the Corresponding Segments of the Proposed Route

County, State	Alternatives by Milepost MP Environmental / Engineering Factors	Unit a/	Alternative Route	Proposed Route
Columbiana, Stark, OH	**MP 1.8 – ELECTRIC TRANSMISSION LINE ALTERNATIVE**			
	Pipeline Length/ROW Summary	---	---	---
	MP to MP b/	MP	1.8 to 29.33	1.8 to 29.03
	Total Length	mile	27.5	27.2
	Parallel/Adjacent to Existing ROW	mile	TBD	TBD
	Construction ROW (based on a 100-foot-wide ROW)	acre	333.7	324.2
	Permanent ROW (based on a 50-foot-wide ROW)	acre	168.8	164.9
	Laterals Required	no.	0	0
	Total Length of Laterals	mile	N/A	N/A
	Total Construction ROW for Laterals (based on a 100-foot-wide ROW)	acre	N/A	N/A
	Total Permanent ROW for Laterals (based on a 50-foot-wide ROW)	acre	N/A	N/A
	Environmental Factors	---	---	---
	Total Wetlands Crossed c/	no.	17	17
	Forested	no.	4	3
	Scrub Shrub	no.	0	2
	Emergent	no.	2	9
	Scrub Shrub/Emergent	no.	4	3
	Total Wetlands Affected d/	acre	6.8	8.0
	Total Waterbodies Crossed e/	no.	66	50
	Total Length of Waterbodies Crossed e/	LF	2,540.6	501.7
	Major Waterbodies >100 feet e/	no.	7	0
	Groundwater Resources f/	---	---	---
	Groundwater Wells	no.	0	0
	Sole Source Aquifers	no.	0	0
	Wellhead Protection Areas	no.	4	0
	Wildlife Habitat g/	---	---	---
	Forested Land	acre	54.5	74.4
	Designated Critical Wildlife Habitat	no.	0	0
	Known Endangered Species Critical Habitat	no.	0	0
	Waterfowl Production Areas	no.	0	0
	Wildlife Management Areas	no.	0	0
	Cultural Resources h/	---	---	---
	Listed National Register Historic Places Sites	no.	0	0
	Geologic Hazards i/	---	---	---
	Faults	no.	0	0
	Areas of Potential Subsidence	mile	0.13	0
	Areas of High Landslide Potential	mile	9.9	7.0
	Rugged Terrain j/	---	---	---
	Areas of Steep Slopes	mile	5	1.9
	Areas of Sidehill Construction	mile	2.2	1.4
	National and State Parks and Forests k/	---	---	---

TABLE 10.5-3

Comparison of the Electric Transmission Line Alternative with the Corresponding Segments of the Proposed Route

County, State	Alternatives by Milepost MP Environmental / Engineering Factors	Unit a/	Alternative Route	Proposed Route
	State	mile	0	0
	Federal	mile	0	0
	Public Lands or Conservation Lands Crossed l/	LF	353.21 ft	100.26 ft
	Land Ownership (100' corridor)	---	378 tracts/ 25.43 mi	186 tracts / 26.74 mi
	Public Land	no./mile	6 tracts / .07 mi	2 tracts / .02 mi
	Private Land	no./mile	372 tracts / 25.27 mi	184 tracts / 26.72 mi
	Tribal Land	no./mile	0	0
	Residential Structures within 50 feet of Construction ROW m/	no.	129	16
	Road Crossings	---	---	---
	Total Roads Crossed n/	no	42	54
	Construction in Roadways	mile	0.3	0.5
	Bored Road Crossings	no.	37	54
	Open Cut Road Crossings	no.	0	0
	HDD Road Crossings	no.	5	0
	Railroads Crossed	no.	3	4

NOTES: TBD = To Be Determined.
Parallel/Adjacent to Existing ROW is classified as any utility within 200 feet of the project workspace.

a/ MP = mile post; no. = number of features crossed; LF = linear feet crossed; acre = acreage of area within estimated workspace generally a 100-foot-wide nominal construction right of way ("ROW"), except 75-foot-wide construction ROW in wetlands.

b/ Each alternative route has distinct mile-posting; these MPs do not necessarily correlate to the MPs of the currently Proposed Route.

c/ Number of wetlands crossed calculated by intersecting centerline with U.S. Fish & Wildlife Service ("USFWS") National Wetland Inventory ("NWI") data.

d/ Estimated acres of wetland impact is based on a 75-foot-wide-construction ROW in wetlands based on NWI data.

e/ Total number of waterbodies, length of waterbodies, and number of major waterbodies crossed calculated by intersecting centerline with National Hydrography Data ("NHD") waterbodies and from review of aerial photography and waterbodies identified on U.S. Geological Survey ("USGS") topographic maps.

f/ Public wells, surface water protection areas, and sole source aquifers were identified using publicly available datasets from the Ohio Environmental Protection Agency ("OEPA"), Division of Drinking and Ground Water and the Michigan Department of Environmental Quality ("MDEQ"), Statewide Groundwater Database. Data presented are based on resources encountered within a 300-foot area centered over the pipeline centerline.

g/ Wildlife Management Areas crossed by the pipeline centerline based on Ohio Department of Natural Resources ("ODNR") and Michigan Department of Natural Resources ("MDNR") publicly available datasets. Critical Habitat/Endangered Species Area based on USFWS datasets. Waterfowl protection areas based on WPA Mapper. Forested land acreage based on 100-foot-wide construction ROW.

h/ Total number of sites based on the National Register of Historic Places crossed within a 300-foot area centered over the propose pipeline centerline.

i/ Numbers and lengths of geologic hazards based on fault lines, karst geology, and number of earthquake epicenters occurring within a 300-foot area centered over the proposed pipeline centerline based on USGS and ODNR datasets.

j/ Rugged terrain crossed includes areas of steep slopes and sidehill construction based on USGS topographic maps within a 300-foot area centered on the proposed pipeline centerline.

k/ Length of crossings of national and state parks and forests based on Ducks Unlimited dataset intersecting the centerline.

l/ Length of public lands or conservation lands crossed based on datasets from Ducks Unlimited, Black Swamp Conservancy Easements, Western Reserve Land Conservancy Protection Properties, and ODNR Conservation Areas intersecting the centerline.

m/ Number of residential structures includes houses, garages and sheds within 50 feet of the proposed construction ROW i.e., 100 foot distance on both sides of the pipeline centerline based on review of aerial photography/LIDAR data.

n/ Number of roads crossed includes federal, state and local roads, but does not include driveways.

TABLE 10.5-4

Comparison of the Nimisila Reservoir Alternative with the Corresponding Segments of the Proposed Route

County, State	Alternatives by Milepost MP Environmental / Engineering Factors	Unit a/	Alternative Route	Proposed Route
Summit, OH	**MP 36.2 – NIMISILA RESERVOIR ALTERNATIVE**			
	Pipeline Length/ROW Summary	---	---	---
	MP to MP b/	MP	36.2 to 43.2	36.2 to 45.7
	Total Length	mile	7.0	9.5
	Parallel/Adjacent to Existing ROW	mile	TBD	TBD
	Construction ROW (based on a 100-foot-wide ROW)	acre	84.5	110.0
	Permanent ROW (based on a 50-foot-wide ROW)	acre	42.2	57.3
	Laterals Required	no.	0	0
	Total Length of Laterals	mile	N/A	N/A
	Total Construction ROW for Laterals (based on a 100-foot-wide ROW)	acre	N/A	N/A
	Total Permanent ROW for Laterals (based on a 50-foot-wide ROW)	acre	N/A	N/A
	Environmental Factors	---	---	---
	Total Wetlands Crossed c/	no.	14	9
	Forested	no.	0	1
	Scrub Shrub	no.	1	2
	Emergent	no.	2	1
	Scrub Shrub/Emergent	no.	1	2
	Total Wetlands Affected d/	acre	9.7	5.6
	Total Waterbodies Crossed e/	no.	19	19
	Total Length of Waterbodies Crossed e/	LF	4,432.8	298.4
	Major Waterbodies >100 feet e/	no.	2	1
	Groundwater Resources f/	---	---	---
	Groundwater Wells	no.	0	0
	Sole Source Aquifers	no.	0	0
	Wellhead Protection Areas	no.	1	0
	Wildlife Habitat g/	---	---	---
	Forested Land	acre	38.3	53.5
	Designated Critical Wildlife Habitat	no.	0	0
	Known Endangered Species Critical Habitat	no.	0	0
	Waterfowl Production Areas	no.	0	0
	Wildlife Management Areas	no.	0	0
	Cultural Resources h/	---	---	---
	Listed National Register Historic Places Sites	no.	0	0
	Geologic Hazards i/	---	---	---
	Faults	no.	0	0
	Areas of Potential Subsidence	mile	0.08	0
	Areas of High Landslide Potential	mile	0	0
	Rugged Terrain j/	---	---	---
	Areas of Steep Slopes	mile	3	9.5
	Areas of Sidehill Construction	mile	2.7	3.4
	National and State Parks and Forests k/	---	---	---
	State	mile	1.0	0.2
	Federal	mile	0	0

TABLE 10.5-4

Comparison of the Nimisila Reservoir Alternative with the Corresponding Segments of the Proposed Route

County, State	Alternatives by Milepost MP Environmental / Engineering Factors	Unit a/	Alternative Route	Proposed Route
	Public Lands or Conservation Lands Crossed l/	LF	5,267.73 ft	1,154.89 ft
	Land Ownership (100' corridor)	---	105 tracts / 6.81 mi	131 tracts / 9.31 mi
	Public Land	no./mile	2 tracts / 1.00 mi	3 tracts / .02 mi
	Private Land	no./mile	103 tracts / 5.81 mi	128 tracts / 9.09 mi
	Tribal Land	no./mile	0	0
	Residential Structures within 50 feet of Construction ROW m/	no.	27	26
	Road Crossings	---	---	---
	Total Roads Crossed n/	no	10	14
	Construction in Roadways	mile	0.1	0.2
	Bored Road Crossings	no.	10	14
	Open Cut Road Crossings	no.	0	0
	HDD Road Crossings	no.	0	0
	Railroads Crossed	no.	0	0

NOTES: TBD = To Be Determined.

a/ MP = mile post; no. = number of features crossed; LF = linear feet crossed; acre = acreage of area within estimated workspace generally a 100-foot-wide nominal construction right of way ("ROW"), except 75-foot-wide construction ROW in wetlands.

b/ Each alternative route has distinct mile-posting; these MPs do not necessarily correlate to the MPs of the currently Proposed Route.

c/ Number of wetlands crossed calculated by intersecting centerline with U.S. Fish & Wildlife Service ("USFWS") National Wetland Inventory ("NWI") data.

d/ Estimated acres of wetland impact is based on a 75-foot-wide-construction ROW in wetlands based on NWI data.

e/ Total number of waterbodies, length of waterbodies, and number of major waterbodies crossed calculated by intersecting centerline with National Hydrography Data ("NHD") waterbodies and from review of aerial photography and waterbodies identified on U.S. Geological Survey ("USGS") topographic maps.

f/ Public wells, surface water protection areas, and sole source aquifers were identified using publicly available datasets from the Ohio Environmental Protection Agency ("OEPA"), Division of Drinking and Ground Water and the Michigan Department of Environmental Quality ("MDEQ"), Statewide Groundwater Database. Data presented are based on resources encountered within a 300-foot area centered over the pipeline centerline.

g/ Wildlife Management Areas crossed by the pipeline centerline based on Ohio Department of Natural Resources ("ODNR") and Michigan Department of Natural Resources ("MDNR") publicly available datasets. Critical Habitat/Endangered Species Area based on USFWS datasets. Waterfowl protection areas based on WPA Mapper. Forested land acreage based on 100-foot-wide construction ROW.

h/ Total number of sites based on the National Register of Historic Places crossed within a 300-foot area centered over the propose pipeline centerline.

i/ Numbers and lengths of geologic hazards based on fault lines, karst geology, and number of earthquake epicenters occurring within a 300-foot area centered over the proposed pipeline centerline based on USGS and ODNR datasets.

j/ Rugged terrain crossed includes areas of steep slopes and sidehill construction based on USGS topographic maps within a 300-foot area centered on the proposed pipeline centerline.

k/ Length of crossings of national and state parks and forests based on Ducks Unlimited dataset intersecting the centerline.

l/ Length of public lands or conservation lands crossed based on datasets from Ducks Unlimited, Black Swamp Conservancy Easements, Western Reserve Land Conservancy Protection Properties, and ODNR Conservation Areas intersecting the centerline.

m/ Number of residential structures includes houses, garages and sheds within 50 feet of the proposed construction ROW i.e., 100 foot distance on both sides of the pipeline centerline based on review of aerial photography/LIDAR data.

n/ Number of roads crossed includes federal, state and local roads, but does not include driveways.

+ Parallel/Adjacent to Existing ROW is classified as any utility within 200 feet of the project workspace.

TABLE 10.5-5

Comparison of the Hubbard Valley Park Alternative with the Corresponding Segments of the Proposed Route

County, State	Alternatives by Milepost MP Environmental / Engineering Factors	Unit a/	Alternative Route	Proposed Route
Medina, OH	**MP 60.7 – HUBBARD VALLEY PARK ALTERNATIVE**			
	Pipeline Length/ROW Summary	---	---	---
	MP to MP b/	MP	60.7 to 64.3	60.7 to 64.4
	Total Length	mile	3.6	3.7
	Parallel/Adjacent to Existing ROW	mile	TBD	TBD
	Construction ROW (based on a 100-foot-wide ROW)	acre	43.2	46.7
	Permanent ROW (based on a 50-foot-wide ROW)	acre	21.6	22.9
	Laterals Required	no.	0	0
	Total Length of Laterals	mile	N/A	N/A
	Total Construction ROW for Laterals (based on a 100-foot-wide ROW)	acre	N/A	N/A
	Total Permanent ROW for Laterals (based on a 50-foot-wide ROW)	acre	N/A	N/A
	Environmental Factors	---	---	---
	Total Wetlands Crossed c/	no.	1	2
	Forested	no.	1	0
	Scrub Shrub	no.	0	0
	Emergent	no.	0	0
	Scrub Shrub/Emergent	no.	0	2
	Total Wetlands Affected d/	acre	0.2	0.6
	Total Waterbodies Crossed e/	no.	17	5
	Total Length of Waterbodies Crossed e/	LF	211.7	28.9
	Major Waterbodies >100 feet e/	no.	0	0
	Groundwater Resources f/	---	---	---
	Groundwater Wells	no.	0	0
	Sole Source Aquifers	no.	0	0
	Wellhead Protection Areas	no.	0	0
	Wildlife Habitat g/	---	---	---
	Forested Land	acre	20.1	6.2
	Designated Critical Wildlife Habitat	no.	0	0
	Known Endangered Species Critical Habitat	no.	0	0
	Waterfowl Production Areas	no.	0	0
	Wildlife Management Areas	no.	0	0
	Cultural Resources h/	---	---	---
	Listed National Register Historic Places Sites	no.	0	0
	Geologic Hazards i/	---	---	---
	Faults	no.	0	0
	Areas of Potential Subsidence	mile	0	0
	Areas of High Landslide Potential	mile	0	0
	Rugged Terrain j/	---	---	---
	Areas of Steep Slopes	mile	3.5	3.7
	Areas of Sidehill Construction	mile	2.5	1.0
	National and State Parks and Forests k/	---	---	---
	State	mile	0	0
	Federal	mile	0	0
	Public Lands or Conservation Lands Crossed l/	LF	2,906.49 ft	0 ft

TABLE 10.5-5

Comparison of the Hubbard Valley Park Alternative with the Corresponding Segments of the Proposed Route

County, State	Alternatives by Milepost MP Environmental / Engineering Factors	Unit a/	Alternative Route	Proposed Route
	Land Ownership (100' corridor)	---	40 tracts / 3.43 mi	30 tracts / 3.62 mi
	Public Land	no./mile	5 tracts / .55 mi	0 tracts
	Private Land	no./mile	35 tracts / 2.88 mi	30 tracts / 3.62 mi
	Tribal Land	no./mile	0	0
	Residential Structures within 50 feet of Construction ROW m/	no.	1	1
	Road Crossings	---	---	---
	Total Roads Crossed n/	no	5	8
	Construction in Roadways	mile	0.1	0.1
	Bored Road Crossings	no.	5	8
	Open Cut Road Crossings	no.	0	0
	HDD Road Crossings	no.	0	0
	Railroads Crossed	no.	0	0

NOTES: TBD = To Be Determined.
Parallel/Adjacent to Existing ROW is classified as any utility within 200 feet of the project workspace.

a/ MP = mile post; no. = number of features crossed; LF = linear feet crossed; acre = acreage of area within estimated workspace generally a 100-foot-wide nominal construction right of way ("ROW"), except 75-foot-wide construction ROW in wetlands.

b/ Each alternative route has distinct mile-posting; these MPs do not necessarily correlate to the MPs of the currently Proposed Route.

c/ Number of wetlands crossed calculated by intersecting centerline with U.S. Fish & Wildlife Service ("USFWS") National Wetland Inventory ("NWI") data.

d/ Estimated acres of wetland impact is based on a 75-foot-wide-construction ROW in wetlands based on NWI data.

e/ Total number of waterbodies, length of waterbodies, and number of major waterbodies crossed calculated by intersecting centerline with National Hydrography Data ("NHD") waterbodies and from review of aerial photography and waterbodies identified on U.S. Geological Survey ("USGS") topographic maps.

f/ Public wells, surface water protection areas, and sole source aquifers were identified using publicly available datasets from the Ohio Environmental Protection Agency ("OEPA"), Division of Drinking and Ground Water and the Michigan Department of Environmental Quality ("MDEQ"), Statewide Groundwater Database. Data presented are based on resources encountered within a 300-foot area centered over the pipeline centerline.

g/ Wildlife Management Areas crossed by the pipeline centerline based on Ohio Department of Natural Resources ("ODNR") and Michigan Department of Natural Resources ("MDNR") publicly available datasets. Critical Habitat/Endangered Species Area based on USFWS datasets. Waterfowl protection areas based on WPA Mapper. Forested land acreage based on 100-foot-wide construction ROW.

h/ Total number of sites based on the National Register of Historic Places crossed within a 300-foot area centered over the propose pipeline centerline.

i/ Numbers and lengths of geologic hazards based on fault lines, karst geology, and number of earthquake epicenters occurring within a 300-foot area centered over the proposed pipeline centerline based on USGS and ODNR datasets.

j/ Rugged terrain crossed includes areas of steep slopes and sidehill construction based on USGS topographic maps within a 300-foot area centered on the proposed pipeline centerline.

k/ Length of crossings of national and state parks and forests based on Ducks Unlimited dataset intersecting the centerline.

l/ Length of public lands or conservation lands crossed based on datasets from Ducks Unlimited, Black Swamp Conservancy Easements, Western Reserve Land Conservancy Protection Properties, and ODNR Conservation Areas intersecting the centerline.

m/ Number of residential structures includes houses, garages and sheds within 50 feet of the proposed construction ROW i.e., 100 foot distance on both sides of the pipeline centerline based on review of aerial photography/LIDAR data.

n/ Number of roads crossed includes federal, state and local roads, but does not include driveways.

TABLE 10.5-6

Comparison of the Edison Woods Preserve and Apple Orchard Alternative with the Corresponding Segments of the Proposed Route

County, State	Alternatives by Milepost MP Environmental / Engineering Factors	Unit a/	Alternative Route	Proposed Route
Erie, OH	**MP 100.6 – EDISON WOOD PRESERVE AND APPLE ORCHARD ALTERNATIVE**			
	Pipeline Length/ROW Summary	---	---	---
	MP to MP b/	MP	100.6 to 108.4	100.6 to 108.5
	Total Length	mile	7.8	7.9
	Parallel/Adjacent to Existing ROW	mile	TBD	TBD
	Construction ROW (based on a 100-foot-wide ROW)	acre	94.7	94.0
	Permanent ROW (based on a 50-foot-wide ROW)	acre	47.3	48.3
	Laterals Required	no.	0	0
	Total Length of Laterals	mile	N/A	N/A
	Total Construction ROW for Laterals (based on a 100-foot-wide ROW)	acre	N/A	N/A
	Total Permanent ROW for Laterals (based on a 50-foot-wide ROW)	acre	N/A	N/A
	Environmental Factors	---	---	---
	Total Wetlands Crossed c/	no.	5	0
	Forested	no.	2	0
	Scrub Shrub	no.	1	0
	Emergent	no.	1	0
	Scrub Shrub/Emergent	no.	1	0
	Total Wetlands Affected d/	acre	1.6	0
	Total Waterbodies Crossed e/	no.	14	3
	Total Length of Waterbodies Crossed e/	LF	197.4	41.5
	Major Waterbodies >100 feet e/	no.	0	0
	Groundwater Resources f/	---	---	---
	Groundwater Wells	no.	0	0
	Sole Source Aquifers	no.	0	0
	Wellhead Protection Areas	no.	0	0
	Wildlife Habitat g/	---	---	---
	Forested Land	acre	20.0	17.3
	Designated Critical Wildlife Habitat	no.	0	0
	Known Endangered Species Critical Habitat	no.	0	0
	Waterfowl Production Areas	no.	0	0
	Wildlife Management Areas	no.	0	0
	Cultural Resources h/	---	---	---
	Listed National Register Historic Places Sites	no.	0	0
	Geologic Hazards i/	---	---	---
	Faults	no.	0	0
	Areas of Potential Subsidence	mile	0	0
	Areas of High Landslide Potential	mile	0	0
	Rugged Terrain j/	---	---	---
	Areas of Steep Slopes	mile	4.6	7.9
	Areas of Sidehill Construction	mile	3.4	0
	National and State Parks and Forests k/	---	---	---
	State	mile	0	0
	Federal	mile	0	0
	Public Lands or Conservation Lands Crossed l/	LF	1,620.00 ft	130.98 ft

TABLE 10.5-6

Comparison of the Edison Woods Preserve and Apple Orchard Alternative with the Corresponding Segments of the Proposed Route

County, State	Alternatives by Milepost MP Environmental / Engineering Factors	Unit a/	Alternative Route	Proposed Route
	Land Ownership (100' corridor)	---	49 tracts / 7.63 mi	50 tracts / 7.82 mi
	Public Land	no./mile	1 tract / 0.31 mi	1 tract / 0.02 mi
	Private Land	no./mile	48 tracts / 7.32 mi	49 tracts / 7.80 mi
	Tribal Land	no./mile	0	0
	Residential Structures within 50 feet of Construction ROW m/	no.	10	0
	Road Crossings	---	---	---
	Total Roads Crossed n/	no	12	10
	Construction in Roadways	mile	0.1	0.2
	Bored Road Crossings	no.	12	10
	Open Cut Road Crossings	no.	0	0
	HDD Road Crossings	no.	0	0
	Railroads Crossed	no.	0	0

NOTES: TBD = To Be Determined.
Parallel/Adjacent to Existing ROW is classified as any utility within 200 feet of the project workspace.

a/ MP = mile post; no. = number of features crossed; LF = linear feet crossed; acre = acreage of area within estimated workspace generally a 100-foot-wide nominal construction right of way ("ROW"), except 75-foot-wide construction ROW in wetlands.

b/ Each alternative route has distinct mile-posting; these MPs do not necessarily correlate to the MPs of the currently Proposed Route.

c/ Number of wetlands crossed calculated by intersecting centerline with U.S. Fish & Wildlife Service ("USFWS") National Wetland Inventory ("NWI") data.

d/ Estimated acres of wetland impact is based on a 75-foot-wide-construction ROW in wetlands based on NWI data.

e/ Total number of waterbodies, length of waterbodies, and number of major waterbodies crossed calculated by intersecting centerline with National Hydrography Data ("NHD") waterbodies and from review of aerial photography and waterbodies identified on U.S. Geological Survey ("USGS") topographic maps.

f/ Public wells, surface water protection areas, and sole source aquifers were identified using publicly available datasets from the Ohio Environmental Protection Agency ("OEPA"), Division of Drinking and Ground Water and the Michigan Department of Environmental Quality ("MDEQ"), Statewide Groundwater Database. Data presented are based on resources encountered within a 300-foot area centered over the pipeline centerline.

g/ Wildlife Management Areas crossed by the pipeline centerline based on Ohio Department of Natural Resources ("ODNR") and Michigan Department of Natural Resources ("MDNR") publicly available datasets. Critical Habitat/Endangered Species Area based on USFWS datasets. Waterfowl protection areas based on WPA Mapper. Forested land acreage based on 100-foot-wide construction ROW.

h/ Total number of sites based on the National Register of Historic Places crossed within a 300-foot area centered over the propose pipeline centerline.

i/ Numbers and lengths of geologic hazards based on fault lines, karst geology, and number of earthquake epicenters occurring within a 300-foot area centered over the proposed pipeline centerline based on USGS and ODNR datasets.

j/ Rugged terrain crossed includes areas of steep slopes and sidehill construction based on USGS topographic maps within a 300-foot area centered on the proposed pipeline centerline.

k/ Length of crossings of national and state parks and forests based on Ducks Unlimited dataset intersecting the centerline.

l/ Length of public lands or conservation lands crossed based on datasets from Ducks Unlimited, Black Swamp Conservancy Easements, Western Reserve Land Conservancy Protection Properties, and ODNR Conservation Areas intersecting the centerline.

m/ Number of residential structures includes houses, garages and sheds within 50 feet of the proposed construction ROW i.e., 100 foot distance on both sides of the pipeline centerline based on review of aerial photography/LIDAR data.

n/ Number of roads crossed includes federal, state and local roads, but does not include driveways.

TABLE 10.5-7

Comparison of the Black Swamp Land Conservancy and Sandusky River Alternative with the Corresponding Segments of the Proposed Route

County, State	Alternatives by Milepost MP Environmental / Engineering Factors	Unit a/	Alternative Route	Proposed Route
Sandusky, OH	**MP 136.4 – BLACK SWAMP LAND CONSERVANCY AND SANDUSKY RIVER ALTERNATIVE**			
	Pipeline Length/ROW Summary	---	---	---
	MP to MP b/	MP	136.4 to145.1	136.4 to145.2
	Total Length	mile	8.7	8.8
	Parallel/Adjacent to Existing ROW	mile	TBD	TBD
	Construction ROW (based on a 100-foot-wide ROW)	acre	105.0	101.2
	Permanent ROW (based on a 50-foot-wide ROW)	acre	52.5	53.6
	Laterals Required	no.	0	0
	Total Length of Laterals	mile	N/A	N/A
	Total Construction ROW for Laterals (based on a 100-foot-wide ROW)	acre	N/A	N/A
	Total Permanent ROW for Laterals (based on a 50-foot-wide ROW)	acre	N/A	N/A
	Environmental Factors	---	---	---
	Total Wetlands Crossed c/	no.	2	2
	Forested	no.	1	1
	Scrub Shrub	no.	0	0
	Emergent	no.	0	0
	Scrub Shrub/Emergent	no.	0	0
	Total Wetlands Affected d/	acre	1.1	0.7
	Total Waterbodies Crossed e/	no.	12	11
	Total Length of Waterbodies Crossed e/	LF	699.0	491.4
	Major Waterbodies >100 feet e/	no.	1	1
	Groundwater Resources f/	---	---	---
	Groundwater Wells	no.	0	0
	Sole Source Aquifers	no.	0	0
	Wellhead Protection Areas	no.	1	0
	Wildlife Habitat g/	---	---	---
	Forested Land	acre	5.0	2.4
	Designated Critical Wildlife Habitat	no.	0	0
	Known Endangered Species Critical Habitat	no.	0	0
	Waterfowl Production Areas	no.	0	0
	Wildlife Management Areas	no.	0	0
	Cultural Resources h/	---	---	---
	Listed National Register Historic Places Sites	no.	0	0
	Geologic Hazards i/	---	---	---
	Faults	no.	0	0
	Areas of Potential Subsidence	mile	8.7	8.8
	Areas of High Landslide Potential	mile	0	0
	Rugged Terrain j/	---	---	---
	Areas of Steep Slopes	mile	0	0
	Areas of Sidehill Construction	mile	0	0
	National and State Parks and Forests k/	---	---	---
	State	mile	0	0
	Federal	mile	0	0
	Public Lands or Conservation Lands Crossed l/	LF	0 ft	154.94 ft

TABLE 10.5-7

Comparison of the Black Swamp Land Conservancy and Sandusky River Alternative with the Corresponding Segments of the Proposed Route

County, State	Alternatives by Milepost MP Environmental / Engineering Factors	Unit a/	Alternative Route	Proposed Route
	Land Ownership (100' corridor)	---	58 tracts / 8.55 mi	56 tracts / 8.66 mi
	Public Land	no./mile	0 tracts	2 tracts / 0.03 mi
	Private Land	no./mile	58 tracts / 8.55 mi	54 tracts / 8.63 mi
	Tribal Land	no./mile	0	0
	Residential Structures within 50 feet of Construction ROW m/	no.	10	7
	Road Crossings	---	---	---
	Total Roads Crossed n/	no	11	15
	Construction in Roadways	mile	0.1	0.1
	Bored Road Crossings	no.	11	14
	Open Cut Road Crossings	no.	0	0
	HDD Road Crossings	no.	0	1
	Railroads Crossed	no.	1	1

NOTES: TBD = To Be Determined.
Parallel/Adjacent to Existing ROW is classified as any utility within 200 feet of the project workspace.

a/ MP = mile post; no. = number of features crossed; LF = linear feet crossed; acre = acreage of area within estimated workspace generally a 100-foot-wide nominal construction right of way ("ROW"), except 75-foot-wide construction ROW in wetlands.

b/ Each alternative route has distinct mile-posting; these MPs do not necessarily correlate to the MPs of the currently Proposed Route.

c/ Number of wetlands crossed calculated by intersecting centerline with U.S. Fish & Wildlife Service ("USFWS") National Wetland Inventory ("NWI") data.

d/ Estimated acres of wetland impact is based on a 75-foot-wide-construction ROW in wetlands based on NWI data.

e/ Total number of waterbodies, length of waterbodies, and number of major waterbodies crossed calculated by intersecting centerline with National Hydrography Data ("NHD") waterbodies and from review of aerial photography and waterbodies identified on U.S. Geological Survey ("USGS") topographic maps.

f/ Public wells, surface water protection areas, and sole source aquifers were identified using publicly available datasets from the Ohio Environmental Protection Agency ("OEPA"), Division of Drinking and Ground Water and the Michigan Department of Environmental Quality ("MDEQ"), Statewide Groundwater Database. Data presented are based on resources encountered within a 300-foot area centered over the pipeline centerline.

g/ Wildlife Management Areas crossed by the pipeline centerline based on Ohio Department of Natural Resources ("ODNR") and Michigan Department of Natural Resources ("MDNR") publicly available datasets. Critical Habitat/Endangered Species Area based on USFWS datasets. Waterfowl protection areas based on WPA Mapper. Forested land acreage based on 100-foot-wide construction ROW.

h/ Total number of sites based on the National Register of Historic Places crossed within a 300-foot area centered over the propose pipeline centerline.

i/ Numbers and lengths of geologic hazards based on fault lines, karst geology, and number of earthquake epicenters occurring within a 300-foot area centered over the proposed pipeline centerline based on USGS and ODNR datasets.

j/ Rugged terrain crossed includes areas of steep slopes and sidehill construction based on USGS topographic maps within a 300-foot area centered on the proposed pipeline centerline.

k/ Length of crossings of national and state parks and forests based on Ducks Unlimited dataset intersecting the centerline.

l/ Length of public lands or conservation lands crossed based on datasets from Ducks Unlimited, Black Swamp Conservancy Easements, Western Reserve Land Conservancy Protection Properties, and ODNR Conservation Areas intersecting the centerline.

m/ Number of residential structures includes houses, garages and sheds within 50 feet of the proposed construction ROW i.e., 100 foot distance on both sides of the pipeline centerline based on review of aerial photography/LIDAR data.

n/ Number of roads crossed includes federal, state and local roads, but does not include driveways.

TABLE 10.5-8

Comparison of the Maumee State Forest Alternative with the Corresponding Segments of the Proposed Route

County, State	Alternatives by Milepost MP Environmental / Engineering Factors	Unit a/	Alternative Route	Proposed Route
Lucas, Fulton, OH	**MP 181.05 – MAUMEE STATE FOREST ALTERNATIVE**			
	Pipeline Length/ROW Summary	---	---	---
	MP to MP b/	MP	181.05 to 192.6	181.05 to 195.3
	Total Length	mile	11.6	14.3
	Parallel/Adjacent to Existing ROW	mile	TBD	TBD
	Construction ROW (based on a 100-foot-wide ROW)	acre	140.8	171.5
	Permanent ROW (based on a 50-foot-wide ROW)	acre	70.4	86.4
	Laterals Required	no.	0	0
	Total Length of Laterals	mile	N/A	N/A
	Total Construction ROW for Laterals (based on a 100-foot-wide ROW)	acre	N/A	N/A
	Total Permanent ROW for Laterals (based on a 50-foot-wide ROW)	acre	N/A	N/A
	Environmental Factors	---	---	---
	Total Wetlands Crossed c/	no.	16	2
	Forested	no.	13	1
	Scrub Shrub	no.	0	1
	Emergent	no.	2	0
	Scrub Shrub/Emergent	no.	0	0
	Total Wetlands Affected d/	acre	6.4	0.8
	Total Waterbodies Crossed e/	no.	25	25
	Total Length of Waterbodies Crossed e/	LF	311.3	256.3
	Major Waterbodies >100 feet e/	no.	0	0
	Groundwater Resources f/	---	---	---
	Groundwater Wells	no.	0	0
	Sole Source Aquifers	no.	0	0
	Wellhead Protection Areas	no.	0	0
	Wildlife Habitat g/	---	---	---
	Forested Land	acre	36.7	14.8
	Designated Critical Wildlife Habitat	no.	0	0
	Known Endangered Species Critical Habitat	no.	0	0
	Waterfowl Production Areas	no.	0	0
	Wildlife Management Areas	no.	0	0
	Cultural Resources h/	---	---	---
	Listed National Register Historic Places Sites	no.	0	0
	Geologic Hazards i/	---	---	---
	Faults	no.	0	0
	Areas of Potential Subsidence	mile	11.7	13.9
	Areas of High Landslide Potential	mile	0	0
	Rugged Terrain j/	---	---	---
	Areas of Steep Slopes	mile	0	0
	Areas of Sidehill Construction	mile	0	0
	National and State Parks and Forests k/	---	---	---
	State	mile	1.6	0.4
	Federal	mile	0	0

TABLE 10.5-8

Comparison of the Maumee State Forest Alternative with the Corresponding Segments of the Proposed Route

County, State	Alternatives by Milepost MP Environmental / Engineering Factors	Unit a/	Alternative Route	Proposed Route
	Public Lands or Conservation Lands Crossed l/	LF	8,717.57 ft	2,380 ft
	Land Ownership (100' corridor)	---	68 tracts / 11.51 mi	64 tracts / 14.10 mi
	Public Land	no./mile	8 tracts / 1.65 mi	1 tract / 0.45 mi
	Private Land	no./mile	60 tracts / 9.86 mi	63 tracts / 13.65 mi
	Tribal Land	no./mile	0	0
	Residential Structures within 50 feet of Construction ROW m/	no.	4	1
	Road Crossings	---	---	---
	Total Roads Crossed n/	no	19	21
	Construction in Roadways	mile	0.1	0.1
	Bored Road Crossings	no.	18	21
	Open Cut Road Crossings	no.	0	0
	HDD Road Crossings	no.	1	0
	Railroads Crossed	no.	2	3

NOTES: TBD = To Be Determined.
Parallel/Adjacent to Existing ROW is classified as any utility within 200 feet of the project workspace.

a/ MP = mile post; no. = number of features crossed; LF = linear feet crossed; acre = acreage of area within estimated workspace generally a 100-foot-wide nominal construction right of way ("ROW"), except 75-foot-wide construction ROW in wetlands.

b/ Each alternative route has distinct mile-posting; these MPs do not necessarily correlate to the MPs of the currently Proposed Route.

c/ Number of wetlands crossed calculated by intersecting centerline with U.S. Fish & Wildlife Service ("USFWS") National Wetland Inventory ("NWI") data.

d/ Estimated acres of wetland impact is based on a 75-foot-wide-construction ROW in wetlands based on NWI data.

e/ Total number of waterbodies, length of waterbodies, and number of major waterbodies crossed calculated by intersecting centerline with National Hydrography Data ("NHD") waterbodies and from review of aerial photography and waterbodies identified on U.S. Geological Survey ("USGS") topographic maps.

f/ Public wells, surface water protection areas, and sole source aquifers were identified using publicly available datasets from the Ohio Environmental Protection Agency ("OEPA"), Division of Drinking and Ground Water and the Michigan Department of Environmental Quality ("MDEQ"), Statewide Groundwater Database. Data presented are based on resources encountered within a 300-foot area centered over the pipeline centerline.

g/ Wildlife Management Areas crossed by the pipeline centerline based on Ohio Department of Natural Resources ("ODNR") and Michigan Department of Natural Resources ("MDNR") publicly available datasets. Critical Habitat/Endangered Species Area based on USFWS datasets. Waterfowl protection areas based on WPA Mapper. Forested land acreage based on 100-foot-wide construction ROW.

h/ Total number of sites based on the National Register of Historic Places crossed within a 300-foot area centered over the propose pipeline centerline.

i/ Numbers and lengths of geologic hazards based on fault lines, karst geology, and number of earthquake epicenters occurring within a 300-foot area centered over the proposed pipeline centerline based on USGS and ODNR datasets.

j/ Rugged terrain crossed includes areas of steep slopes and sidehill construction based on USGS topographic maps within a 300-foot area centered on the proposed pipeline centerline.

k/ Length of crossings of national and state parks and forests based on Ducks Unlimited dataset intersecting the centerline.

l/ Length of public lands or conservation lands crossed based on datasets from Ducks Unlimited, Black Swamp Conservancy Easements, Western Reserve Land Conservancy Protection Properties, and ODNR Conservation Areas intersecting the centerline.

m/ Number of residential structures includes houses, garages and sheds within 50 feet of the proposed construction ROW i.e., 100 foot distance on both sides of the pipeline centerline based on review of aerial photography/LIDAR data.

n/ Number of roads crossed includes federal, state and local roads, but does not include driveways.

TABLE 10.5-9

Comparison of the Washtenaw County School Complex Alternative with the Corresponding Segments of the Proposed Route

County, State	Alternatives by Milepost MP Environmental / Engineering Factors	Unit a/	Alternative Route	Proposed Route
Washtenaw, MI	**MP 236.5 – WASHTENAW COUNTY SCHOOL COMPLEX ALTERNATIVE**			
	Pipeline Length/ROW Summary	---	---	---
	MP to MP b/	MP	236.5 to 241.6	236.5 to 241.6
	Total Length	mile	5.1	5.1
	Parallel/Adjacent to Existing ROW	mile	TBD	TBD
	Construction ROW (based on a 100-foot-wide ROW)	acre	62.0	60.2
	Permanent ROW (based on a 50-foot-wide ROW)	acre	30.9	30.7
	Laterals Required	no.	0	0
	Total Length of Laterals	mile	N/A	N/A
	Total Construction ROW for Laterals (based on a 100-foot-wide ROW)	acre	N/A	N/A
	Total Permanent ROW for Laterals (based on a 50-foot-wide ROW)	acre	N/A	N/A
	Environmental Factors	---	---	---
	Total Wetlands Crossed c/	no.	3	3
	Forested	no.	0	1
	Scrub Shrub	no.	1	1
	Emergent	no.	1	0
	Scrub Shrub/Emergent	no.	0	0
	Total Wetlands Affected d/	acre	1.2	1.6
	Total Waterbodies Crossed e/	no.	5	6
	Total Length of Waterbodies Crossed e/	LF	39.7	46.5
	Major Waterbodies >100 feet e/	no.	0	0
	Groundwater Resources f/	---	---	---
	Groundwater Wells	no.	7	3
	Sole Source Aquifers	no.	0	0
	Wellhead Protection Areas	no.	0	0
	Wildlife Habitat g/	---	---	---
	Forested Land	acre	2.5	9.5
	Designated Critical Wildlife Habitat	no.	0	0
	Known Endangered Species Critical Habitat	no.	0	0
	Waterfowl Production Areas	no.	0	0
	Wildlife Management Areas	no.	0	0
	Cultural Resources h/	---	---	---
	Listed National Register Historic Places Sites	no.	0	0
	Geologic Hazards i/	---	---	---
	Faults	no.	0	0
	Areas of Potential Subsidence	mile	0	0
	Areas of High Landslide Potential	mile	0	0
	Rugged Terrain j/	---	---	---
	Areas of Steep Slopes	mile	0	0
	Areas of Sidehill Construction	mile	0	0
	National and State Parks and Forests k/	---	---	---
	State	mile	0	0
	Federal	mile	0	0
	Public Lands or Conservation Lands Crossed l/	LF	1,340 ft	0 ft

TABLE 10.5-9

Comparison of the Washtenaw County School Complex Alternative with the Corresponding Segments of the Proposed Route

County, State	Alternatives by Milepost MP Environmental / Engineering Factors	Unit a/	Alternative Route	Proposed Route
	Land Ownership (100' corridor)	---	66 tracts / 5.99 mi	34 tracts / 5.00 mi
	Public Land	no./mile	1 tract / 0.25 mi	0 tracts
	Private Land	no./mile	65 tracts / 5.73 mi	34 tracts / 5.00 mi
	Tribal Land	no./mile	0	0
	Residential Structures within 50 feet of Construction ROW m/	no.	11	1
	Road Crossings	---	---	---
	Total Roads Crossed n/	no	4	5
	Construction in Roadways	mile	0.1	0.1
	Bored Road Crossings	no.	4	5
	Open Cut Road Crossings	no.	0	0
	HDD Road Crossings	no.	0	0
	Railroads Crossed	no.	0	0

NOTES: TBD = To Be Determined.
Parallel/Adjacent to Existing ROW is classified as any utility within 200 feet of the project workspace.

a/ MP = mile post; no. = number of features crossed; LF = linear feet crossed; acre = acreage of area within estimated workspace generally a 100-foot-wide nominal construction right of way ("ROW"), except 75-foot-wide construction ROW in wetlands.

b/ Each alternative route has distinct mile-posting; these MPs do not necessarily correlate to the MPs of the currently Proposed Route.

c/ Number of wetlands crossed calculated by intersecting centerline with U.S. Fish & Wildlife Service ("USFWS") National Wetland Inventory ("NWI") data.

d/ Estimated acres of wetland impact is based on a 75-foot-wide-construction ROW in wetlands based on NWI data.

e/ Total number of waterbodies, length of waterbodies, and number of major waterbodies crossed calculated by intersecting centerline with National Hydrography Data ("NHD") waterbodies and from review of aerial photography and waterbodies identified on U.S. Geological Survey ("USGS") topographic maps.

f/ Public wells, surface water protection areas, and sole source aquifers were identified using publicly available datasets from the Ohio Environmental Protection Agency ("OEPA"), Division of Drinking and Ground Water and the Michigan Department of Environmental Quality ("MDEQ"), Statewide Groundwater Database. Data presented are based on resources encountered within a 300-foot area centered over the pipeline centerline.

g/ Wildlife Management Areas crossed by the pipeline centerline based on Ohio Department of Natural Resources ("ODNR") and Michigan Department of Natural Resources ("MDNR") publicly available datasets. Critical Habitat/Endangered Species Area based on USFWS datasets. Waterfowl protection areas based on WPA Mapper. Forested land acreage based on 100-foot-wide construction ROW.

h/ Total number of sites based on the National Register of Historic Places crossed within a 300-foot area centered over the propose pipeline centerline.

i/ Numbers and lengths of geologic hazards based on fault lines, karst geology, and number of earthquake epicenters occurring within a 300-foot area centered over the proposed pipeline centerline based on USGS and ODNR datasets.

j/ Rugged terrain crossed includes areas of steep slopes and sidehill construction based on USGS topographic maps within a 300-foot area centered on the proposed pipeline centerline.

k/ Length of crossings of national and state parks and forests based on Ducks Unlimited dataset intersecting the centerline.

l/ Length of public lands or conservation lands crossed based on datasets from Ducks Unlimited, Black Swamp Conservancy Easements, Western Reserve Land Conservancy Protection Properties, and ODNR Conservation Areas intersecting the centerline.

m/ Number of residential structures includes houses, garages and sheds within 50 feet of the proposed construction ROW i.e., 100 foot distance on both sides of the pipeline centerline based on review of aerial photography/LIDAR data.

n/ Number of roads crossed includes federal, state and local roads, but does not include driveways.

TABLE 10.5-10

Comparison of the CORN Western Alternative with the Corresponding Segments of the Proposed Route

County, State	Alternatives by Milepost MP Environmental / Engineering Factors	Unit a/	Alternative Route	Proposed Route
Henry, Fulton, Lenawee, OH	**MP 185.4 – CORN WESTERN ALTERNATIVE**			
	Pipeline Length/ROW Summary	---	---	---
	MP to MP b/	MP	185.4 to 215.8	185.4 to 204.7
	Total Length	mile	31.3	20.2
	Parallel/Adjacent to Existing ROW +	mile	TBD	TBD
	Construction ROW (based on a 100-foot-wide ROW)	acre	379.7	244.0
	Permanent ROW (based on a 50-foot-wide ROW)	acre	189.8	122.4
	Laterals Required	no.	0	0
	Total Length of Laterals	mile	N/A	N/A
	Total Construction ROW for Laterals (based on a 100-foot-wide ROW)	acre	N/A	N/A
	Total Permanent ROW for Laterals (based on a 50-foot-wide ROW)	acre	N/A	N/A
	Environmental Factors	---	---	---
	Total Wetlands Crossed c/	no.	4	2
	Forested	no.	3	1
	Scrub Shrub	no.	0	1
	Emergent	no.	1	0
	Scrub Shrub/Emergent	no.	0	0
	Total Wetlands Affected d/	acre	1.4	0.8
	Total Waterbodies Crossed e/	no.	44	36
	Total Length of Waterbodies Crossed e/	LF	515.7	392.5
	Major Waterbodies >100 feet e/	no.	0	0
	Groundwater Resources f/	---	---	---
	Groundwater Wells	no.	0	0
	Sole Source Aquifers	no.	0	0
	Wellhead Protection Areas	no.	0	0
	Wildlife Habitat g/	---	---	---
	Forested Land	acre	14.1	10.1
	Designated Critical Wildlife Habitat	no.	0	0
	Known Endangered Species Critical Habitat	no.	0	0
	Waterfowl Production Areas	no.	0	0
	Wildlife Management Areas	no.	0	0
	Cultural Resources h/	---	---	---
	Listed National Register Historic Places Sites	no.	0	0
	Geologic Hazards i/	---	---	---
	Faults	no.	0	0
	Areas of Potential Subsidence	mile	9.7	11.8
	Areas of High Landslide Potential	mile	0	0
	Rugged Terrain j/	---	---	---
	Areas of Steep Slopes	mile	0	0
	Areas of Sidehill Construction	mile	0	0
	National and State Parks and Forests k/	---	---	---
	State	mile	0.3	0.4

TABLE 10.5-10

Comparison of the CORN Western Alternative with the Corresponding Segments of the Proposed Route

County, State	Alternatives by Milepost MP Environmental / Engineering Factors	Unit a/	Alternative Route	Proposed Route
	Federal	mile	0	0
	Public Lands or Conservation Lands Crossed l/	LF	4,360 ft	2.380 ft
	Land Ownership (100' corridor)	---	125 tracts / 31.15 mi	87 tracts / 19.92 mi
	Public Land	no./mile	3 tracts / 0.83 mi	1 tract / 0.45 mi
	Private Land	no./mile	122 tracts / 30.33 mi	86 tracts / 19.47 mi
	Tribal Land	no./mile	0	0
	Residential Structures within 50 feet of Construction ROW m/	no.	5	2
	Road Crossings	---	---	---
	Total Roads Crossed n/	no	39	28
	Construction in Roadways	mile	0.2	0.2
	Bored Road Crossings	no.	39	28
	Open Cut Road Crossings	no.	0	0
	HDD Road Crossings	no.	0	0
	Railroads Crossed	no.	4	7

NOTES: TBD = To Be Determined.

\+ Parallel/Adjacent to Existing ROW is classified as any utility within 200 feet of the project workspace.

a/ MP = mile post; no. = number of features crossed; LF = linear feet crossed; acre = acreage of area within estimated workspace generally a 100-foot-wide nominal construction right of way ("ROW"), except 75-foot-wide construction ROW in wetlands.

b/ Each alternative route has distinct mile-posting; these MPs do not necessarily correlate to the MPs of the currently Proposed Route.

c/ Number of wetlands crossed calculated by intersecting centerline with U.S. Fish & Wildlife Service ("USFWS") National Wetland Inventory ("NWI") data.

d/ Estimated acres of wetland impact is based on a 75-foot-wide-construction ROW in wetlands based on NWI data.

e/ Total number of waterbodies, length of waterbodies, and number of major waterbodies crossed calculated by intersecting centerline with National Hydrography Data ("NHD") waterbodies and from review of aerial photography and waterbodies identified on U.S. Geological Survey ("USGS") topographic maps.

f/ Public wells, surface water protection areas, and sole source aquifers were identified using publicly available datasets from the Ohio Environmental Protection Agency ("OEPA"), Division of Drinking and Ground Water and the Michigan Department of Environmental Quality ("MDEQ"), Statewide Groundwater Database. Data presented are based on resources encountered within a 300-foot area centered over the pipeline centerline.

g/ Wildlife Management Areas crossed by the pipeline centerline based on Ohio Department of Natural Resources ("ODNR") and Michigan Department of Natural Resources ("MDNR") publicly available datasets. Critical Habitat/Endangered Species Area based on USFWS datasets. Waterfowl protection areas based on WPA Mapper. Forested land acreage based on 100-foot-wide construction ROW.

h/ Total number of sites based on the National Register of Historic Places crossed within a 300-foot area centered over the propose pipeline centerline.

i/ Numbers and lengths of geologic hazards based on fault lines, karst geology, and number of earthquake epicenters occurring within a 300-foot area centered over the proposed pipeline centerline based on USGS and ODNR datasets.

j/ Rugged terrain crossed includes areas of steep slopes and sidehill construction based on USGS topographic maps within a 300-foot area centered on the proposed pipeline centerline.

k/ Length of crossings of national and state parks and forests based on Ducks Unlimited dataset intersecting the centerline.

l/ Length of public lands or conservation lands crossed based on datasets from Ducks Unlimited, Black Swamp Conservancy Easements, Western Reserve Land Conservancy Protection Properties, and ODNR Conservation Areas intersecting the centerline.

m/ Number of residential structures includes houses, garages and sheds within 50 feet of the proposed construction ROW i.e., 100 foot distance on both sides of the pipeline centerline based on review of aerial photography/LIDAR data.

n/ Number of roads crossed includes federal, state and local roads, but does not include driveways.

TABLE 10.6-1

Route Variations Incorporated into the NEXUS Project Pipeline Route

Start MP	End MP	Length of Variation (Feet)	County (or Counties)	Town (or Towns)	Supporting Reason(s) for Variation	Data Sources Reviewed in Route Variation Analyses a/	Figure Number
0	0.9	4,711	Columbiana	Franklin, Hanover	Avoids metering sites and other infrastructure at Kensington Process Facility.	Field/Aerial/ ROW	10.6.1-1
0.0	1.3	7,659	Columbiana	Hanover	Rerouted around existing infrastructure per request of Momentum Midstream.	Field/ROW	10.6.1-2
1.4	1.7	1,414	Columbiana	Hanover	Avoids a pond, house and barn	Aerial/Field	10.6.1-3
2.1	2.3	1,126	Columbiana	Hanover	Avoids a well, minimizes distance paralleling stream and reduces footprint within FEMA floodplain	Field/Aerial/ FEMA	10.6.1-4
4.1	4.3	1,020	Columbiana	West	Landowner request to preserve trees north of the alignment	ROW	10.6.1-5
4.2	4.6	2,122	Columbiana	West	Avoids a wellhead and storage tank	Aerial/ROW/ Field	10.6.1-6
5.4	5.8	2,425	Columbiana	West	Reroute avoids crossing through a pond.	Field	10.6.1-7
6.8	7	949	Columbiana	West		Field/Aerial	10.6.1-8
7.3	7.8	2,158	Columbiana	West	Minimizes steep slope and wetland crossings	Field/NHD/ NWI	10.6.1-9
11.3	11.5	1,345	Columbiana	Knox	Avoids and minimizes crossing through forested wetlands and along stream, which minimizes forested wetland conversion	NWI/NHD	10.6.1-10
13.6	13.8	1,041	Stark	Washington	Creates a right-angle crossing at Highway 183; avoids two ditched streams at boring location	Field/NHD/ NWI/Aerial	10.6.1-11
18.7	19.1	1,804	Stark	Washington	Avoids a crude oil storage tank, minimizes forested wetland clearing adjacent to a creek and avoids a survey section corner point installed by Ohio State Survey	Field	10.6.1-12
24.5	25.3	3,876	Stark	Marlboro	Avoids a pond and several houses, reduces forested wetland impacts, eliminates	Field/FEMA	10.6.1-13

TABLE 10.6-1

Route Variations Incorporated into the NEXUS Project Pipeline Route

Start MP	End MP	Length of Variation (Feet)	County (or Counties)	Town (or Towns)	Supporting Reason(s) for Variation	Data Sources Reviewed in Route Variation Analyses a/	Figure Number
					a stream crossing and avoids a large section of FEMA-mapped floodplain		
27.7	28.1	2,340	Stark	Lake	Avoids an OEPA Class III wetland	Field	10.6.1-14
28.6	29.1	2,735	Stark	Lake	Requested change per ODNR staff; avoids forested uplands	ROW	10.6.1-15
29.9	30.1	1,007	Stark	Lake	Avoids three large storage tanks	ROW/Aerial	10.6.1-16
30.4	30.8	2,305	Stark	Lake	Avoids a pond and large associated wetland area and moves the alignment further away from two residences	Field/NHD/ NWI	10.6.1-17
36.3	Joined at Removed Section of Former Alignment South of 37.2	4,669	Summit	Green	Landowner request to avoid cutting through property and instead parallel northern property border.	ROW	10.6.1-18
47.9	48.3	1,989	Summit, Wayne	Franklin, Chippewa	Reroute to increase distance from residences and a barn	ROW/Aerial	10.6.1-19
49	49.8	3,456	Wayne	Chippewa	Reroute to increase distance from residences	ROW/Aerial	10.6.1-20
53	53.7	3,583	Wayne	Chippewa	Reroute avoids crossing near residences and powerline, and reduces forested areas crossed	ROW/Aerial/ Field	10.6.1-21
Departs from Removed Section of Former Alignment North of 56.1	57.1	5,530	Medina	Wadsworth, Guilford	Avoids house currently under construction and two large sheds/barns which have been constructed in past month	ROW/Aerial/ Field	10.6.1-22
59.1	60	4,662	Medina	Guilford	Per landowners request at Open House meeting –	ROW	10.6.1-23

TABLE 10.6-1

Route Variations Incorporated into the NEXUS Project Pipeline Route

Start MP	End MP	Length of Variation (Feet)	County (or Counties)	Town (or Towns)	Supporting Reason(s) for Variation	Data Sources Reviewed in Route Variation Analyses a/	Figure Number
					variation no longer runs between their houses		
61.4	62	3,312	Medina	Guilford	Per landowners request at Open House meeting – one landowner requested to have pipeline on their property and another requested it not to be placed on their property	ROW	10.6.1-24
74.3	77.1	14,462	Medina	York, Litchfield	Per landowner request, that the pipeline be moved further to the north to travel through cleared agricultural fields – the resulting variation is further away from several developed lots, a stream crossing, a mature American Elm, and a wetland	ROW	10.6.1-25
79.8	80.2	1,754	Lorain	Grafton	Avoids a pond and moves the route further away from nearby homes	Field/NHD/ NWI	10.6.1-26
80.3	80.8	2,960	Lorain	Grafton	Avoids a pet cemetery at request of landowners	ROW/Field	10.6.1-27
80.8	81.7	3,999	Lorain	Grafton	Avoids several houses and a wetland and reduces forested conversion.	Field/ROW/ Aerial	10.6.1-28
81.8	Joined at Removed Section of Former Alignment West of 82.9	5,224	Lorain	Grafton	Avoids several homes and yards and reduces crossing distance through a portion of public park land	Field/NWI/NHD	10.6.1-29
82.6	83	2,115	Lorain	Grafton	Removes a point of inflection ("PI") in reroute around maple farm	ROW	10.6.1-30
Departs from Removed Section of Former Alignment West of 82.9	83.1	1,034	Lorain	Grafton	Avoids a maple farm and minimizes mature forest conversion	Field	10.6.1-31

TABLE 10.6-1

Route Variations Incorporated into the NEXUS Project Pipeline Route

Start MP	End MP	Length of Variation (Feet)	County (or Counties)	Town (or Towns)	Supporting Reason(s) for Variation	Data Sources Reviewed in Route Variation Analyses a/	Figure Number
84.3	85.1	4,019	Lorain	LaGrange	Avoids traversing two existing pipelines	LIDAR/ ROW	10.6.1-32
Departs from Removed Section of Former Alignment North of 88	Joined at Removed Section of Former Alignment North of 88.4	2,299	Lorain	LaGrange, Pittsfield	Avoids wetland and portion of a Lorain County Metro Park	Field/ROW	10.6.1-33
Departs from Removed Section of Former Alignment North of 88.4	89.3	4,452	Lorain	Pittsfield	Avoids passing within 660 feet of an active eagle nest and minimizes stream crossing impacts	Field/ODNR	10.6.1-34
89.3	89.9	3,119	Lorain	Pittsfield	Avoids a Class III wetland or a high scoring class II wetland and minimizes mature forest clearing	NWI/Field	10.6.1-35
90.3	91	3,463	Lorain	Pittsfield, Russia	Minimizes crossings of existing pipeline	Field/ROW	10.6.1-36
Departs from Removed Section of Former Alignment East of 90.9	Joined at Removed Section of Former Alignment North of 92.2	9,059	Lorain	Russia	Avoids a confluence of five existing pipelines and avoids Black Swamp Woods conservation easement and its constituent conservation site (maple-ash-oak swamp)	Field/Aerial/ ROW	10.6.1-37
91.1	91.4	1,504	Lorain	Russia	Avoids passing within 660 feet of an active eagle nest	Field/ODNR	10.6.1-38
94.5	96	7,993	Lorain	Henrietta	Reroute to shift pipeline further from residences	ROW	10.6.1-39
96.4	99.3	15,511	Lorain, Erie	Henrietta Township (L), Florence Township (E)	Avoids crossing through a large section of an ODNR-mapped rare habitat (beech-sugar maple forest) and avoids a large area of forested wetland and upland. The variation will also reduce the crossing length through a conservation property owned by the Girl Scouts of America	Field/NWI/ NHD/ ODNR	10.6.1-40

TABLE 10.6-1

Route Variations Incorporated into the NEXUS Project Pipeline Route

Start MP	End MP	Length of Variation (Feet)	County (or Counties)	Town (or Towns)	Supporting Reason(s) for Variation	Data Sources Reviewed in Route Variation Analyses a/	Figure Number
100.6	107	34,558	Erie	Florence, Berlin	Variation shifts alignment further away from residences	ROW	10.6.1-41
109	110.3	5,839	Erie	Berlin	Avoids two barns and avoids approximately 290 feet of crossing distance through a FEMA-mapped floodplain	NWI/ROW/ LIDAR/ FEMA	10.6.1-42
110.3	111.2	4,564	Erie	Berlin, Milan	Variation shifts alignment further away from residences	ROW/ LIDAR	10.6.1-43
112.6	112.9	1,595	Erie	Milan	Eliminates a PI prior to the HDD crossing of the Huron River	ROW/ LIDAR	10.6.1-44
114.2	114.7	2,229	Erie	Milan	Avoids an active private shooting range	Aerial/FEMA	10.6.1-45
115.5	117.5	10,475	Erie	Milan, Oxford	Variation avoids powerline and pond, and shifts alignment further from residence	Field/ROW/ LIDAR	10.6.1-46
126.1	126.7	3,138	Erie	Groton	Variation avoids passing between two residences while paralleling an existing pipeline ROW	ROW	10.6.1-47
127.1	129	9,749	Sandusky	Townsend	Creates a right-angle crossing at I-90	Aerial/ LIDAR	10.6.1-48
134.5	135	2,462	Sandusky	Riley	Avoids a waste management facility (property has various test wells within its boundaries), avoids paralleling a large stream and minimizes wetland impacts	Field/Aerial	10.6.1-49
136.4	137.9	8,133	Sandusky	Riley	Variation avoids an existing bridge and shortens overall alignment	ROW/Field	10.6.1-50
143.3	145.2	10,247	Sandusky	Sandusky	Variation removes a PI and shortens overall alignment	ROW	10.6.1-51
148.8	149.7	4,709	Sandusky	Washington	Avoids Black Swamp Conservancy easement and avoids paralleling small	Aerial/NWI/ NHD/ Public lands data	10.6.1-52

TABLE 10.6-1

Route Variations Incorporated into the NEXUS Project Pipeline Route

Start MP	End MP	Length of Variation (Feet)	County (or Counties)	Town (or Towns)	Supporting Reason(s) for Variation	Data Sources Reviewed in Route Variation Analyses a/	Figure Number
					stream for approximately 1,164 linear feet		
150.1	150.8	3,822	Sandusky	Washington	Avoids Black Swamp Conservatory easement	Public lands data	10.6.1-53
150.9	152.3	7,069	Sandusky	Washington	Avoids Black Swamp Conservatory easement	Public lands data	10.6.1-54
156.3	157.8	7,740	Sandusky	Woodville	Avoids crossing over two existing pipelines and minimizes impacts on wetland	NWI/Aerial/ ROW	10.6.1-55
160.3	160.5	1,065	Wood	Troy	Avoids an electric transmission line tower	ROW	10.6.1-56
161.6	161.9	1,377	Wood	Troy	Variation to cross railroad at a 90 degree angle	ROW	10.6.1-57
171.4	171.8	2,284	Wood	Middleton	Variation shifts alignment further from residences	ROW	10.6.1-58
173.9	175.5	7,967	Wood	Middleton	Reduces powerline and road crossings and shifts alignment further from residences	ROW	10.6.1-59
175.9	177.5	8,527	Wood, Lucas	Washington, Waterville	Straighten the HDD under the Maumee River.	NWI/LIDAR/ ROW	10.6.1-60
178	179.6	8,330	Lucas	Waterville	Provides right-angle crossings for Highway 24 and Hertzfeld Road reducing crossing distance	ROW/Aerial	10.6.1-61
181	195.3	76,929	Lucas, Fulton	Providence, Swan Creek, Fulton	Variation avoids multiple OEPA Category III wetlands, road and pipeline crossings, and reroutes around the town of Swanton.	Field/NWI/ ODNR	10.6.1-62
Departs from Removed Section of Former Alignment East of 191.9	Joined at Removed Section of Former Alignment East of 194.9	11,141	Fulton	Swan Creek, Fulton	Avoids residences, creates a right-angle crossing at roads and railroad, avoids electrical substation and avoids 944 linear feet of forested upland	Field/NHD/ NWI/Aerial	10.6.1-63

TABLE 10.6-1

Route Variations Incorporated into the NEXUS Project Pipeline Route

Start MP	End MP	Length of Variation (Feet)	County (or Counties)	Town (or Towns)	Supporting Reason(s) for Variation	Data Sources Reviewed in Route Variation Analyses a/	Figure Number
196.2	196.4	1,318	Fulton	Fulton	Variation avoids crossing through a residence	Field/ROW	10.6.1-64
196.2	196.4	985	Fulton	Fulton	Variation moves alignment further from residence	ROW	10.6.1-65
200.6	Joined at Removed Section of Former Alignment East of 201.4	4,487	Fulton	Amboy	Variation removes two powerline crossings and multiple PIs; shortens overall alignment	ROW	10.6.1-66
Departs from Removed Section of Former Alignment East of 201.4	Joined at Removed Section of Former Alignment East of 202.4	5,353	Fulton	Amboy	Variation avoids the Metamora Water Facility and two likely TRO land tracts	ROW	10.6.1-67
202.4	203.1	4,031	Fulton, OH Lenawee, MI	Amboy, Ogden	Avoids powerline crossings and removes a PI	ROW/Aerial	10.6.1-68
208.8	East 210.1	6,737	Lenawee	Ogden, Palmyra	Reduces forest clearing adjacent to the Raisin River	LIDAR/NWI/ Field	10.6.1-69
209.7	211.1	7,789	Lenawee	Ogden, Palmyra	Removes PIs and reduces length of the alignment.	ROW/ LIDAR	10.6.1-70
211.4	211.6	1,083	Lenawee	Palmyra	Avoids a residence	ROW/ LIDAR	10.6.1-71
215.6	219.3	19,361	Lenawee	Blissfield, Deerfield, Ridgeway	Avoids crossing existing utilities and collocates with existing pipelines	ROW/ LIDAR	10.6.1-72
227.3	229.1	8,604	Monroe	Milan	Variation crosses railroad at 90° angle and avoids crossing existing pipelines	ROW/ LIDAR	10.6.1-73
231.2	232.6	6,784	Washtenaw	York	Reduces forest clearing adjacent to the Saline River	Aerial/Field	10.6.1-74
235.8	236	1,067	Washtenaw	Augusta	Avoids crossing through a residence and a garage	ROW/ LIDAR	10.6.1-75
241	243	13,086	Washtenaw	Augusta, Ypsilanti	Avoids residences and waterbodies; avoids street lay adjacent to a school,	ROW/Field/ LIDAR	10.6.1-76

TABLE 10.6-1

Route Variations Incorporated into the NEXUS Project Pipeline Route

Start MP	End MP	Length of Variation (Feet)	County (or Counties)	Town (or Towns)	Supporting Reason(s) for Variation	Data Sources Reviewed in Route Variation Analyses a/	Figure Number
					church, cemetery and several neighborhoods		
243.4	Joined at Removed Section of Former Alignment West of 244.6	6,171	Washtenaw	Ypsilanti	Avoids street lay constraints associated with existing underground utilities	ROW/Field/ LIDAR	10.6.1-77
244.6	245.6	3,850	Washtenaw	Ypsilanti	Variation to former alignment and HDD location across the Maumee River to avoid parkland, river crossing, HVAC lines, existing pipelines, water mains, water towers, a dam, and nearby roads.	ROW/ LIDAR/Field	10.6.1-78
246.1	246.2	590	Washtenaw	Ypsilanti	Minor alteration to avoid existing salvage yard.	ROW/ LIDAR/ Aerial	10.6.1-79

a/ Pipeline alignment planning decisions were based on a number of data sources including onsite assessment of project constraints (in some areas) along with review of the NEXUS Project Geographic Information System (GIS) database. The database includes information collected from commercial, municipal, state, federal, educational, and conservation sources. Additionally, data sources particularly pertinent to the minor route variations described in Resource Report 10 include:

Aerial = 2014 Aerial Photography interpretation
FEMA = Federal Emergency Management Agencies National Flood Insurance Rate Maps
Field= NEXUS resource field surveys
LIDAR = (light detection and ranging) – remote sensing technology providing three-dimensional surface data from aerial reconnaissance
NHD = National Hydrography Dataset (NRCS)
NWI = National Wetlands Inventory (USFWS)
ODNR = Ohio Department of Natural Resources
ROW = right-of-way agents and/or landowner contact

TABLE 10.7.1-1

Comparison of Potential NEXUS Compressor Station Alternatives

Property and Resources Evaluated	Compressor Station 1			Compressor Station 2			Compressor Station 3			Compressor Station 4		
	Alt. 1 (Currently Preferred Site)	**Alt. 2**	**Alt. 3**	**Alt. 1** (Currently Preferred Site)	**Alt. 2**	**Alt. 3**	**Alt. 1**	**Alt. 2**	**Alt. 3** (Currently Preferred Site)	**Alt. 1**	**Alt. 2** (Currently Preferred Site)	**Alt. 3**
Approximate Milepost	1.25	3.14	3.25	60.1	61.8	62.9	124.2	127.0	129.3	177.7 (south)	177.7 (north)	181
Property Size (approx. acres)	116.3	37.5	54.8	75.3	59.4	36.4	53.6	67.9	59.7	40.1	37.7	78.8
Wetlands (acres) a/	0.9	0	0 (*estimated*)	0.7	1.6	0.7	0	0 (*estimated*)	0	0.1	0	7.6
Streams (linear feet) b/	1,157	0	0 (*estimated*)	0	2,148	138	0	0 (*estimated*)	0	656	332	2,517
Predominant Land Uses (approx. % of property)												
Agricultural	87%	83%	40%	80%	71%	86%	93%	100%	100%	100%	100%	81%
Forest/Wood-land	13%	17%	45%	15%	22%	14%	-	-	-	-	-	19%
Open Land	-	-	15%	-	7%	-	-	-	-	-	-	-
Residential	-	-	-	5%	-	-	7%	-	-	-	-	-
Distance from Property to Pipeline (feet)	0 (intersects)	200	75	0 (intersects)	0 (intersects)	0 (intersects)	0 (intersects)	0 (intersects)	0 (intersects)	0 (intersects)	0 (intersects)	0 (intersects)
Prime Farmland Soils (approx. % of total property)												
Prime	22%	16%	-	56%	>1%	33%	10%	12%	>1%	-	-	3%

TABLE 10.7.1-1

Comparison of Potential NEXUS Compressor Station Alternatives

Property and Resources Evaluated	Compressor Station 1			Compressor Station 2			Compressor Station 3			Compressor Station 4		
	Alt. 1 (Currently Preferred Site)	**Alt. 2**	**Alt. 3**	**Alt. 1** (Currently Preferred Site)	**Alt. 2**	**Alt. 3**	**Alt. 1**	**Alt. 2**	**Alt. 3** (Currently Preferred Site)	**Alt. 1**	**Alt. 2** (Currently Preferred Site)	**Alt. 3**
Prime if drained	-	-	-	39%	76%	35%	87%	88%	100%	100%	100%	76%
Prime if drained and protected from flooding	1%	-	-	-	10%	1%	-	-	-	-	-	-
Prime if protected from flooding	-	-	-	-	-	-	-	-	-	-	-	-
Total % of Actual or Potential Prime Soils	23%	16%	-	75%	87%	69%	97%	100%	100%	100%	100%	79%
Critical Habitat, Federal T&E Species c/	potential habitat for NLEB; other T&E TBD upon further review	potential habitat for NLEB; other T&E TBD upon further and review	potential habitat for NLEB; other T&E TBD upon further review	None identified; TBD upon further review	potential habitat for NLEB and IBat; other T&E TBD upon further review	potential habitat for NLEB and IBat; other T&E TBD upon further review	potential habitat for NLEB and IBat; other T&E TBD upon further review	None identified; TBD upon further review	None identified; TBD upon further review	None identified; TBD upon further review	None identified; TBD upon further review	None identified; TBD upon further review
Cultural Resources Onsite	No	No	No	No	No	No	No	No	No	No	No	No
Approx. Number of NSAs within ½-mile of Property	89	27	33	73	79 (campground to southwest assessed as one NSA)	54	33	31	34	16	28	41

TABLE 10.7.1-1

Comparison of Potential NEXUS Compressor Station Alternatives

Property and Resources Evaluated	Compressor Station 1			Compressor Station 2			Compressor Station 3			Compressor Station 4		
	Alt. 1 (Currently Preferred Site)	**Alt. 2**	**Alt. 3**	**Alt. 1** (Currently Preferred Site)	**Alt. 2**	**Alt. 3**	**Alt. 1**	**Alt. 2**	**Alt. 3** (Currently Preferred Site)	**Alt. 1**	**Alt. 2** (Currently Preferred Site)	**Alt. 3**
Nearest NSA To Property Boundary (approx. feet) d/	60	350	180	0 (farmhouse on property)	112	615	0 (farmhouse on property)	40 (farmhouse on outparcel)	25 (house on outparcel)	1,085	650	158
Preliminary Visual Impact Assessment	Visible from OH 644	Visible from Buffalo and Campbell Roads Potentially visible from Ellyson Road	Visible from Buffalo and Myers Roads Potentially visible from Mardis Road	-Visible from Guilford Road and US-224/I-76 and Guilford Road - Potentially visible from Route 118 (Blake Road) and Route 97 (Greenwich Road)	- Visible from Guilford Road - Potentially visible from Route 118 (Blake Road) and Good Road	- Visible from I-71, Good Road, Hubbard Valley Road - Potentially visible from Route 3 (Wooster Pike)	- Visible from I-80/90, Billings Road, Route 13 (Mason Road), Deyo Road, and Route 32 (Portland Road)	- Visible from I-90/80, Northwest Road, County Road 235, Dining Road, OH 269, and OH 101	- Visible from I-90/80, North County Roads 278, 294 and 302, OH-101, and County Road 237	-Visible from US 24, Route 221 (Hertzfeld Road), Route 136 (Neapolis Waterville Road), Route 143, and Moosman Drive - Potentially visible from Norward Road, and Blue Creek Park	-Visible from US 24, Route 221 (Hertzfeld Road), Route 136 (Neapolis Waterville Road), Norward Road, and Moosman Drive - Potentially visible from Route 143) , and Blue Creek Park	- Visible from Route 136 (Neapolis Waterville Road), Route 295 (Berkey Southern Road), Yawberg Road, and Route 142 (Doran Road) - potentially visible from Blue Creek Park

TABLE 10.7.1-1

Comparison of Potential NEXUS Compressor Station Alternatives

Property and Resources Evaluated	Compressor Station 1			Compressor Station 2			Compressor Station 3			Compressor Station 4		
	Alt. 1 (Currently Preferred Site)	**Alt. 2**	**Alt. 3**	**Alt. 1** (Currently Preferred Site)	**Alt. 2**	**Alt. 3**	**Alt. 1**	**Alt. 2**	**Alt. 3** (Currently Preferred Site)	**Alt. 1**	**Alt. 2** (Currently Preferred Site)	**Alt. 3**

a/ Unless noted, wetlands were field delineated. The term "estimated" means resource areas were estimated based on aerial photo interpretation or Project GIS datasets (in most cases because land access was not authorized in time for this report.) The acreage provided includes all wetland areas within the boundary of the proposed or alternative compressor station site and does not correlate with potential impacts. These data, if applicable, will be included in the next filing of Resource Report 10 when compressor station engineering designs have progressed.

b/ Unless noted, streams were field delineated. The term "estimated" means resource areas were estimated based on aerial photo interpretation or Project GIS datasets (in most cases because land access for field surveys was not authorized in time for this report.) The linear footage provided includes all stream lengths within the boundary of the proposed or alternative compressor station site and does not correlate with potential impacts. These data, if applicable, will be included in the next filing of Resource Report 10 when compressor station engineering designs have progressed.

c/ T&E = Threatened & Endangered
TBD = To Be Determined
NLEB = Northern Long Eared Bat (*Myotis septentrionalis*)
IBat = Indiana Bat (*Myotis sodalis*)

d/ NSA is noise sensitive areas. Physical locations (i.e., construction footprint) of compressor station facilities within alternative sites are TBD, the measurements for this early analysis of NSAs are measured from the property lines of the site being described herein.