ATLANTIC COAST PIPELINE, LLC
ATLANTIC COAST PIPELINE
Docket No. PF15-6-000

and

DOMINION TRANSMISSION, INC.
SUPPLY HEADER PROJECT
Docket No. PF15-5-000

Resource Report 10
Alternatives

Draft

Prepared by

an ERM Group company

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Summary of Required Federal Energy Regulatory Commission Report Information

Minimum Filing Requirements:	Report Section Reference
1. Address the "no action" alternative. (§ 380.12(l)(1)) • Discuss the costs and benefits associated with the alternative.	Section 10.3
2. For large projects, address the effect of energy conservation or energy alternatives to the project. (§ 380.12(i)(1))	Sections 10.4 and 10.5
3. Identify system alternatives considered during the identification of the project and provide the rationale for rejecting each alternative. (§ 380.12(l)(1)) • Discuss the costs and benefits associated with each alternative.	Section 10.6
4. 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. (§ 380.12(l)(2)(ii)) • For onshore projects new to offshore areas, be sure to address alternatives using offshore routings.	Sections 10.7, 10.8, 10.9, and 10.10
5. 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. (§ 380.12(l)(2)(ii))	Section 10.11

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LIST OF ACRONYMS AND ABBREVIATIONS

ACP	Atlantic Coast Pipeline
AGL	AGL Resources, Inc.
Atlantic	Atlantic Coast Pipeline, LLC
bcf/d	billion cubic feet per day
Certificate	Certificate of Public Convenience and Necessity
CFR	Code of Federal Regulations
Columbia	Columbia Gas Transmission, LLC
Commission	Federal Energy Regulatory Commission
DOE	U.S. Department of Energy
Dominion	Dominion Resources, Inc.
DOMSP	Dominion South Point
DOT	State/Commonwealth Department of Transportation
Dth/d	dekatherms per day
DTI	Dominion Transmission, Inc.
Duke Energy	Duke Energy Corporation
DVP	Dominion Virginia Power
East Tennessee	East Tennessee Natural Gas, LLC
EIA	U.S. Energy Information Administration
ER	Environmental Report
FERC	Federal Energy Regulatory Commission
FWS	U.S. Fish and Wildlife Service
GDS-NWR	Great Dismal Swamp National Wildlife Refuge
GIS	geographic information system
GWNF	George Washington National Forest
I-295	Interstate 295
I-64	Interstate 64
I-77	Interstate 77
I-79	Interstate 79
I-95	Interstate 95
kV	kilovolt
kw	kilowatt
kwh/m^2/d	kilowatt hours per square meter per day
M&R	metering and regulating
mcf	thousand cubic feet
mcf/d	thousand cubic feet per day
MNF	Monongahela National Forest
Mountain Valley	Mountain Valley, LLC
MP	milepost
MPC	Monongahela Power Company
MVP	Mountain Valley Pipeline
mw	megawatt
mwh	megawatt hours
mwh/d	megawatt-hours per day
NPS	National Park Service
NRA	National Recreation Area

NRCS	Natural Resources Conservation Service
PEC	Progress Energy Carolinas, LLC
Piedmont	Piedmont Natural Gas Co., Inc.
PNBP	Petersburg National Battlefield Park
Projects	Atlantic Coast Pipeline and Supply Header Project
SHP	Supply Header Project
SNP	Shenandoah National Park
Texas Eastern	Texas Eastern Transmission, LP
TNC	The Nature Conservancy
Transco	Transcontinental Gas Pipe Line Company, LLC
USDOT	U.S. Department of Transportation
USFS	U.S. Forest Service
VOF	Virginia Outdoors Foundation
WBWF	Ward Burton Wildlife Foundation
West Penn	West Penn Power

ATLANTIC COAST PIPELINE – Docket No. PF15-6-000 and
SUPPLY HEADER PROJECT – Docket No. PF15-5-000

10.0 RESOURCE REPORT 10 – ALTERNATIVES

Atlantic Coast Pipeline

Atlantic Coast Pipeline, LLC (Atlantic) is a company formed by four major U.S. energy companies – Dominion Resources, Inc. (Dominion; NYSE: D), Duke Energy Corporation (Duke Energy; NYSE: DUK), Piedmont Natural Gas Co., Inc. (Piedmont; NYSE: PNY), and AGL Resources, Inc. (AGL; NYSE: GAS). The company was created to develop, own, and operate the proposed Atlantic Coast Pipeline (ACP), an approximately 556-mile-long, interstate natural gas transmission pipeline system designed to meet growing energy needs in Virginia and North Carolina. The ACP will be capable of delivering 1.5 billion cubic feet per day (bcf/d) [1] of natural gas to be used to generate electricity, heat homes, and run local businesses. The underground pipeline Project will facilitate cleaner air, increase the reliability and security of natural gas supplies, and provide a significant economic boost in West Virginia, Virginia, and North Carolina. More information is provided at the company's website at www.dom.com/acpipeline. Atlantic has contracted with Dominion Transmission, Inc. (DTI), a subsidiary of Dominion, to permit, build, and operate the ACP on behalf of Atlantic. [2]

Atlantic is seeking authorization from the Federal Energy Regulatory Commission (FERC or Commission) under Section 7(c) of the Natural Gas Act to construct, own, operate, and maintain the following proposed facilities for the ACP:

Mainline Pipeline Facilities:

- AP-1: approximately 292.8 miles of 42-inch outside diameter natural gas transmission pipeline in Harrison, Lewis, Upshur, Randolph, and Pocahontas Counties, West Virginia; Highland, Augusta, Nelson, Buckingham, Cumberland, Prince Edward, Nottoway, Dinwiddie, Brunswick, and Greensville Counties, Virginia; and Northampton County, North Carolina.
- AP-2: approximately 181.5 miles of 36-inch outside diameter natural gas transmission pipeline in Northampton, Halifax, Nash, Wilson, Johnston, Sampson, Cumberland, and Robeson Counties, North Carolina.

Lateral Pipeline Facilities:

- AP-3: approximately 77.6 miles of 20-inch outside diameter natural gas lateral pipeline in Northampton County, North Carolina; and Greensville and Southampton Counties and the Cities of Suffolk and Chesapeake, Virginia.

[1] The 1.5 bcf/d is equivalent to approximately 1.5 million dekatherms per day (Dth/d). The bcf/d unit of measurement is used to refer to the capacity of the ACP system. The Dth/d measurement is used to refer to contractual obligations (as set forth in Table 1.2-1).

[2] As described in this report, DTI actions associated with the ACP are on behalf of Atlantic.

- AP-4: approximately 3.1 miles of 16-inch outside diameter natural gas lateral pipeline in Brunswick County, Virginia.
- AP-5: approximately 1.0 mile of 16-inch outside diameter natural gas lateral pipeline in Greensville County, Virginia.

Compressor Station Facilities:

- Compressor Station 1: a new, natural gas-fired compressor station approximately at milepost (MP) 6.8 of the AP-1 mainline in Lewis County, West Virginia.
- Compressor Station 2: a new, natural gas-fired compressor station approximately at MP 186.0 of the AP-1 mainline in Buckingham County, Virginia.
- Compressor Station 3: a new natural gas-fired compressor station approximately at MP 292.8 of the AP-1 mainline in Northampton County, North Carolina.

Other Aboveground Facilities:

- Nine new metering and regulating (M&R) stations at receipt and/or delivery points along the new pipelines (including one at Compressor Station 1 and one at Compressor Station 2).
- Twenty-nine valve sites at select points along the new pipelines at intervals specified by U.S. Department of Transportation (USDOT) regulations at Title 49 Code of Federal Regulations (CFR) Part 192.
- Eight sets of pig launcher and/or receiver sites at 11 points along the new pipelines (including launcher/receiver sites at Compressor Stations 2 and 3).

As required by 18 CFR 380.12, Atlantic is submitting this Environmental Report (ER) in support of its Application to the Commission for a Certificate of Public Convenience and Necessity (Certificate) to construct and operate the proposed ACP facilities.

Supply Header Project

DTI proposes to construct and operate approximately 36.7 miles of pipeline loop and modify existing compression facilities in Pennsylvania and West Virginia. This Project, referred to as the Supply Header Project (SHP), will enable DTI to provide firm transportation service of up to 1.5 bcf/d to various customers, including Atlantic. Atlantic will be a Foundation Shipper in the SHP, and will utilize the SHP capacity to allow its shippers access to natural gas supplies from various DTI receipt points for further delivery to points along the ACP.

DTI is seeking authorization from the FERC under Section 7(c) of the Natural Gas Act to construct, own, operate, and maintain the following proposed facilities for the SHP:

Pipeline Loops:

- TL-636: approximately 3.9 miles of 30-inch outside diameter natural gas pipeline looping DTI's existing LN-25 pipeline in Westmoreland County, Pennsylvania.

- TL-635: approximately 32.8 miles of 36-inch outside diameter natural gas pipeline looping DTI's existing TL-360 pipeline in Harrison, Doddridge, Tyler, and Wetzel Counties, West Virginia.

Compressor Station Modifications:

- JB Tonkin Compressor Station: modifications at DTI's existing JB Tonkin Compressor Station in Westmoreland County, Pennsylvania.
- Crayne Compressor Station: modifications at DTI's existing Crayne Compressor Station in Greene County, Pennsylvania.
- Burch Ridge Compressor Station: crossover piping at DTI's existing Burch Ridge Compressor Station in Marshall County, West Virginia.
- Mockingbird Hill Compressor Station: modifications at or near DTI's existing Mockingbird Hill Compressor Station in Wetzel County, West Virginia.

Other Aboveground Facilities:

- Five valve sites at select points along the new pipeline loops at intervals specified by USDOT regulations at 49 CFR 192.
- Two sets of pig launcher and receiver sites at the ends of each of the new pipeline loops.

As required by 18 CFR 380.12, DTI is submitting this ER in support of its Application to the Commission for a Certificate to construct and operate the proposed SHP facilities.

Scope of Resource Report 10

This Resource Report is required for all applications and describes alternatives which were considered during the identification of the Projects, including a comparison of the potential environmental impacts of such alternatives to those of the Projects. The alternatives considered include no-action, alternative systems, and conservation or alternative energy sources.

10.1 INTRODUCTION

Atlantic and DTI identified and evaluated a number of alternatives to the proposed Projects. These include a no-action alternative; alternative energy sources, including traditional and renewable sources; energy conservation measures; system alternatives; conceptual collocation route alternatives; major route alternatives; minor route variations; minor route adjustments; and alternative aboveground facility sites. The review of alternatives included an assessment and comparison of a number of factors, including technical and economic feasibility, constructability, environmental impact, ability to meet the purpose and need of the Projects, and input from stakeholders, including Federal land managing agencies, Federal and State/Commonwealth resource agencies, and landowners.

As a result of desktop analyses and field surveys, Atlantic and DTI identified a number of route alternatives and variations along the proposed pipeline routes to avoid or minimize

crossings of sensitive environmental features or to address engineering or other issues. These route alternatives and variations were incorporated into the proposed pipeline routes as described in detail below. Additional route alternatives or variations may be considered to address issues identified as a result of ongoing environmental and civil field surveys, engineering design work, agency consultations, landowner communications, or other stakeholder input. Information on additional route alternatives or variations identified and evaluated by Atlantic and DTI will be described in the final Resource Report 10.

10.2 SYSTEM DESCRIPTION

The Projects were designed based on customer requirements and precedent agreements which specify the locations of receipt and delivery points on the ACP (see Table 1.2-1 in Resource Report 1). The locations of these points were designed to enhance transportation capabilities on the ACP based on a combination of flow dynamics relative to receipts and deliveries of natural gas into and out of the system. In particular, Atlantic's precedent agreements with its customers specify the following:

- Three customers (Duke Energy Progress, Inc., Duke Energy Carolinas, LLC, and Piedmont Natural Gas Company) identified the existing Transcontinental Gas Pipe Line Company, LLC (Transco) system as a primary receipt point with an interconnection in Buckingham County, Virginia.

- Four customers (Duke Energy Progress, Inc., Duke Energy Carolinas, LLC, Piedmont, and Virginia Power Services, Inc.) identified the existing Transco system as a primary delivery point with an interconnection in Buckingham County, Virginia.

- Two customers (Virginia Natural Gas, Inc. and Virginia Power Services, Inc.) identified an interconnection with the existing Virginia Natural Gas system in the City of Chesapeake, Virginia as a primary delivery point.

- One customer (Virginia Power Services, Inc.) identified the existing Columbia Gas Transmission system as a primary delivery point with an interconnection in Randolph County, West Virginia.

- One customer (Virginia Power Services, Inc.) identified one of its facilities currently under construction as a primary delivery point with an interconnection in Brunswick County, Virginia,

- One customer (Virginia Power Services, Inc.) identified the proposed site for one of its facilities as a primary delivery point with an interconnection in Greensville County, Virginia.

Deliveries out of the ACP and into the existing customer systems were similarly designed to enhance the delivery capabilities of the existing customer systems. For example, the three proposed delivery points to the Piedmont system (i.e., the Smithfield, Fayetteville, and Pembroke M&R Stations) are critical points to allow for the efficient distribution of the requested volumes of natural gas into the Piedmont and Duke Energy systems and subsequently into the Public Service Company of North Carolina's system. A change in the delivery points and required

pressures would have a negative impact on Piedmont's ability to deliver gas to Duke Energy and other customers, which would result in reduced volumes of natural gas on Piedmont's system or require additional infrastructure to accommodate the requested volumes of natural gas.

With regard to the SHP, one of the critical requirements of Atlantic's customers is to have access to a low cost supply hub with a large volume of transactions characterized by multiple buyers and sellers willing to trade natural gas on a daily basis and into the futures market (liquidity). Dominion South Point (DOMSP), which is representative of transactions on the DTI pipeline system south of Armstrong County, Pennsylvania, is one of the most highly liquid trading hubs in America, far surpassing most others in the area. This significant liquidity continues to expand with the abundance of production and processing volumes in West Virginia, Pennsylvania, and Ohio. DOMSP trades at a significant discount to the Henry Hub, a nationally significant distribution hub located in Louisiana. Going forward, it is expected that DOMSP will continue to trade at a deep discount to the Henry Hub. [3]

The SHP facilities are designed to provide Atlantic's customers with access to DOMSP in addition to other physical interconnecting entities. This will allow Atlantic's end-use customers to control a diverse suite of supply options providing them access to physical interconnects with upstream suppliers. Based on these factors, the SHP facilities must be integrated into the footprint of the physical points that comprise DOMSP.

10.3 NO-ACTION ALTERNATIVE

Through a competitive process, the ACP was selected as the preferred Project to supply natural gas from supply points in Ohio, West Virginia, and Pennsylvania to specified delivery points for existing customers in both Virginia and North Carolina. On April 2, 2014, Duke Energy and Piedmont distributed a Request for Firm Gas Transportation Service Proposal to 12 Interstate Pipelines. In response to this proposal, Dominion held a non-binding Open Season from April 16 to May 9, 2014 which announced Dominion's intent to pursue the then titled Southeast Reliability Project, to be owned either through DTI or a new interstate natural gas pipeline subsidiary. A final offer proposed the pipeline to be built as a joint venture between the Foundation Shippers and Dominion.

On June 11, 2014, Dominion submitted a proposal that would establish a new interstate natural gas pipeline company providing geographically diverse and wholesale transportation services from the Mid-Atlantic supply regions to the North Carolina and Virginia markets. Dominion's proposal was one of four conforming proposals submitted by the proposal deadline. Dominion was notified by Duke Energy and Piedmont on July 10, 2014 that Dominion was selected to build the market-driven project to serve Piedmont and Duke Energy.

On June 2, 2014, Virginia Power Services Energy Corp., Inc. (a Dominion company) issued a Request for Proposal for Natural Gas Firm Transportation Service to serve Virginia. Dominion was notified by Virginia Power Services Energy Corp., Inc. on August 22, 2014 that Dominion was chosen to serve the load requested in the Request for Proposal.

On September 2, 2014, Dominion, Duke Energy, Piedmont Natural Gas, and AGL Resources, announced the formation of Atlantic to pursue the ACP. From October 21 through

[3] Source: BENTEK NE Market Call (April 2015).

November 10, 2014, Atlantic held a binding Open Season for the remaining unsubscribed capacity on the ACP. As noted in Resource Report 1, 1,360,000 dekatherms per day (Dth/d) (approximately 1.33 bcf/d) of the proposed 1.5 bcf/d capacity of the ACP is currently subscribed pursuant to precedent agreements with six customers. Similarly, Atlantic has committed to 1,360,000 Dth/d of the proposed 1.5 bcf/d capacity of the SHP.

Under the no-action alternative, neither the ACP nor the SHP would be built and the environmental impacts associated with construction and operation of the proposed facilities would not occur. By not constructing these Projects, however, Atlantic and DTI would be unable to meet their existing customers' demands for natural gas and the projected demand by other industrial, commercial, and domestic customers (including power-generating facilities) in Virginia and North Carolina. As described in Resource Report 1, the projected demand is due to a combination of population growth and displacement of coal-fired electric power generation. In addition, other benefits from the Projects, such as future economic development opportunities, reduced energy costs in the region, and the repowering of coal-fired electric generation to gas-fired electric generation, would not be realized.

Under the no-action alternative, other natural gas transmission companies could propose to construct new facilities similar to the Projects to meet the demand for new natural gas transportation service in Virginia and North Carolina. Such actions would likely result in impacts similar to or greater than those described in this ER for the ACP and SHP, and might not meet the Projects' objectives to satisfy demand from existing customers within the proposed time frames. For all these reasons, the no-action alternative is not practical and provides no advantage over the Projects.

10.4 ALTERNATIVE ENERGY SOURCES

The ACP and SHP are designed to provide for the transportation of natural gas from supply points in Ohio, West Virginia, and Pennsylvania to demand areas in Virginia, and North Carolina. The use of alternative energy sources is an option to meet some of the short-term and long-term demands for energy in the target market areas. Potential alternative energy sources to natural gas include traditional fuels, such as coal and oil, nuclear energy, and electricity (including electricity generated from oil, coal, and nuclear power); and renewable energy sources, such as wind, solar, hydroelectric, biomass, and tidal and wave. All of these alternative energy sources, depending on the location of the source, would require new infrastructure, including transmission facilities, to connect supply and demand areas.

10.4.1 Traditional Fuel Sources

10.4.1.1 Oil and Coal

Compared to other fossil fuels, natural gas is a relatively clean and efficient fuel. The use of coal-based or petroleum energy instead of natural gas would likely result in increased emissions of pollutants, such as nitrogen oxide, sulfur dioxide, and greenhouse gases (e.g., carbon dioxide). Additionally, coal-based energy creates large quantities of coal combustion byproducts (e.g., fly ash), which require environmental management and disposition. Because natural gas is a cleaner burning fuel than other fossil fuel alternatives, and does not require solid

waste disposal, the environmental impacts associated with increased use of coal or petroleum would likely exceed the impacts of the proposed Projects.

When compared to average air emissions for coal-fired power generation, natural gas-fired power generation produces approximately half as much carbon dioxide, less than a third as much nitrogen oxides, and less than one percent as much sulfur oxides at the power plant. When compared to average air emissions for oil-fired power generation, natural gas-fired power generation produces approximately two-thirds as much carbon dioxide, half as much nitrogen oxides, and less than one percent as much sulfur dioxides at the power plant (U.S. Environmental Protection Agency, 2014a). Therefore, coal-fired and oil-fired generation provides no environmental advantage over the ACP and SHP.

Another impact of increased use of petroleum and coal relative to natural gas is that volatility in natural gas pricing, particularly during periods of peak demand, could be exacerbated. As of May 2014, natural gas prices in Virginia and North Carolina were higher than the national average due to limited supply and increased demand. Citygate natural gas prices in Virginia and North Carolina, respectively, were 28.9 percent and 16.5 percent higher than the national average (U.S. Energy Information Administration (EIA), 2014a, 2014b). The proposed ACP and SHP would provide a reliable source of domestically produced natural gas, which could help stabilize natural gas prices during periods of peak demand.

The viability of increased use of coal as an alternative to natural gas could be further diminished by a rule proposed in June 2014 by the U.S. Environmental Protection Agency aimed at reducing carbon dioxide emissions from power generating facilities.[4] The proposed rule identifies fossil fuel electric utility generating units as the largest stationary sources of greenhouse gas emissions in the United States, and notes that coal-fired units are the largest emitters (U.S. Environmental Protection Agency, 2014b). The proposed rule provides guidelines to help the power sector achieve by 2030 reductions of approximately 30 percent from 2005 carbon dioxide emissions levels. A main component of the proposed rule is to encourage the conversion of aging base load coal-fired plants to a cleaner fuel source, such as natural gas. If the proposed rule becomes law, States/Commonwealths would be required to adopt a plan to meet tailored rate-based goals in carbon dioxide emissions, which could continue to spur conversions of coal-fired facilities to natural gas.

10.4.1.2 Nuclear Power

The Energy Policy Act of 2005 incorporated a range of measures to support current nuclear plants and provide incentives for building new nuclear facilities. In a projection by the EIA, nuclear power capacity will increase from 769 billion kilowatt-hours in 2012 to 811 billion kilowatt-hours in 2040, accounting for 16 percent of total electric generation. However, nuclear generating capacity will decrease from 102 gigawatts in 2012 to 98 gigawatts in 2020, as new construction and upgrades to existing nuclear facilities are offset by retirements of older facilities (EIA, 2014c).

[4] The Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, available online at https://www.federalregister.gov/articles/2014/06/18/2014-13726/carbon-pollution-emission-guidelines-for-existing-stationary-sources-electric-utility-generating).

In addition to the expected decline in generating capacity, nuclear power is a controversial source of energy. There are a number of environmental and regulatory challenges regarding safety, security, and the disposal of toxic materials (spent fuel) at nuclear facilities. Given these issues, as well as the high construction costs and long construction schedules for nuclear plants, it is unlikely that a new nuclear power facility and associated electric transmission lines could be sited and developed to provide power to demand areas in Virginia and North Carolina within the time frame proposed for the ACP and SHP. For these reasons, nuclear power is not a viable alternative to the proposed Projects.

10.4.2 Renewable Energy Sources

Renewable energy sources are expected to play an increasingly prominent role in meeting U.S. energy demands in the coming years. Federal, State/Commonwealth, and local incentives and continuing research will likely contribute to an increase in the availability and cost effectiveness of renewable sources such as wind, solar, hydroelectric, biomass, and tidal and wave. In a projection by the EIA, total U.S. electricity generation from renewable sources (excluding conventional hydropower) will increase from 12 percent in 2012 to 16 percent in 2040 (EIA, 2014c). Dominion Resources has invested and continues to invest in wind, solar, and biomass sources of generation as part of its overall generation portfolio and in accordance with its State/Commonwealth-approved Integrated Resource Plans. Nonetheless, significant long-term investment in new facilities would be necessary before renewable energy could potentially satisfy a substantial portion of the projected energy demand in Virginia and North Carolina.

According to the EIA (2014d and 2014e), approximately 1,000 cubic feet (1 mcf) of natural gas can reasonably be assumed to generate 0.127 megawatt hours (mwh) of electricity using standard power generating assumptions. The Projects would transport approximately 1.5 bcf/d of natural gas, which is the equivalent of 1,500,000 thousand cubic feet per day (mcf/d). If used to generate electricity, 1,500,000 mcf/d of natural gas would yield approximately 190,500 mwh per day (mwh/d) of electricity (1,500,000 mcf/d x 0.127 mwh per mcf of natural gas =190,500 mwh/d). [5] Most existing commercial wind facilities in the United States generate less than 1,000 mwh/d and most commercial solar facilities generate less than 500 mwh/d. To achieve a reasonable economy of scale relative to the Projects, massive investment in new renewable generating facilities would be required. [6]

The largest commercially available wind turbine from General Electric is a 4.1 megawatt (mw) nameplate rated turbine (General Electric, 2014). This turbine is intended for offshore use only, based on its large size and required minimum wind speeds. If this model turbine or a similarly rated turbine could be adapted for use on land, and if the turbine could operate 24 hours per day, 365 days per year at a capacity factor of 40 percent (an unreasonably optimistic assumption), each turbine would produce approximately 39.4 mwh/d (4.1 mw x 24 hours per day x a 0.4 capacity factor = 39.4 mwh/d per turbine) (EIA, 2014e). [7] Using the best-case scenario output, approximately 4,835 turbines would be needed to produce an equivalent amount of energy which could be supplied by the Projects (assuming the natural gas is used to generate

[5] This is based on a heat rate of 8,039 British thermal units per kilowatt hour, which is commensurate with a combined cycle natural gas fired power plant.

[6] Several people who attended the ACP Open Houses or filed comments with the FERC suggested that wind or solar power could be used to meet current and future demand for electricity in Virginia and North Carolina.

[7] The capacity factor of 40 percent is the highest annual capacity factor for wind generation given by the EIA (2014e).

electricity). Based on the unreasonably optimistic assumptions used, the number of turbines actually required to produce an equivalent amount of energy would be substantially higher.

According to the National Renewable Energy Laboratory (2009), the average direct impact area (i.e., the area of direct surface disruption due to construction and operation of new facilities) needed to generate 1 mw of wind energy is approximately 2.5 acres. The average total impact area (i.e., the area within the footprint of an operating wind facility) needed to generate 1 mw of wind energy is approximately 84 acres. Using these estimates, approximately 12,088 acres of direct impact area (2.5 acres per mw x 4,835 turbines) and 406,140 acres of total impact area (84 acres x 4,835 turbines) would be required to generate 190,500 mwh/d of wind electricity.

Construction of the Projects would affect approximately 14,105 acres, of which approximately 8,360 acres would be retained for operation of the proposed facilities. For new natural gas-fired electricity generation, Atlantic and DTI estimate an average of about 30 mw of nameplate capacity installed per acre for facilities with a generating capacity of at least 600 mw. Using this estimate, approximately 265 acres of land would be required to generate 190,500 mwh/d (190,500 mwh/d / 24 hours = 7,938 mw of nameplate generation capacity installed; 7,938 mw / 30 mw per acre = 265 acres). Based on these estimates, the area required to install the Projects plus the area required to install new, natural gas-fired power plants is less than the area required to install and operate wind facilities that could produce an equivalent amount of energy.

In addition to greater land requirements, the cost to install 4,835 wind turbines would be higher than the cost to install the Projects plus the additional cost of installing new, natural gas-fired electric generating facilities. According to Windustry (2014), a nonprofit organization which supports and promotes the installation of renewable wind energy, the general cost to install commercial scale wind projects as of early 2013 ranged from $1.2 to $2.2 million dollars per mw of nameplate capacity installed. This range in price is based upon the varied installation costs as well as the amount of new infrastructure required to connect a commercial scale wind farm to the utility grid, such as additional transmission lines and access roads.

Based upon the best-case wind generation scenario described above, 4,835 turbines at 4.1 nameplate mw per turbine would produce 19,824 nameplate mw (4,835 turbines x 4.1 nameplate mw = 19,824 nameplate mw). At this scale, assuming the cost of installation drops to about $1.0 million dollars per mw (which is cheaper than the best-case assumption), the total cost of installation would be approximately $19.8 billion dollars (19,824 nameplate mw x $1,000,000 dollars = $19,824,000,000 dollars). The EIA (2013) provides higher estimates for the cost to install wind generating facilities at approximately $2.2 million dollars per mw ($2,213 per kw) for onshore facilities and approximately $6.2 million dollars per mw ($6,230 per kw) for offshore facilities.

Atlantic and DTI estimate a cost of about $5.5 billion dollars to construct the Projects. According to the EIA (2013), the average cost to build an advanced, combined-cycle, natural gas-fired electric generating facility is about $1.0 million dollars per mw of nameplate capacity installed (approximately $1,023 per kw). Using this estimate, the cost required to install 7,938 mw of nameplate capacity (which is equivalent to 190,500 mwh/d) would be approximately $8.1 billion dollars ($1,023,000 per mw installed x 7,938 mw of nameplate

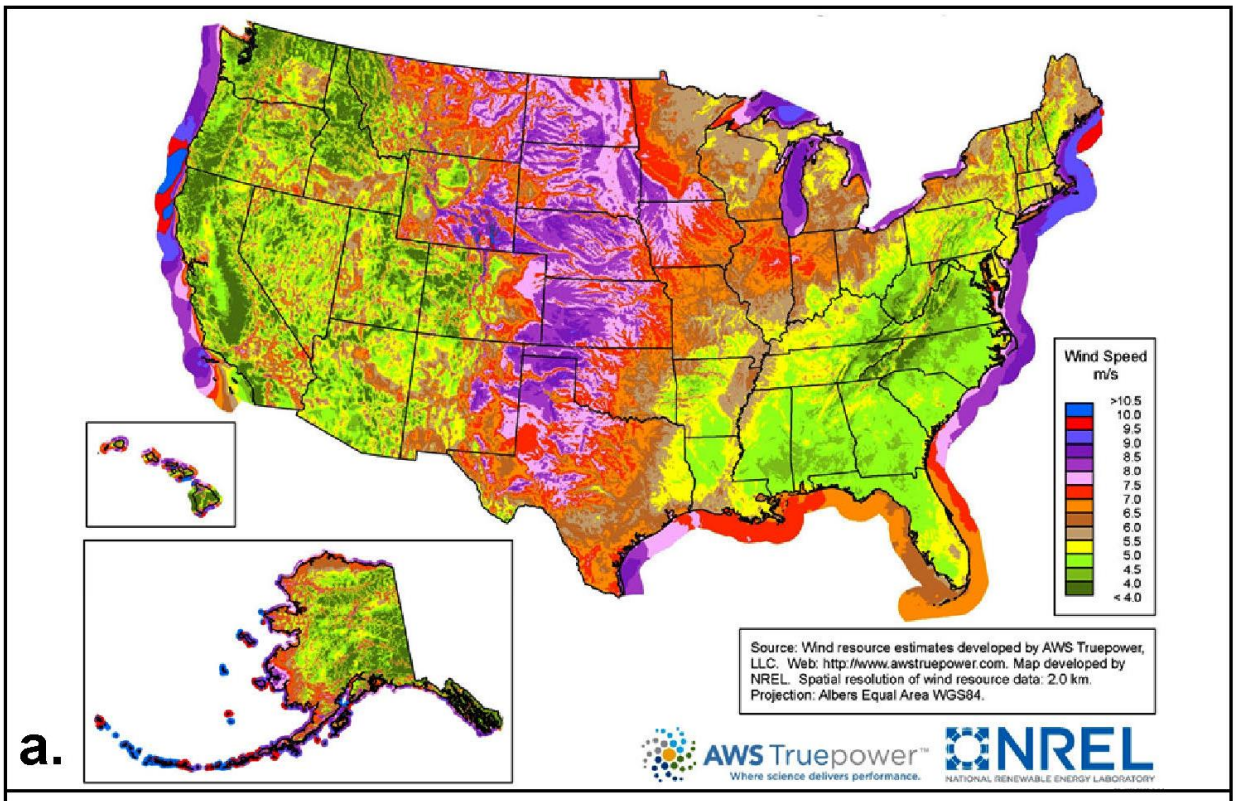
generation capacity = $8,120,575,000). The cost of the Projects plus the additional cost of installing new, natural gas-fired electric generating facilities (a combined total of about $13.6 billion dollars) is less than the cost required to install and operate wind facilities producing an equivalent amount of energy using the best-case operating assumptions for the wind facilities.

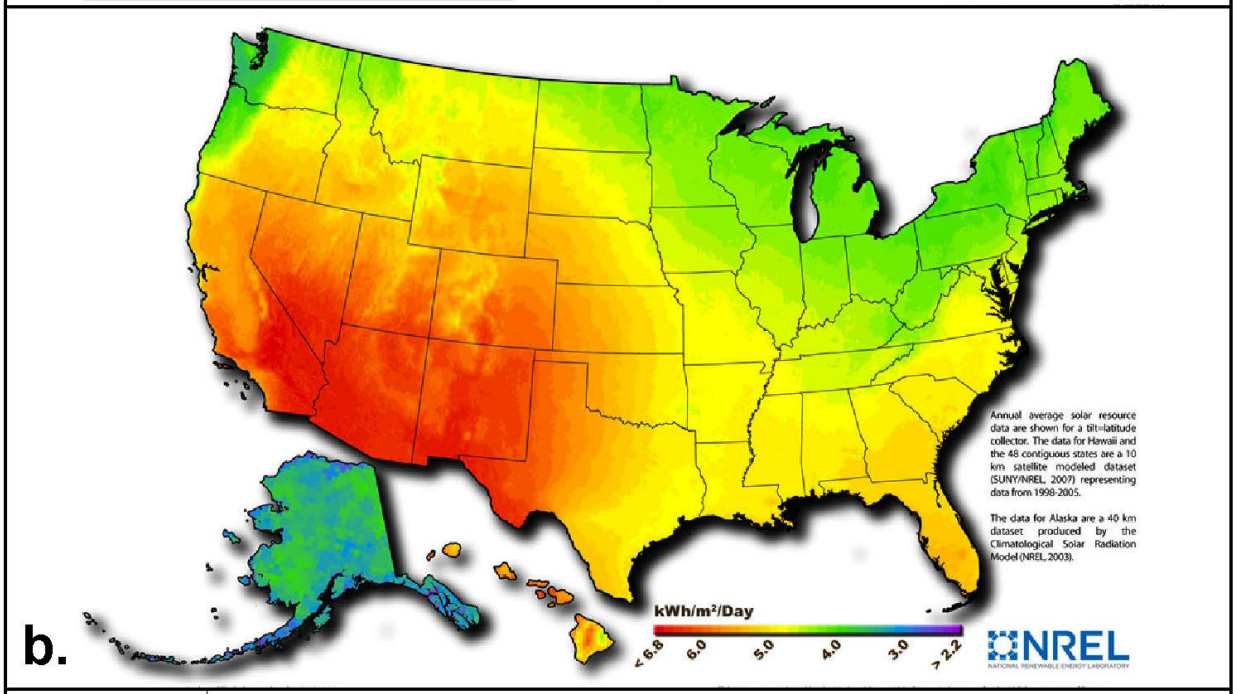
The wind energy estimates described above are based upon the best-case wind production potential for wind energy development. According to the U.S. Department of Energy's (DOE) Office of Energy Efficiency and Renewable Energy, areas with an annual average wind speed around 6.5 meters per second at a height of 80 meters are considered to be suitable for wind development based on current technology. As shown on Figure 10.4.2-1, the average annual wind speed at a height of 80 meters onshore for West Virginia, Virginia, and North Carolina is generally well below the 6.5 meters per second average wind speed. Therefore, the majority of land in West Virginia, Virginia, and North Carolina, is not suitable for commercial wind development using currently available technology.

Average offshore annual wind speed along the coasts of Virginia and North Carolina is greater than 6.5 meters per second. However, offshore wind power generation does not currently occur at a utility scale in the United States due to limitations of the cost of energy, mitigation of environmental impacts, and technical challenges of project installation and grid interconnection (DOE, 2014). According to the DOE's Office of Efficiency and Renewable Energy, the first demonstration-scale offshore wind projects in the U.S. are proposed to be deployed by 2017. As no utility-scale offshore wind projects are currently in operation within the U.S., offshore wind generation is not considered a viable alternative to the ACP.

Like wind, commercial scale solar energy generation would require significant investment in land. By way of example, the Ivanpah Solar Electric Generating System in California, which encompasses approximately 3,500 acres of land, generates approximately 392 mwh/d of electricity. Ivanpah claims they have a smaller footprint than traditional photovoltaic solar generation (Ivanpah, 2014), which affects a larger area. Using an equivalent acre to megawatt ratio as the Ivanpah facility, approximately 1.7 million acres of land would need to be dedicated to solar power generation to produce an equivalent amount of energy which could be supplied by the Projects (assuming the natural gas is used to generate electricity). This is significantly higher than the area required to install the Projects plus the area required to install new, natural gas-fired electric generating facilities.

The amount of land required to generate 392 mwh/d at the Ivanpah facility is based on the high solar generating potential found in southern California. As shown on Figure 10.4.2-1, the solar generating potential per square meter in southern California is greater than 6.8 kilowatt hours per square meter per day ($kwh/m^2/d$). In contrast, the solar generating potential in North Carolina and Virginia is less than 5.5 $kwh/m^2/d$, and is typically around 4.0 $kwh/m^2/d$ in West Virginia. Therefore, the actual acreage needed for commercial scale solar power generation in West Virginia, Virginia, and North Carolina to produce an equivalent amount of energy which could be supplied by the Projects (assuming the natural gas is used to generate electricity) would be greater than 1.7 million acres using the assumptions described above.





Atlantic Coast Pipeline

Atlantic Coast Pipeline
Figure 10.4.2-1
U.S. Wind and Solar Resource Potential
a. Wind Resource Potential at 80 Meters
b. Photovoltaic Solar Resource Potential

Natural Resource Group
an ERM Group company

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In addition to the large land area and limited solar generation potential in the ACP Project area and SHP Project area, installation of solar generation facilities would be cost prohibitive. The Ivanpah Solar Electric Generating System cost approximately $2.2 billion dollars to construct (Ivanpah, 2014). The Ivanpah facility generates 392 mwh/d of electricity. New facilities approximately 485 times larger than the Ivanpah facility would be required to produce an equivalent amount of energy to that which could be supplied by the Projects (assuming the natural gas is used to generate electricity) (190,000 mwh/d / 392 mwh/d = 485). Using these assumptions, the solar equivalent to the Projects would cost approximately $1.1 trillion dollars ($2.2 billion dollars x 485 facilities = $1,067,000,000 dollars). This is significantly higher than the cost to install the Projects plus the cost required to install new, natural gas-fired electric generating facilities.

The area required to generate one mw of electricity from hydroelectric facilities varies significantly. More land generally is required to create reservoirs in flatter areas than in areas with hilly terrain. The Union of Concerned Scientists (2015) provided estimates of 2,000 acres per mw from a large hydroelectric facility in a flat area of Brazil, and 0.25 acre per mw for typical, run-of-the-river, hydroelectric facilities built in hilly areas. Using the lower acre to megawatt ratio, approximately 48,000 acres of land would be needed to generate 190,500 mwh/d of electricity at hydroelectric facilities. As with wind and solar power, the land impact of hydroelectric facilities would greatly exceed the land requirements of the Projects plus the additional land required to install new, natural gas-fired electric generating facilities.

The cost required to install hydroelectric generating facilities varies, but the EIA (2013) provides an average cost of just under $3.0 million per mw of nameplate capacity installed (approximately $2,936 per kw). Based on this estimate, the cost required to install 7,938 mw of nameplate capacity (which is equivalent to 190,500 mwh/d) would be about $23 billion dollars ($2,936,000 per mw installed x 7,938 mw nameplate generation capacity = $23,305,968,000). This is higher than the cost of installing the Projects plus the additional cost required to install new, natural gas-fired electric generating facilities.

Based on the discussion above, both the land requirements and the cost of installing wind, solar, or hydroelectric facilities capable of producing 190,500 mwh/d of electricity is significantly higher than the cost of the Projects plus the cost of installing new, natural gas-fired electric generating facilities. Additionally, there is limited potential to develop commercial scale wind and solar power in West Virginia, Virginia, and North Carolina based on wind and solar potential using current technologies. For these reasons, wind, solar, and hydroelectric facilities are not feasible alternatives to the Projects.

10.5 ENERGY CONSERVATION

Energy conservation could help alleviate some of the growing demand for energy in the U.S. and in the States/Commonwealths to be serviced by the ACP. State/Commonwealth and Federal energy conservation measures will likely play an important role in slowing the growth of energy demand in the coming decades. However, it is unlikely that these measures will offset the demand for new natural gas sources. The EIA predicts that U.S. energy use per capita will decrease by approximately 8 percent through 2040, as higher efficiency standards for vehicles

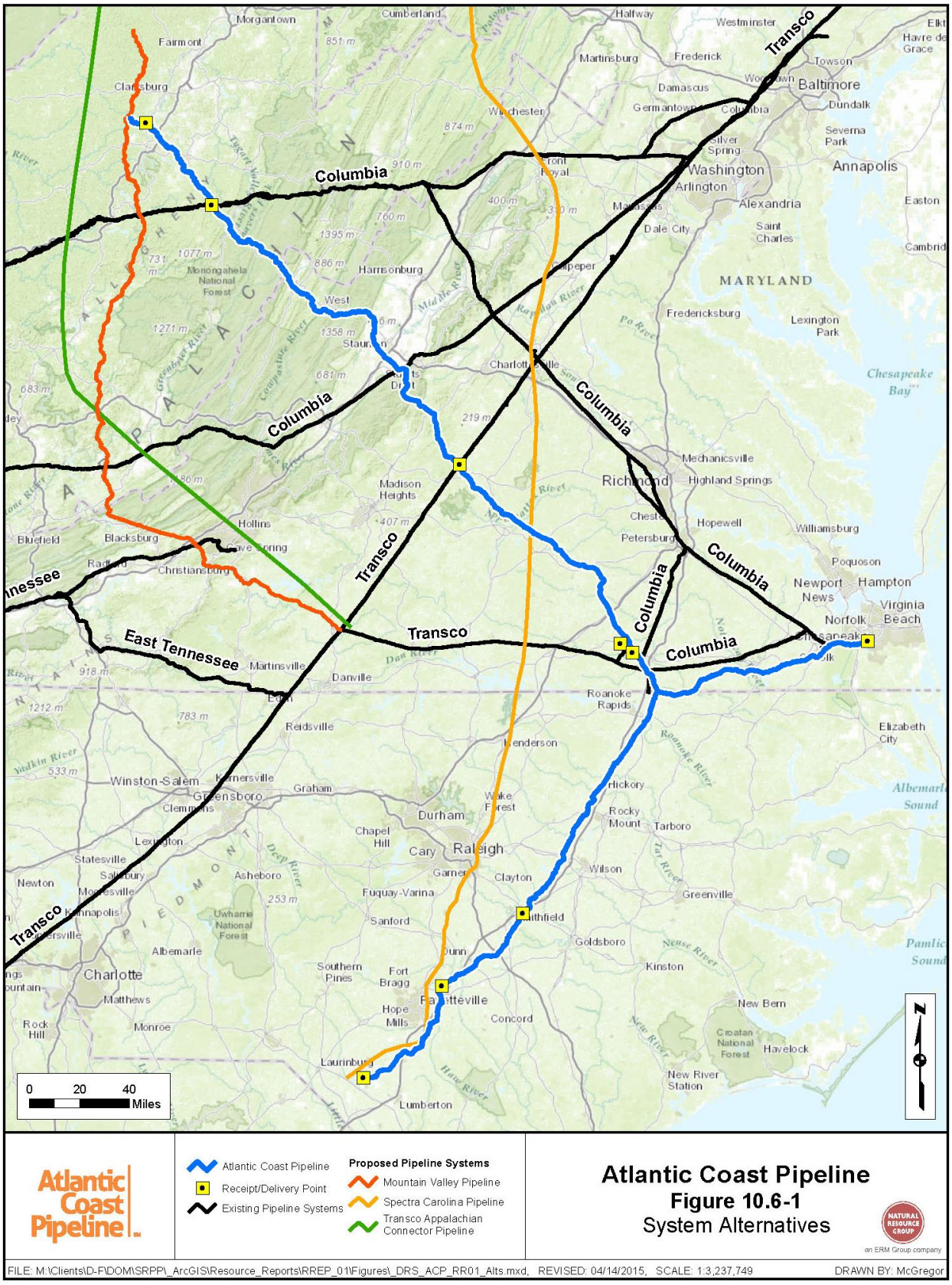
and appliances take effect. Nevertheless, the EIA indicates that, even with the recently enacted energy efficiency policies, total primary energy consumption, including fuels used for electricity generation, will grow by 0.4 percent per year from 2014 to 2040 (EIA, 2014c). To meet this demand, the EIA predicts that total domestic production of natural gas in the United States will grow from 24.0 trillion cubic feet in 2012 to 37.5 trillion cubic feet by 2040, and that shale gas production will make up 53 percent of total U.S. production in 2040, up from 40 percent in 2012 (EIA, 2014c). The anticipated growth in natural gas demand will be driven primarily by its increased use for electric power generation and industrial applications.

Reduction in the need for additional energy is the preferred option wherever possible. Conservation of energy reduces the demand for limited existing reserves. Although energy conservation measures will be important elements in addressing future energy demands, it is unlikely that they will be able to offset more than a fraction of anticipated demand in the foreseeable future. As a result, energy conservation alone (or in conjunction with other alternatives) is not a viable alternative because it does not preclude the need for natural gas infrastructure projects like the ACP and SHP to meet the growing demand for energy.

10.6 SYSTEM ALTERNATIVES

System alternatives would make use of other existing, modified, or proposed pipeline systems to meet the same objectives as the ACP. Use of a system alternative would make it unnecessary to construct all or part of the ACP, though modifications or additions to existing or proposed systems could be required. The modifications or additions would result in environmental impacts that could be less than, similar to, or greater than those associated with the ACP. Because the SHP will involve modifications and additions to existing DTI facilities, no system alternatives were considered.

Several existing, high-pressure, high-volume natural gas pipeline systems provide transportation services to delivery points in the Mid-Atlantic and southeast regions. These include Transco; Columbia Gas Transmission, LLC (Columbia); and East Tennessee Natural Gas, LLC (East Tennessee). Additionally, several new pipeline projects have been proposed to provide natural gas transportation service in the same regions, including the Spectra Energy Carolina Pipeline Project; Mountain Valley, LLC (Mountain Valley) Mountain Valley Pipeline (MVP) Project; and Transco Appalachian Connector Pipeline Project. Significant modifications to each of these systems would be necessary to access the same supply areas and/or provide transportation service to the same customers or at the same delivery points as the ACP. Figure 10.6-1 depicts the locations of these existing and proposed systems relative to the ACP. Descriptions of the systems are provided in the subsections below.


Atlantic Coast Pipeline
Receipt/Delivery Point
Existing Pipeline Systems
Proposed Pipeline Systems
Mountain Valley Pipeline
Spectra Carolina Pipeline
Transco Appalachian Connector Pipeline
Atlantic Coast Pipeline
Figure 10.6-1
System Alternatives
0 20 40 Miles
Columbia
Transco
East Tennessee
MARYLAND
Washington
Baltimore
Annapolis
Richmond
Charlottesville
Roanoke
Durham
Raleigh
Charlotte
Fayetteville
Wilmington
Norfolk
Virginia Beach
Newport News
Hampton
Chesapeake Bay
Albemarle Sound
Pamlico Sound
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10.6.1 Existing Systems

10.6.1.1 Transcontinental Gas Pipe Line Company

Transco operates a 1,800-mile-long, multi-pipeline system that delivers natural gas to major metropolitan areas in the northeast, Mid-Atlantic, and southeast regions of the United States. In the vicinity of the ACP, Transco's mainline passes southwest to northeast through North Carolina and Virginia, and includes a lateral pipeline connecting the mainline to points in southeastern Virginia. The system is believed to be capacity constrained for delivery service as demonstrated by several recently proposed projects. These include:

- the Atlantic Sunrise Project an approximately 185-mile-long pipeline expansion in Pennsylvania (Docket No. PF14-9-00);
- the Virginia Southside Expansion Project, an approximately 100-mile-long pipeline adjacent to Transco's existing lateral in southeast Virginia (Docket No. CP13-30-000); and
- the Virginia Southside Expansion Project II, an approximately 4-mile-long pipeline adjacent to Transco's existing lateral in southeast Virginia (Docket No. CP-13-118-000).

A significant upgrade of the existing Transco system would be necessary to access the same supply areas, transport the same volume of natural gas, and reach the same delivery points as the ACP. New pipeline construction measuring up to 300 miles in length could be required to connect supply areas to the Transco mainline (see the discussion of the proposed Appalachian Connector Pipeline Project below). Additional upgrade of the Transco mainline, including new compression and looping, would be necessary to increase capacity and accommodate the volume of gas required for the ACP. Moreover, construction of new mainline or lateral pipelines would be necessary to reach the same delivery points as the ACP in southeastern Virginia (approximately 160 miles) and North Carolina (approximately 180 to 200 miles).

The environmental impacts associated with the upgrades and new pipeline construction for the Transco system (a combined total of 640 to 680 miles of new pipeline) would likely be greater than those of the ACP. Therefore, the theoretical modifications to the existing system would provide no environmental advantage over the ACP. For this reason, and the fact that the existing system does not meet the ACP's purpose and need, the existing Transco system is not considered a viable system alternative.

10.6.1.2 Columbia Gas Transmission

The existing Columbia system in the Mid-Atlantic region provides transportation services from supply areas in the Appalachian region to demand areas in southern Virginia, including the City of Chesapeake. Because the system is capacity constrained, significant upgrades, including new compression, looping, and mainline or lateral pipelines, would need to be built to transport the same volume of natural gas as the ACP to southern Virginia. Assuming a complete loop of the existing system, up to 400 miles or more of new pipeline could be required to reach the

proposed ACP delivery points in southern Virginia. Additional pipeline construction would also be required to reach the proposed delivery points in Brunswick County, Virginia (approximately 10 miles) and in southern North Carolina (approximately 170 miles), much of which could be similar to the proposed AP-2 mainline for the ACP.

While the Columbia system provides access to the same natural gas supply areas, new pipeline facilities (a combined total of approximately 580 miles of new pipeline) would be needed to reach the same delivery points as the ACP in southern Virginia and North Carolina. The environmental impacts associated with construction of these facilities would likely greater than those of the ACP, so these theoretical modifications to the existing Columbia system would provide no environmental advantage over the ACP. For this reason, and the fact that the current system does not meet the ACP's purpose and need, the Columbia system is not considered a viable alternative to the ACP. An evaluation of a conceptual route alternative for the ACP adjacent to the existing Columbia system is provided in Section 10.7.1.1 below.

10.6.1.3 East Tennessee Natural Gas

The East Tennessee pipeline system extends from western Tennessee to central and southern Virginia and northern North Carolina, where it interconnects with Transco. Because the system is believed to be capacity constrained, significant upgrades, including new compression, looping, and mainline or lateral pipelines, would need to be built to transport the same volume of natural gas as the ACP. Additionally, new pipelines would be required to access the same supply areas as the ACP (150 to 180 miles), and provide access to the same delivery points as the ACP in southern Virginia (210 to 230 miles) and North Carolina (190 to 210 miles).

The environmental impacts associated with the system upgrades and new pipeline construction (a minimum of between 550 and 620 miles of new pipeline) would likely be similar to or greater than those of the ACP, so these theoretical modifications to the East Tennessee system would provide no environmental advantage over the ACP. For this reason, and the fact that the current system does not meet the ACP's purpose and need, the existing East Tennessee system is not considered a viable system alternative.

10.6.2 Proposed Systems

10.6.2.1 Carolina Pipeline Project

In 2014, Spectra Energy proposed to construct approximately 430 miles of new pipeline between existing Texas Eastern Transmission, LP (Texas Eastern) facilities in Bedford County, Pennsylvania, and new delivery points in southern Virginia and North Carolina. The project additionally would require unspecified modifications to the existing Texas Eastern system in Pennsylvania and West Virginia. The capacity of the new system, if constructed, would be 1.1 bcf/d (Natural Gas Intelligence Shale Daily, 2014).

Like the ACP, the Carolina Pipeline Project would access gas from the Mid-Atlantic supply areas and provide delivery service to the same areas in southern Virginia and North Carolina. However, additional pipeline construction would be necessary to reach the same or similar delivery points in the City of Chesapeake, Virginia (130 miles or more) and in North Carolina (40 miles or more). Environmental impacts associated with the upgrades to the existing

Texas Eastern system and the new pipeline construction (a combined total of approximately 600 miles of new pipeline) would likely be greater than those of the ACP. Moreover, it is unlikely that the Carolina Pipeline Project could be built in a time frame to meet the ACP's purpose and need because Spectra Energy placed the project on hold in August 2014 (Cumberland Times-News, 2014). For these reasons, the Carolina Pipeline Project is not considered a viable system alternative.

10.6.2.2 Mountain Valley Pipeline Project

Mountain Valley proposes to construct and operate approximately 286 miles of 42-inch-diameter pipeline from an existing Equitrans transmission system in Wetzel County, West Virginia to an interconnection with the existing Transco system in Pittsylvania County, Virginia. The project also would require the construction of four new turbine compressor stations. The MVP Project is currently under review by the FERC under Docket number PF15-3-000. If approved and constructed, the project would provide delivery service of 2 bcf/d of natural gas (MarketWatch, 2014; WDBJ7, 2014; Mountain Valley, 2014).

Mountain Valley identified Transco's existing Compressor Station 165 in Pittsylvania County, Virginia as the end point of the project. An interconnection with Transco at this point would allow Mountain Valley to deliver natural gas to different end-users connected to the Transco system. Through these connections, Mountain Valley would provide natural gas to existing markets served by Transco, which include local distribution companies, industrial users, and power generation facilities in the Appalachian, Mid-Atlantic, and Southeast regions based on an open season. Atlantic's customers and the intended use of the natural gas that would be supplied by the ACP are identified in Tables 1.2-1 and 1.2-2 in Resource Report 1. While the MVP and ACP would be constructed to originate from the same region, the two projects serve different customers and end-use markets.

To meet the same purpose and need as the ACP, the proposed MVP would need to be expanded to provide sufficient capacity for an additional 1.5 bcf/d of natural gas and to reach the same delivery points in Virginia and North Carolina. The proposed MVP route would require approximately 286 miles of pipeline to interconnect with the Transco system, compared to approximately 186 miles of pipeline for the ACP to connect with the Transco system. Moreover, construction of new mainline or lateral pipelines would be necessary to reach the same delivery points as the ACP in southeastern Virginia (approximately 160 miles) and North Carolina (approximately 180 to 200 miles). Consequently, the environmental impacts associated with system expansion and new pipeline construction (a combined total of approximately 626 to 646 miles of new pipeline) would likely be similar to or greater than those of the ACP, and these theoretical project modifications would provide no environmental advantage over the ACP.

For all the reasons discussed above, and the fact that the MVP as proposed does not meet the purpose and need or serve the same customers as the ACP, the MVP is not considered a viable system alternative. An evaluation of a conceptual route alternative for the ACP in a common corridor with the proposed MVP is provided in Section 10.7 below.

10.6.2.3 Appalachian Connector Pipeline Project

Transco announced plans to develop a new pipeline project between the existing Rockies Express pipeline in Monroe County, Ohio; an existing gas processing facility in Marshall County, West Virginia; and the existing Transco mainline in Pittsylvania County, Virginia. The pipeline is believed to measure approximately 300 miles in length and would operate with a capacity of 1 to 2 bcf/d (Williams Partners, LP, 2014a, 2014b). The project would be similar to (and compete with) MVP, and would have the same capacity and delivery limitations as that project relative to the ACP.

To meet the same purpose and need as the ACP, the Appalachian Connector Pipeline Project [8] would need to be expanded to provide sufficient capacity for an additional 1.0 to 1.5 bcf/d of natural gas. Upgrades to the existing Transco mainline and construction of new mainline or lateral pipelines would be necessary to reach the same delivery points as the ACP in southeastern Virginia (approximately 160 miles) and North Carolina (approximately 180 to 200 miles). As a result, the environmental impacts associated with system expansion and new pipeline construction (a combined total of 640 to 680 miles of new pipeline) would likely be greater than those of the ACP, and these theoretical project modifications would provide no environmental advantage over the ACP.

For all the reasons discussed above, and the fact that the project as proposed does not meet the ACP's purpose and need, the Appalachian Connector Pipeline Project is not considered a viable system alternative. An evaluation of a conceptual route alternative for the ACP in a common corridor with the proposed Appalachian Connector Pipeline is provided in Section 10.7 below.

10.7 CONCEPTUAL COLLOCATION ROUTE ALTERNATIVES

Where practical, and depending on site-specific conditions, new natural gas transmission pipelines can sometimes be collocated with existing linear corridor facilities (e.g., other pipelines, electric transmission lines, highways, or railroads) to minimize impacts on environmental and other resources. A pipeline is considered collocated with an existing linear corridor facility if the new right-of-way for the pipeline is adjacent to or very near (within a few hundred feet) of the existing facility. A pipeline can parallel an existing linear corridor facility without being collocated with the existing facility, but this often results in multiple clear-cuts along similar paths with no reduction in impacts on environmental and other resources.

The three criteria listed below are generally used to identify and evaluate opportunities to route a new natural gas transmission pipeline adjacent to existing linear corridor facilities.

- The first criterion is the location and orientation of existing facilities relative to the new pipeline. The existing facilities must provide a relatively direct path between the proposed receipt and delivery points for the new pipeline. Otherwise, routing adjacent to these existing facilities increases the length of the pipeline, which results in greater environmental impact and added cost to the project.

[8] Previously referred to as the Western Marcellus Pipeline Project.

- The second criterion is the nature of terrain along existing facilities. In some areas, the landforms crossed may not allow for the construction of a pipeline adjacent to an existing facility due to factors such as side slope, limitations on the amount of space available for new construction, or the orientation of landforms crossed.

- The third criterion is the nature of existing land uses along the existing facilities. Developed lands (including residential, commercial, and industrial lands) are often found along linear corridor facilities such as highways and railroads. Routing a new pipeline to avoid these developed areas often results in parallel (as opposed to adjacent) alignments and increases the length (and therefore the environmental impact and cost) of a new pipeline.

This section of Resource Report 10 discusses major conceptual collocation route alternatives for the proposed ACP pipelines.[9] In addition to these conceptual alternatives, Atlantic and DTI evaluated potential collocation alternatives for the ACP and SHP in areas where existing pipelines, electric transmission lines, or roads either intersect or run parallel to and near the proposed Projects. Potential route alternatives and variations adjacent to existing facilities which would meet the purpose and need of the Projects and avoid or minimize impacts are discussed in Sections 10.8 and 10.9 below. Desktop review of other potential alternatives identified significant impediments with the routes with regard to terrain, existing developments, or increased length of the Projects. A set of figures and a table providing information on these potential collocation alternatives, including the reasons they are not feasible alternatives, are provided in Appendix 10A of this report. Based on the information in this table, these alternatives were rejected for further analysis.

10.7.1 Pipelines

Atlantic evaluated a conceptual alternative route along the existing Columbia pipeline system in West Virginia and Virginia. Atlantic additionally evaluated three conceptual route alternatives for collocating portions of the proposed AP-1 mainline and proposed MVP in a common corridor. Atlantic also evaluated a conceptual route similar to the route proposed by Transco for the proposed Appalachian Connector Project.[10] Each of these alternatives is discussed below.

10.7.1.1 Columbia Gas Pipeline

Starting approximately at MP 46 of the AP-1 mainline route in Randolph County, West Virginia, a conceptual alternate route for the pipeline adjacent to Columbia would initially head approximately 72 miles to the east, passing through Randolph, Pendleton, Grant, and Hardy Counties, West Virginia. The route would then pivot to the southeast and continue for approximately 110 miles, crossing Shenandoah, Rockingham, Page, Green, Orange, Albemarle, Louisa, and Goochland Counties, Virginia. The route would then head to the south/southeast for

[9] A number of people who attended the ACP Open Houses or filed comments with the FERC said that the proposed pipelines should be adjacent to existing pipelines, electric transmission lines, or roads.

[10] In comments filed with the Commission, various individuals commented that the proposed ACP pipelines should be installed adjacent to the existing Columbia system or the proposed MVP and Appalachian Connector Pipeline systems.

approximately 36 miles, passing through Goochland, Powhatan, and Chesterfield Counties and the Cities of Colonial Heights and Petersburg, Virginia. On the south side of Petersburg, the route would continue approximately 42 miles to the southwest through Prince George, Dinwiddie, Sussex, and Greensville Counties, Virginia, terminating approximately at MP 282 of the proposed AP-1 mainline route (see Figure 10.7.1-1).

In addition to the conceptual mainline route, an alternate route for the proposed AP-3 lateral would also be required. The alternative lateral route would follow an existing Columbia lateral from a point near the City of Petersburg, Virginia, southeast into Hampton Roads. The conceptual alternate lateral route would measure approximately 53 miles in length, crossing Prince George, Sussex, Surry, Southampton, and Isle of White Counties and the City of Suffolk, Virginia. The route would terminate approximately at MP 64 of the currently proposed AP-3 lateral, and then follow the same alignment as the AP-3 lateral to its terminus along the Southern Branch Elizabeth River (see Figure 10.7.1-1).

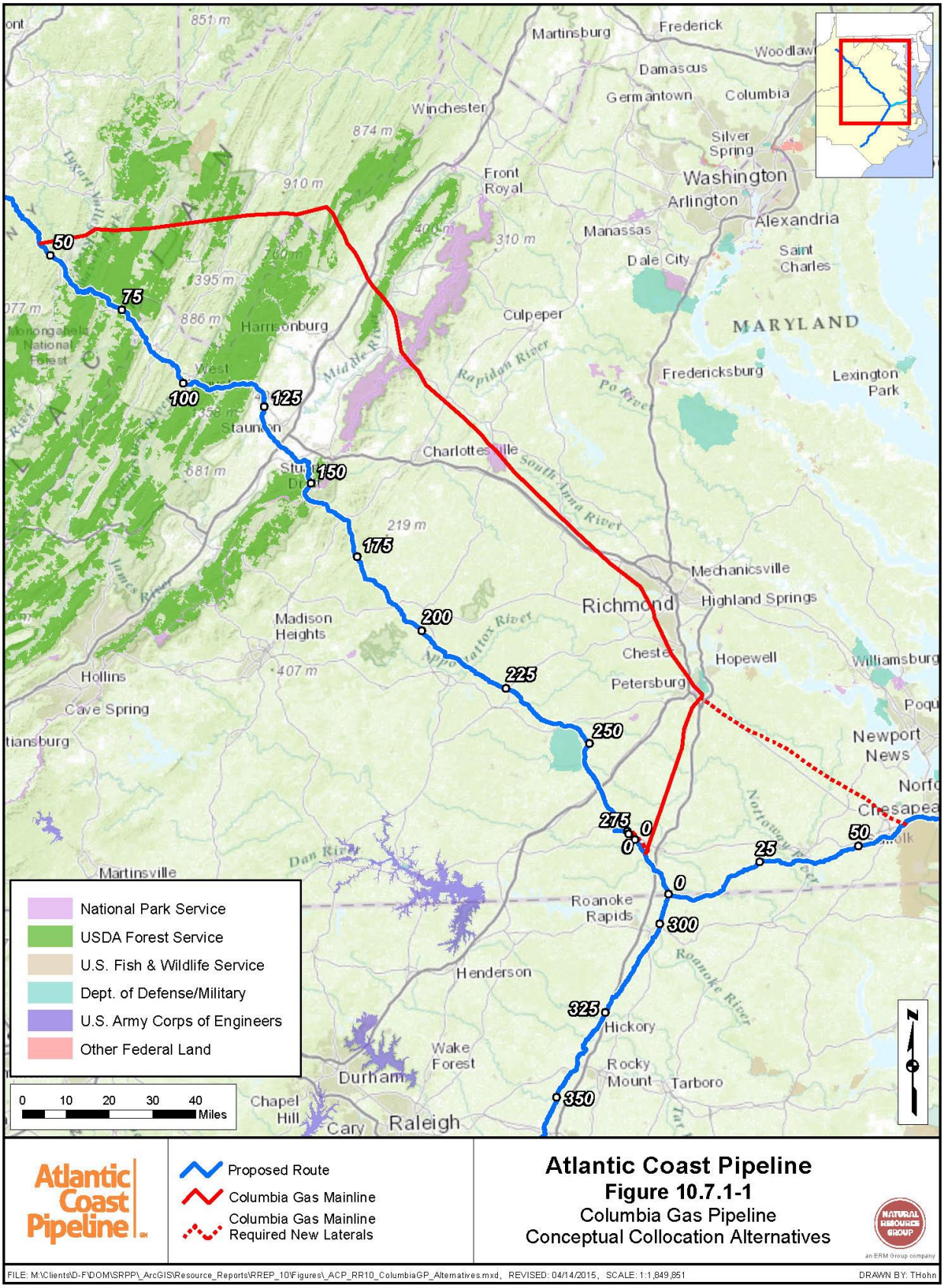
Relative to the corresponding segments of the proposed AP-1 mainline and AP-3 lateral routes, the conceptual alternative routes would add a cumulative total of approximately 28 miles to the length of the ACP, which would increase the environmental impacts and cost of the Project. [11] The additional length would increase the area of impact for the ACP by a minimum of 279 acres and encumber an additional 160 acres in the permanent, maintained easement for the pipelines. [12]

The additional length and cost notwithstanding, there are several issues with a route adjacent to the existing Columbia system which preclude its use as a viable alternative. Collocation in the mountainous areas of West Virginia (including in the Monongahela National Forest (MNF)) and Virginia is not feasible due to rugged topography and space constraints on the ridges that the Columbia system follows. Most of the existing Columbia corridor in these areas contains three existing pipelines of 26- or 36-inch-outside diameter. In several places, the Columbia pipelines diverge from a common corridor into two parallel corridors because there was insufficient room on the ridges to build three adjacent pipelines.

For most of the route across West Virginia and parts of west-central Virginia, the AP-1 mainline could not be constructed adjacent to the existing Columbia pipelines due to a lack of sufficient space to safely construct a new large diameter pipeline. Additionally, the steep terrain would prevent a collocated route from pulling away and quickly returning to an alignment adjacent to Columbia where space constraints are encountered. In many areas, the AP-1 mainline would need to be routed along a new, greenfield right-of-way, which would eliminate the benefits of collocation with an existing utility, such as reduced forest clearing, and also require a new corridor across the MNF. Examples of difficult terrain along the existing Columbia system are depicted on Figure 10.7.1-2.

[11] This includes the length of the Columbia Gas pipeline system plus an additional 15 miles to avoid designated Wilderness and Recreation Areas within the Monongahela National Forest.

[12] These estimates are based on a 125-foot-wide construction right-of-way and 75-foot-wide permanent easement for the AP-1 mainline and a 75-foot-wide construction right-of-way and 50-foot-wide permanent easement for the AP-3 lateral. The conceptual AP-1 mainline adjacent to Columbia would result in an additional 379 acres of construction right-of-way and 227 acres of permanent easement. The conceptual route for the AP-3 lateral would result in a reduction of 100 acres for the construction right-of-way and 67 acres for the permanent easement because this route would be 11 miles shorter than the proposed route.


Martinsburg
Frederick
Woodlawn
Damascus
Germantown
Columbia
Winchester
Silver Spring
Washington
Front Royal
Arlington
Alexandria
Manassas
Saint Charles
Dale City
Culpeper
MARYLAND
Harrisonburg
Fredericksburg
Lexington Park
Staunton
Charlottesville
Mechanicsville
Richmond
Highland Springs
Madison Heights
Hopewell
Williamsburg
Petersburg
Hollins
Cave Spring
Newport News
Martinsville
Roanoke Rapids
Henderson
Hickory
Wake Forest
Rocky Mount
Tarboro
Durham
Chapel Hill
Cary
Raleigh
50
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100
125
150
175
200
225
250
275
0
0
50
25
0
300
325
350
National Park Service
USDA Forest Service
U.S. Fish & Wildlife Service
Dept. of Defense/Military
U.S. Army Corps of Engineers
Other Federal Land
0 10 20 30 40 Miles
N
Atlantic Coast Pipeline
Proposed Route
Columbia Gas Mainline
Columbia Gas Mainline Required New Laterals
Atlantic Coast Pipeline
Figure 10.7.1-1
Columbia Gas Pipeline
Conceptual Collocation Alternatives
NATURAL RESOURCE GROUP
an ERM Group company
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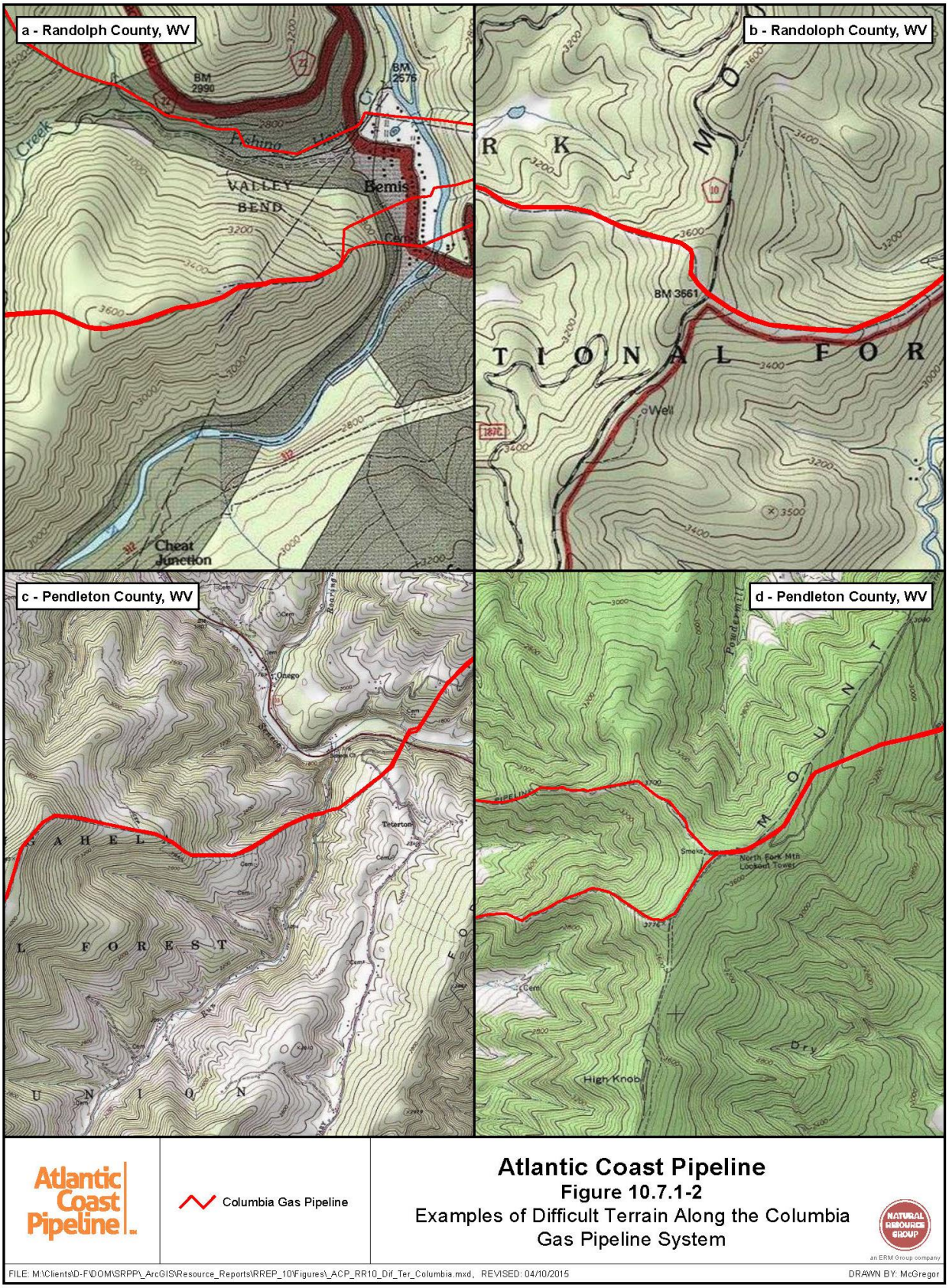
a - Randolph County, WV
b - Randoloph County, WV
c - Pendleton County, WV
d - Pendleton County, WV
Columbia Gas Pipeline
Atlantic Coast Pipeline
Figure 10.7.1-2
Examples of Difficult Terrain Along the Columbia Gas Pipeline System
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DRAWN BY: McGregor

In addition to difficult terrain, there are significant land use constraints that would prohibit constructing a new pipeline adjacent to Columbia. As discussed in Section 10.8.1.2 below, the existing Columbia system across the MNF crosses several sensitive areas including the Laurel Fork North Wilderness Area and Spruce Knob-Seneca Rocks National Recreation Area (NRA). Additionally, there are several other Wilderness Areas in the vicinity of the Columbia system including the Otter Creek, Roaring Plains, and Dolly Sods Wilderness Areas. The Wilderness Areas in particular are significant constraints because crossings of these areas would require authorizations from the U.S. Congress which would be infeasible to obtain within the timeframe required by the purpose and need of the Projects. An alternate greenfield route extending approximately 15 miles to the north of the Columbia system would be necessary to avoid both the NRA and nearby Wilderness Areas.

The Columbia system additionally crosses Federal lands owned and/or managed by the National Park Service (NPS) in three locations: approximately 3.8 miles of the Shenandoah National Park (SNP) in Rockingham and Greene Counties, Virginia; approximately 5.2 miles of the Green Springs National Historic Landmark District in Louisa County, Virginia; and approximately 1.2 miles of the Petersburg National Battlefield Park (PNBP) in the City of Petersburg, Virginia. The NPS has indicated that obtaining a right-of-way to cross NPS lands (other than the Blue Ridge Parkway) requires an authorization from the U.S. Congress. This authorization would be infeasible to obtain within the timeframe required by the purpose and need of the Projects. Consequently, alternate greenfield routes would need to be identified to avoid these features.

The SNP is a long linear park extending approximately 70 miles along the Blue Ridge Mountains between Waynesboro and Front Royal, Virginia (see Figure 10.7.1-1). The existing Columbia system crosses the SNP in the vicinity of the town of Elkton. An alternate route to the south of the SNP would need to pass south of Waynesboro, which would approximate the current AP-1 mainline where it crosses the Blue Ridge Mountains. An alternate route around the SNP to the north would need to pass north of Front Royal, which would add approximately 60 miles of additional pipeline to the conceptual route alternative (an additional 909 acres of temporary impact and 546 acres of new permanent right-of-way) and increase the cost of the ACP. Moreover, an alignment this far to the east of the currently proposed AP-1 mainline route could not be configured to deliver gas to Atlantic's customers with reasonable efficiency. Additional infrastructure, including new laterals, could be required to provide access for Atlantic's customers.

A conceptual route alternative adjacent to Columbia could be aligned to avoid the Green Springs National Historic Landmark District in Louisa County, Virginia with limited effect on the length, area of impact, and cost of the ACP. However, a route adjacent to Columbia could not easily be configured to avoid the PNBP. The Cities of Colonial Heights and Petersburg have built out substantially to the northern and western boundaries of the PNBP. To the east, the PNBP is bounded by the Fort Lee Military Reservation, which itself is bounded to the east by the City of Hopewell. An alternate route to the west around Petersburg and the PNBP would be feasible, and the length would be similar to the corresponding segment of the conceptual route alternative (approximately 20 miles), but the route would be entirely greenfield, which would

eliminate the benefits of collocation in this area. An alternate route to the east of the PNBP would need to pass east of Hopewell, which would increase the length of the conceptual route alternative by approximately 10 to 12 miles (an additional 151 to 182 acres of temporary impact and 91 to 109 acres of permanent easement), all of which would be greenfield.

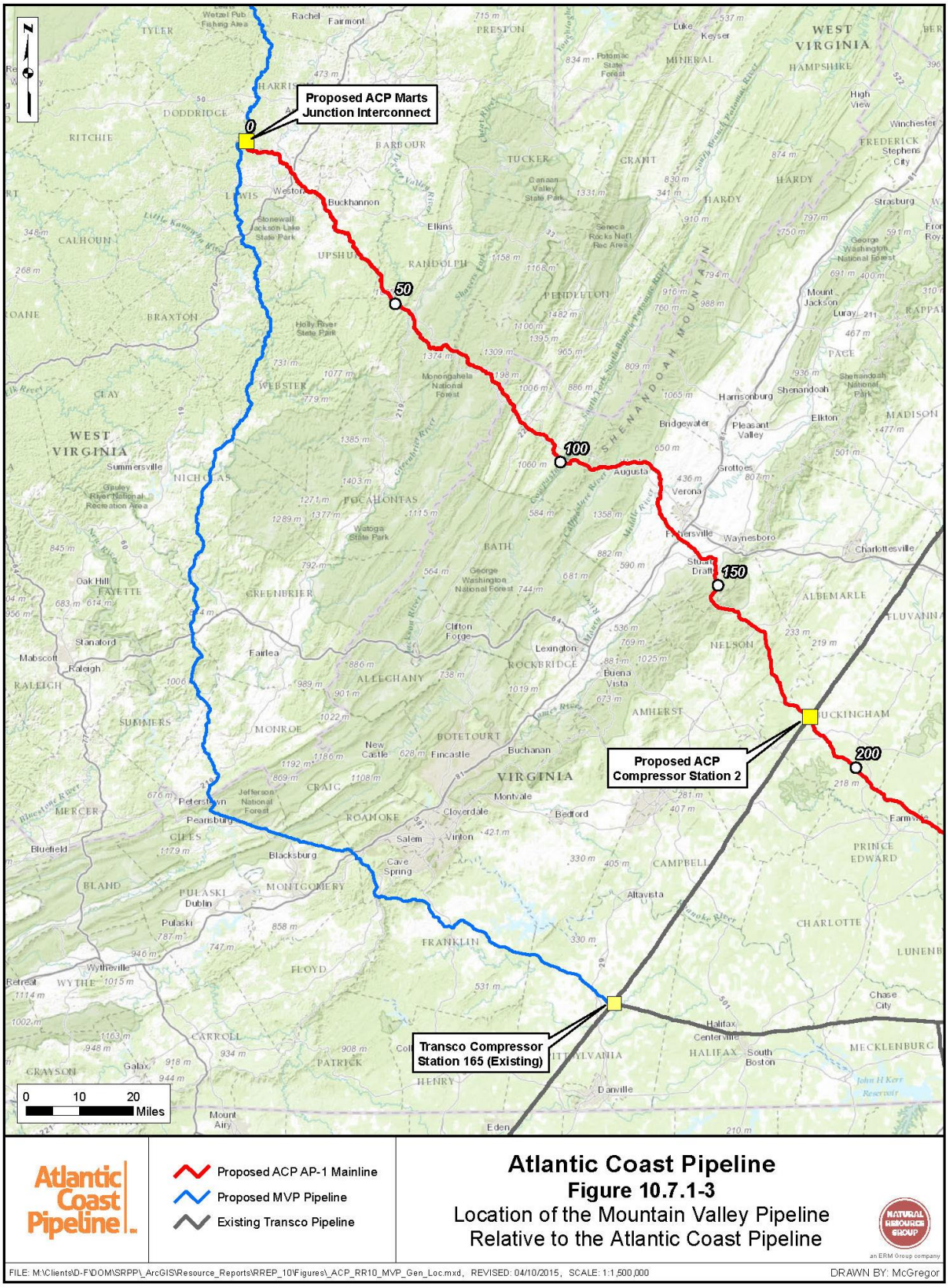
There are other areas along the existing Columbia system where residential or commercial developments have encroached on the existing right-of-way. Many of these areas would need to be avoided by minor route variations measuring several miles in length. The route variations would increase the length of the conceptual route alternative, and they would not be collocated with an existing facility.

Given the terrain and land use constraints along the Columbia system, much of the AP-1 mainline would need to be routed along greenfield rights-of-way which would significantly increase the length of the proposed pipelines, the environmental impact of the ACP, and the cost of the ACP. For these reasons, a route adjacent to Columbia is not a viable or feasible alternative to the proposed route of the ACP.

10.7.1.2 Mountain Valley Pipeline

As noted in Section 10.6.2, Mountain Valley proposes to construct and operate approximately 286 miles of 42-inch outside diameter natural gas transmission pipeline between an existing Equitrans transmission system in Wetzel County, West Virginia, and an interconnection with the existing Transco system in Pittsylvania County, Virginia (at Transco's existing Compressor Station 165). The route of the proposed MVP pipeline passes within approximately 0.6 mile of the proposed AP-1 mainline at the Marts Junction Interconnect (MP 0.0) in Harrison County, West Virginia. From this point, the proposed MVP pipeline heads due south into western Virginia near Blacksburg, then southeast into south-central Virginia. In contrast, the proposed AP-1 mainline route heads southeast into central and southeastern Virginia (see Figure 10.7.1-3).

As discussed in Section 10.2 above, the ACP and SHP were designed based on customer requirements and precedent agreements which specify the locations of receipt and delivery points on the ACP. These include a receipt and delivery point along the Transco system and at various delivery points in southeastern Virginia and North Carolina. The locations of these points were determined by customer needs and an assessment of flow dynamics relative to receipts and deliveries of natural gas. The MVP was designed to interconnect with the existing Transco system at Transco's Compressor Station 165 to deliver gas to customers connected to the Transco system. The ACP and MVP projects serve different end-use markets and customers, and they do not share common delivery points as currently configured.


Proposed ACP Marts Junction Interconnect
0
50
100
150
200
Proposed ACP Compressor Station 2
Transco Compressor Station 165 (Existing)
0 10 20 Miles
Proposed ACP AP-1 Mainline
Proposed MVP Pipeline
Existing Transco Pipeline
Atlantic Coast Pipeline
Atlantic Coast Pipeline
Figure 10.7.1-3
Location of the Mountain Valley Pipeline
Relative to the Atlantic Coast Pipeline
FILE: M:\Clients\D-F\DOM\SRPP_ArcGIS\Resource_Reports\RREP_10\Figures_ACP_RR10_MVP_Gen_Loc.mxd, REVISED: 04/10/2015, SCALE: 1:1,500,000
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Atlantic evaluated three conceptual options for collocating portions of the proposed ACP and MVP pipelines along a common corridor (see Figure 10.7.1-4). Option 1 would involve routing the proposed AP-1 mainline adjacent to the proposed MVP pipeline along the current MVP route between the proposed Marts Junction Interconnection in Harrison County, West Virginia, and Transco's existing Compressor Station 165 in Pittsylvania County, Virginia. [13] Option 2 would involve routing the proposed MVP pipeline along the current AP-1 mainline route between the proposed Marts Junction Interconnection and Atlantic's currently proposed interconnection with the existing Transco system in Buckingham County, Virginia (i.e., at MP 186.0/the Woods Corner M&R Station). [14] Option 3 would involve routing both the AP-1 mainline and MVP pipelines along a new common, intermediate alignment between the currently proposed ACP and MVP routes. [15]

Option 1

Under the Option 1 scenario, the proposed AP-1 mainline would follow the proposed MVP route along a greenfield corridor for approximately 155 miles to the south, passing through Lewis, Braxton, Webster, Nicholas, Greenbrier, Fayette, Summers, and Monroe Counties, West Virginia, and crossing into Giles County, Virginia. The AP-1 mainline would then continue to collocate with the MVP route for approximately 30 miles to the east/southeast along an existing electric transmission line across Giles and Montgomery Counties, Virginia. The two routes would then head south/southeast for approximately 68 miles along a greenfield corridor through Roanoke, Franklin, and Pittsylvania Counties, Virginia. The proposed MVP pipeline would terminate at Transco's existing Compressor Station 165 in Pittsylvania County. The proposed AP-1 mainline would continue from this point for approximately 102 miles to the east along an existing 20-inch-diameter Transco pipeline, crossing Pittsylvania, Halifax, Charlotte, Mecklenburg, Brunswick, and Greensville Counties, Virginia. It would intersect the currently proposed AP-1 mainline route near MP 288 in Greensville County, Virginia.

The Option 1 scenario, if technically feasible, would provide two potential advantages relative to the ACP and MVP projects as currently proposed (assuming both projects are permitted and built): 1) greater collocation with other linear corridor facilities; and 2) avoidance of the MNF and George Washington National Forest (GWNF) along the current AP-1 mainline route (though the Option 1 route would cross a portion of the Jefferson National Forest (JNF)). [16] Because the proposed ACP and MVP pipelines do not share common delivery points, however, the Option 1 scenario would increase the length of the AP-1 mainline by approximately 68 miles due to the need to route the pipeline from Pittsylvania County into southeastern Virginia. This would increase the area of impact for the ACP by a minimum of 1,029 acres and encumber an additional 618 acres in the permanent, maintained easement for the pipeline. [17] Moreover, the additional cost for in the increase in the length of the pipeline would be economically infeasible; therefore, the ACP would not be viable.

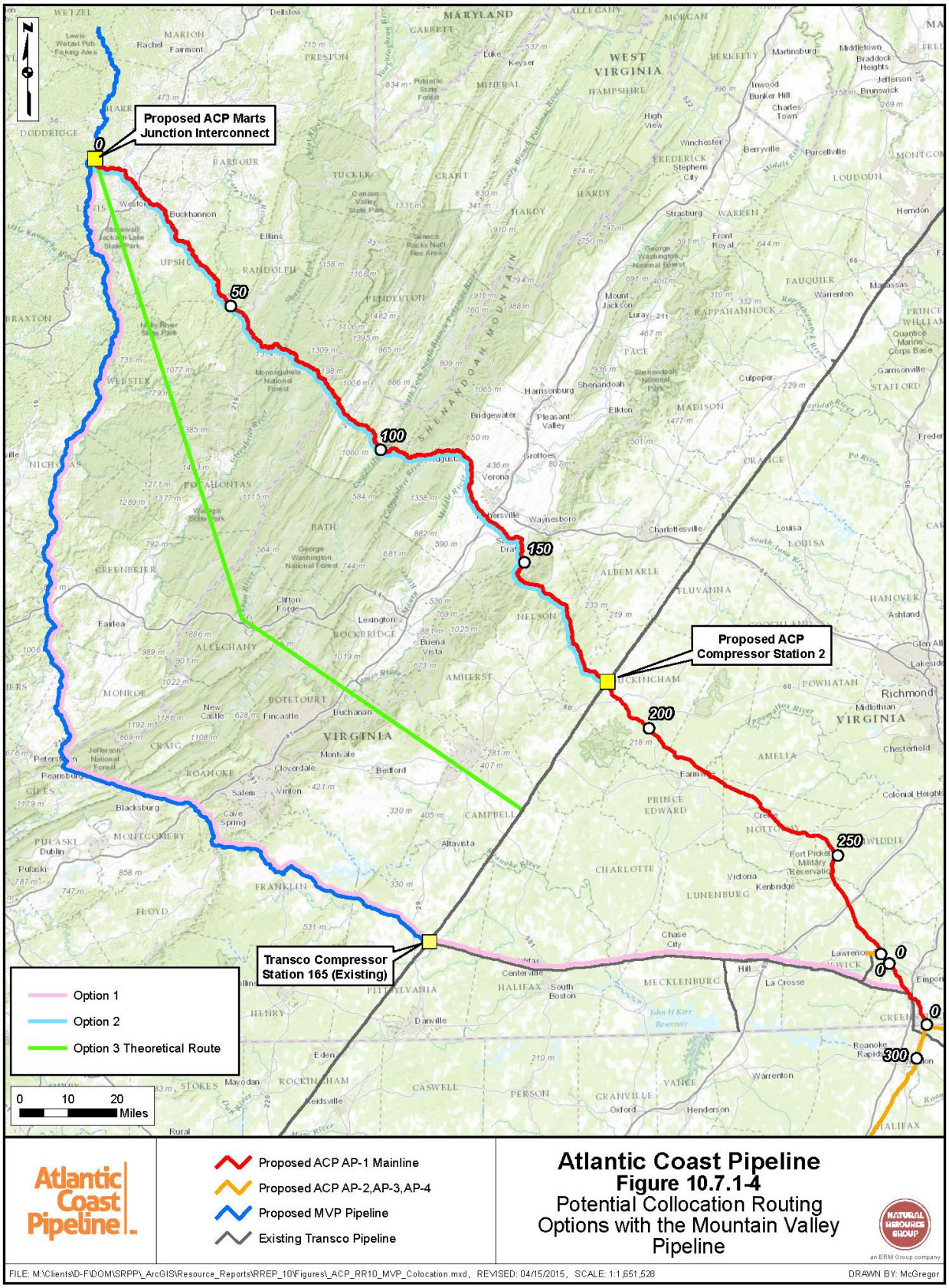
[13] Option 1 assumes that both the MVP and ACP could interconnect with Transco at Transco's existing Compressor Station 165 in Pittsylvania County, Virginia.

[14] Option 2 assumes that both the MVP and ACP could interconnect with Transco at the current proposed interconnect with Transco for the ACP in Buckingham County, Virginia.

[15] Option 3 assumes that both the MVP and ACP could interconnect with Transco at an intermediate point along Transco's existing system.

[16] The MVP route crosses about 2.1 miles of the Jefferson National Forest, though Mountain Valley is currently evaluating potential alternative routes which would increase the crossing length in the forest.

[17] These estimates are based on a 125-foot-wide construction right-of-way and 75-foot-wide permanent easement for the AP-1 mainline.


Proposed ACP Marts Junction Interconnect
0
50
100
150
200
250
300
Proposed ACP Compressor Station 2
Transco Compressor Station 165 (Existing)
Option 1
Option 2
Option 3 Theoretical Route
0 10 20 Miles
Proposed ACP AP-1 Mainline
Proposed ACP AP-2,AP-3,AP-4
Proposed MVP Pipeline
Existing Transco Pipeline
Atlantic Coast Pipeline
Figure 10.7.1-4
Potential Collocation Routing Options with the Mountain Valley Pipeline
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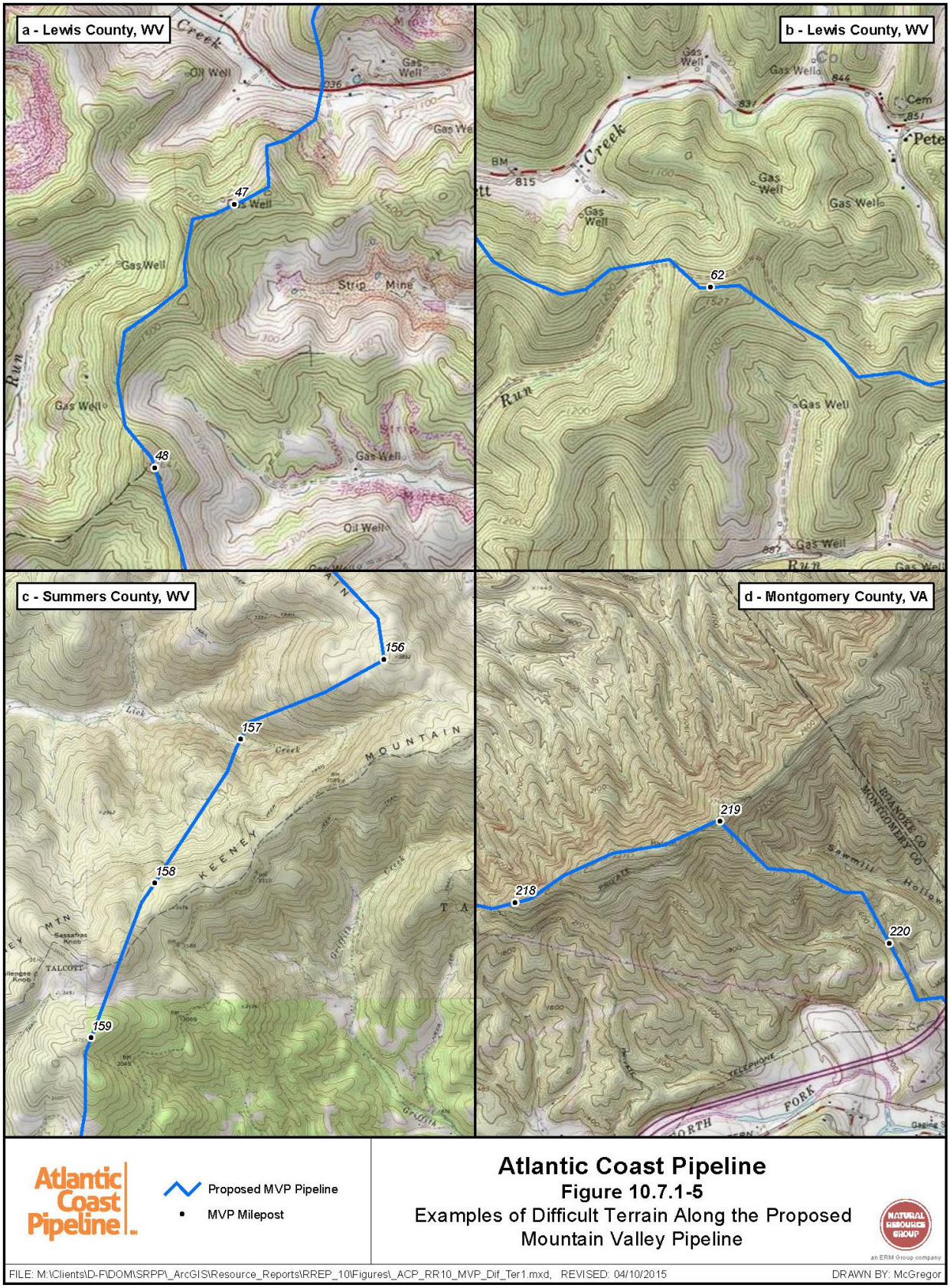
Another flaw with the Option 1 scenario is that the mountainous terrain along portions of the MVP route, particularly in northern West Virginia, would not allow for construction of two large diameter pipelines in a common corridor (see Figure 10.7.1-5). Much of the MVP route in northern West Virginia follows ridgelines with narrow crests and steep side-slopes. There is insufficient space along the tops of the ridgelines for two adjacent pipelines in these areas. Based on review of U.S. Geological Survey topographic quadrangles, there do not appear to be any opportunities to collocate the two pipelines for the initial 40 miles of the route between the crossing of Kincheloe Creek in Harrison County and the crossing of Elk River in Webster County, West Virginia. Additionally, there are limited opportunities to collocate the two pipelines in a common corridor south of the Elk River along the current MVP route. There are several mountain crossings with steep terrain along the MVP route in southern West Virginia and Virginia that would preclude construction of two adjacent pipelines on the same landform. Examples of difficult terrain along the MVP route south of Elk River include:

- the crossings of Big Mountain and surrounding peaks in Webster County, West Virginia;
- the crossings of unnamed mountaintops and ridgelines in the vicinity of Quinwood in Nicholas and Greenbrier Counties, West Virginia;
- the crossings of Little Sewall Mountain and surrounding peaks in Greenbrier County, West Virginia;
- the crossings of Red Spring and Keeney Mountains in Summers County, West Virginia (see Figure 10.7.1-5c);
- the crossings of High Top and Little Top Mountains in Monroe County, West Virginia;
- the crossing of Fort Lewis Mountain in Montgomery County, Virginia (see Figure 10.7.1-5d);
- the crossing of Poor Mountain in Roanoke County, Virginia; and
- the crossing of Cahas Mountain in Franklin County, Virginia.

Because of the difficult terrain, much of the AP-1 mainline in West Virginia under the Option 1 scenario would need to be routed along a separate corridor from MVP. This would include at least 40 miles of the route in the area immediately south of the proposed Marts Junction Interconnection to the Elk River crossing, and significant stretches of the route around the larger mountains and ranges in southern West Virginia and western Virginia. The new rights-of-way required for both pipelines in these areas would eliminate the benefits of collocation, such as reduced clearing of forests, forest fragmentation, and disturbance of other lands.


a - Lewis County, WV
b - Lewis County, WV
c - Summers County, WV
d - Montgomery County, VA
47
48
62
156
157
158
159
218
219
220
Proposed MVP Pipeline
MVP Milepost
Atlantic Coast Pipeline
Figure 10.7.1-5
Examples of Difficult Terrain Along the Proposed Mountain Valley Pipeline
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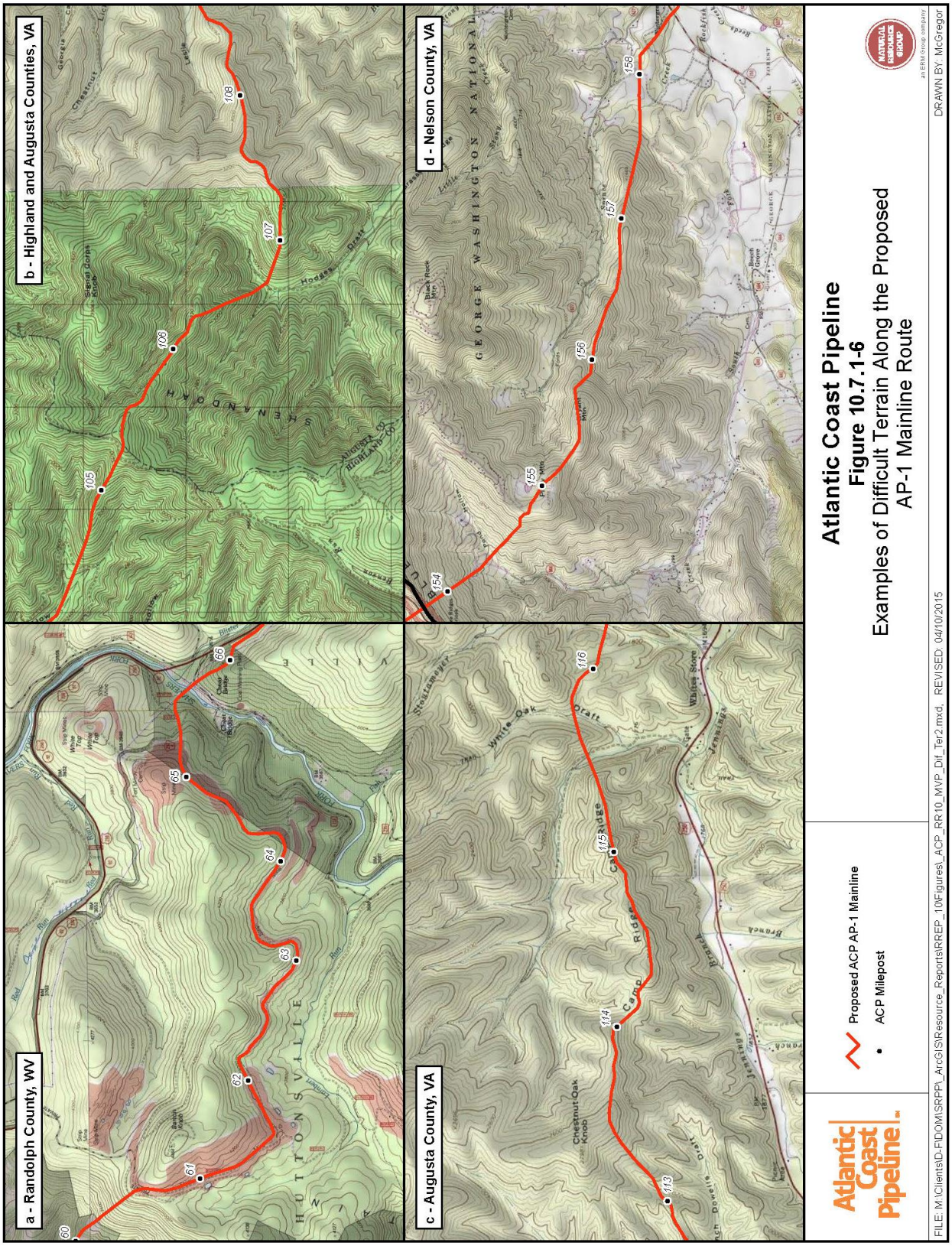
Conceptually, the Option 1 scenario for the AP-1 mainline could in some places increase collocation and avoid crossings of the MNF and GWNF (though they would increase the crossing of the JNF). These potential advantages would be offset by the limited opportunities for collocation along the MVP route in West Virginia as well as the substantial additional length, area of impact, and cost to construct along this or a similar route. For these reasons, the Option 1 scenario is not considered a viable or feasible alternative to the ACP and MVP projects as proposed.

Option 2

Under the Option 2 scenario, the proposed MVP pipeline would follow the AP-1 mainline route to the southeast for approximately 189 miles through Lewis, Upshur, Randolph, Pocahontas, and Highland Counties, West Virginia, and Highland, Augusta, Nelson, and Buckingham Counties, Virginia, where it would interconnect with Transco's existing pipeline system. From this point, the proposed AP-1 mainline would continue along its currently proposed route into central and southeastern Virginia.

The Option 2 scenario, if technically feasible, would result in greater collocation with other linear corridor facilities for the ACP and MVP projects (assuming both pipelines are permitted and built). Routing both pipelines along the current AP-1 alignment would increase the length of the MVP pipeline by only 4 miles, but it would result in significantly greater cumulative impact in the MNF and GWNF. Additionally, while the terrain along the currently proposed AP-1 mainline route provides better opportunities than the MVP route for collocating the ACP and MVP pipelines in a common corridor, there are crossings of steep mountains and ridges where it would not be feasible to install two large diameter pipelines on the same landform, including areas in the MNF and GWNF (see Figure 10.7.1-6). Examples of difficult terrain include:

- the crossing of an abandoned strip mine between approximate MPs 18 and 22 in Lewis and Upshur Counties, West Virginia;
- the crossing of Cheat and Back Allegheny Mountains within the MNF between MPs 60 and 65 in Randolph County, West Virginia (see Figure 10.7.1-6a);
- the crossing of the Shenandoah Mountain range within the GWNF between MPs 104 and 108 in Highland and Augusta Counties, Virginia (see Figure 10.7.1-6b);
- the crossing of Chestnut Oak Knob and Camp Ridge within the GWNF between MPs 113 and 115 in Augusta County, Virginia (see Figure 10.7.1-6c);
- the crossing of the Blue Ridge Mountains (including U.S. Forest Service (USFS) lands along the Blue Ridge Parkway and Appalachian Trail), Piney Mountain, and Bryant Mountain between MPs 153 and 158 in Nelson and Augusta Counties, Virginia (see Figure 10.7.1-6d); and
- the crossings of Thoroughfare Gap and Bailey Mountain between MPs 167 and 170 in Nelson County, Virginia.


a - Randolph County, WV
b - Highland and Augusta Counties, VA
c - Augusta County, VA
d - Nelson County, VA
Proposed ACP AP-1 Mainline
ACP Milepost
Atlantic Coast Pipeline
Atlantic Coast Pipeline
Figure 10.7.1-6
Examples of Difficult Terrain Along the Proposed
AP-1 Mainline Route
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DRAWN BY: McGregor

Although segments of the two pipelines could be constructed within a common corridor, new individual rights-of-way for both pipelines would be necessary in the areas with steep, difficult terrain. This would result in additional crossings of Federal lands in the MNF and GWNF as well as separate crossings of Federal lands at the Appalachian Trail and the Blue Ridge Parkway. For these reasons, the Option 2 scenario is not considered a viable or feasible alternative to the ACP and MVP projects as currently proposed.

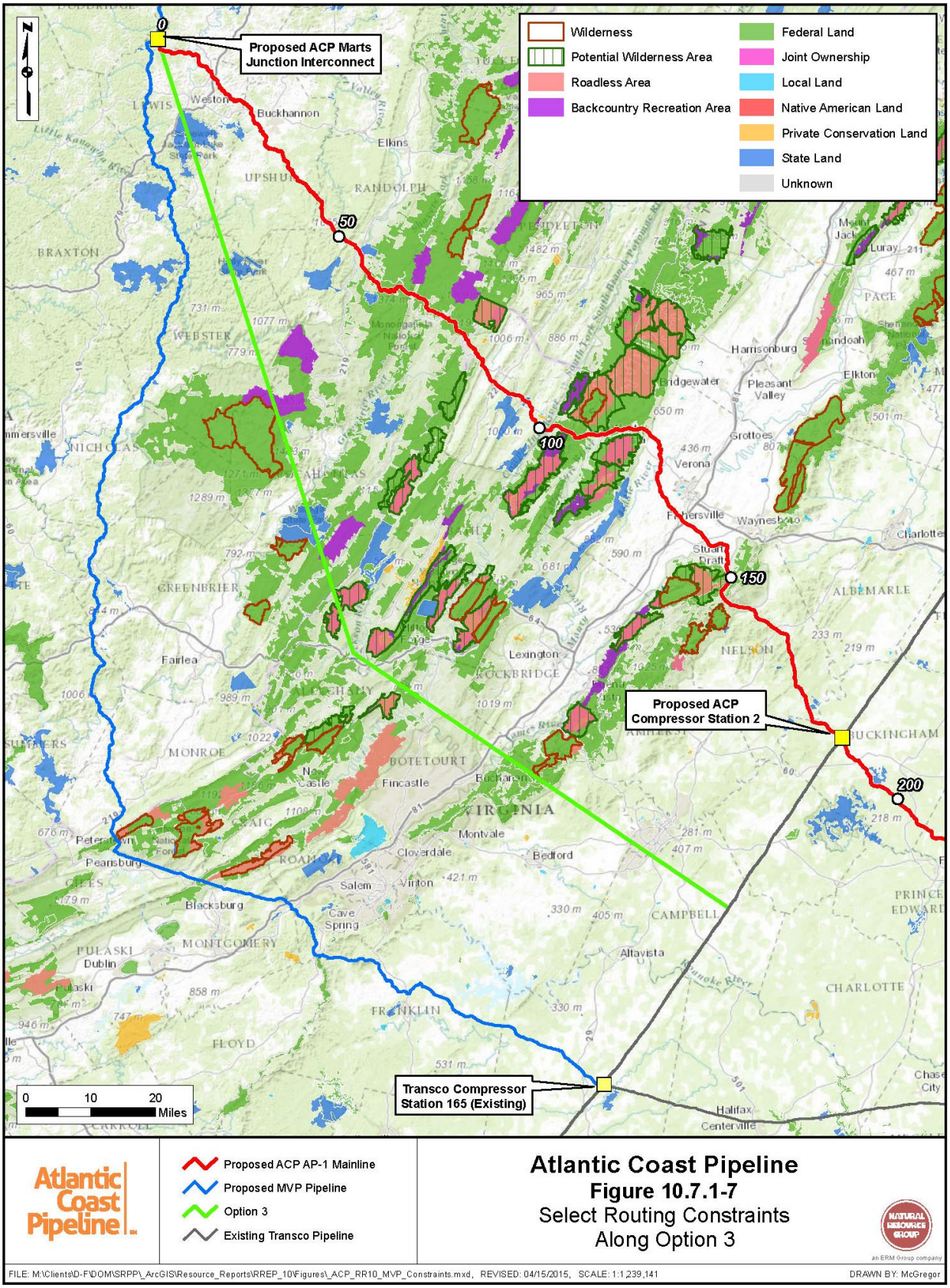
Option 3

Under the Option 3 scenario, the ACP and MVP pipelines would be routed in a common, intermediate corridor relative to the currently proposed routes. Atlantic and DTI attempted to identify a potential new corridor extending south/southeast of the proposed Marts Junction Interconnection in Harrison County, West Virginia, to the existing Transco pipeline system in southern Virginia along terrain with sufficient space for the installation of two adjacent pipelines. As with the Option 1 and 2 scenarios, the terrain in much of this area consists of mountaintops and ridges with narrow crests and steep side slopes with insufficient space for two pipelines.

In addition to the difficult terrain, the area between the currently proposed ACP and MVP pipelines in Virginia includes extensive Federal landholdings in the MNF, GWNF, and JNF, including sensitive features and specially protected and managed lands which would be difficult to cross. These include designated Wilderness Areas, potential Wilderness Areas, roadless areas, backcountry recreation areas, special biological areas, and scenic corridors (see Figure 10.7.1-7). As noted above, crossings of Wilderness Areas would require an act of the U.S. Congress, which would be infeasible to obtain within the timeframe required by the purpose and need of the Projects. Atlantic and DTI were unable to locate any routes that both avoid these features and cross terrain suitable for construction of two large diameter pipelines in a common corridor. For these reasons, the Option 3 scenario is not considered a viable or feasible alternative to the ACP and MVP projects as currently proposed.

10.7.1.3 Appalachian Connector Pipeline

As discussed in Section 10.6.2.3 above, Transco has announced plans to construct the Appalachian Connector Pipeline Project, approximately 300 miles of new pipeline between the existing Rockies Express pipeline in Monroe County, Ohio; an existing gas processing facility in Marshall County, West Virginia; and the existing Transco mainline in Pittsylvania County, Virginia (Transco's existing Compressor Station 165). The project would be similar to (and compete with) MVP and have the same primary delivery point.


Wilderness
Potential Wilderness Area
Roadless Area
Backcountry Recreation Area
Federal Land
Joint Ownership
Local Land
Native American Land
Private Conservation Land
State Land
Unknown
0
50
100
150
200
Proposed ACP Marts Junction Interconnect
Proposed ACP Compressor Station 2
Transco Compressor Station 165 (Existing)
0 10 20 Miles
Proposed ACP AP-1 Mainline
Proposed MVP Pipeline
Option 3
Existing Transco Pipeline
Atlantic Coast Pipeline
Atlantic Coast Pipeline
Figure 10.7.1-7
Select Routing Constraints
Along Option 3
FILE: M:\Clients\D-F\DOM\SRPP_ArcGIS\Resource_Reports\RREP_10\Figures_ACP_RR10_MVP_Constraints.mxd, REVISED: 04/15/2015, SCALE: 1:1,239,141
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According to the project website, the Appalachian Connector Pipeline Project is in the preliminary planning stages and a route has not been proposed (see Figure 10.6-1) (Williams, 2015). However, general location maps available in media reports and from various stakeholder websites suggest that the route would be similar to MVP (see Figure 10.7.1-3) (Williams, 2015). Assuming that is the case, this route would have the same limitations relative to the ACP as described above for MVP. A conceptual alternative route along either MVP or the Appalachian Connector Pipeline would add 68 miles to the length of the AP-1 mainline to access Atlantic's proposed delivery/receipt point in southeastern Virginia. This would significantly increase the length of the pipeline, the area of environmental impact, and the cost of the ACP. Additionally, as described above for the MVP, it would not be feasible to collocate the Appalachian Connector Pipeline and AP-1 mainline in a common corridor similar to the MVP route due to difficult terrain.

For all these reasons, a conceptual alternative route along a similar path as the Appalachian Connector Pipeline provides no advantage over the ACP and is not a viable or feasible alternative route.

10.7.2 Electric Transmission Lines

Relative to another pipeline, there are additional challenges to routing a new natural gas transmission pipeline adjacent to an existing electric transmission line, particularly with regard to terrain. Whereas electric transmission lines can be sited to span steep or difficult topographic features, such as ravines, valleys, and side slopes, pipeline construction in rugged areas must typically cross ridges and hills perpendicular to the slope (i.e., along the natural fall of the slope). For this reason, electric transmission lines can often be built in topographies where pipeline construction would be difficult or impractical.

Another issue with electric transmission lines is that tower structures and wires, especially for high voltage lines, typically require a wide operational right-of-way for safety and reliability. Depending on the operational requirements of the existing electric transmission system, a new pipeline may need to be offset from the transmission line, which could reduce some of the benefits of collocation, such as less tree clearing.

Atlantic evaluated a conceptual alternative route which follows an existing Dominion Virginia Power (DVP) 500 kilovolt (kV) electric transmission line across central and southern Virginia. Additionally, Atlantic and DTI evaluated a conceptual alternative route which follows several existing electric transmission lines, including lines operated by Monongahela Power Company (MPC), West Penn Power (West Penn), and DVP. [18]

10.7.2.1 Dominion Virginia Power Electric Transmission Line

Beginning approximately at MP 120 of the proposed AP-1 mainline in Augusta County, Virginia, a conceptual alternative route adjacent to DVP would initially head due east for approximately 12 miles. The route would then turn to the south and southeast for approximately 84 miles, crossing Augusta, Albemarle, Fluvanna, Goochland, Louisa, and Hanover Counties, Virginia. At a point near Vontay, Virginia, the route would turn south and continue for

[18] In comments filed with the Commission, various individuals commented that the proposed ACP pipelines should be installed adjacent to existing electric transmission lines, including DVP's existing 500 kv electric transmission line.

approximately 57 miles across Hanover, Goochland, Powhatan, Chesterfield, and Dinwiddie Counties, Virginia, passing west of the City of Richmond. The route would then head south for approximately 27 miles across Dinwiddie, Sussex, and Greensville Counties, Virginia, terminating approximately at MP 276 of the proposed AP-1 mainline (see Figure 10.7.2-1).

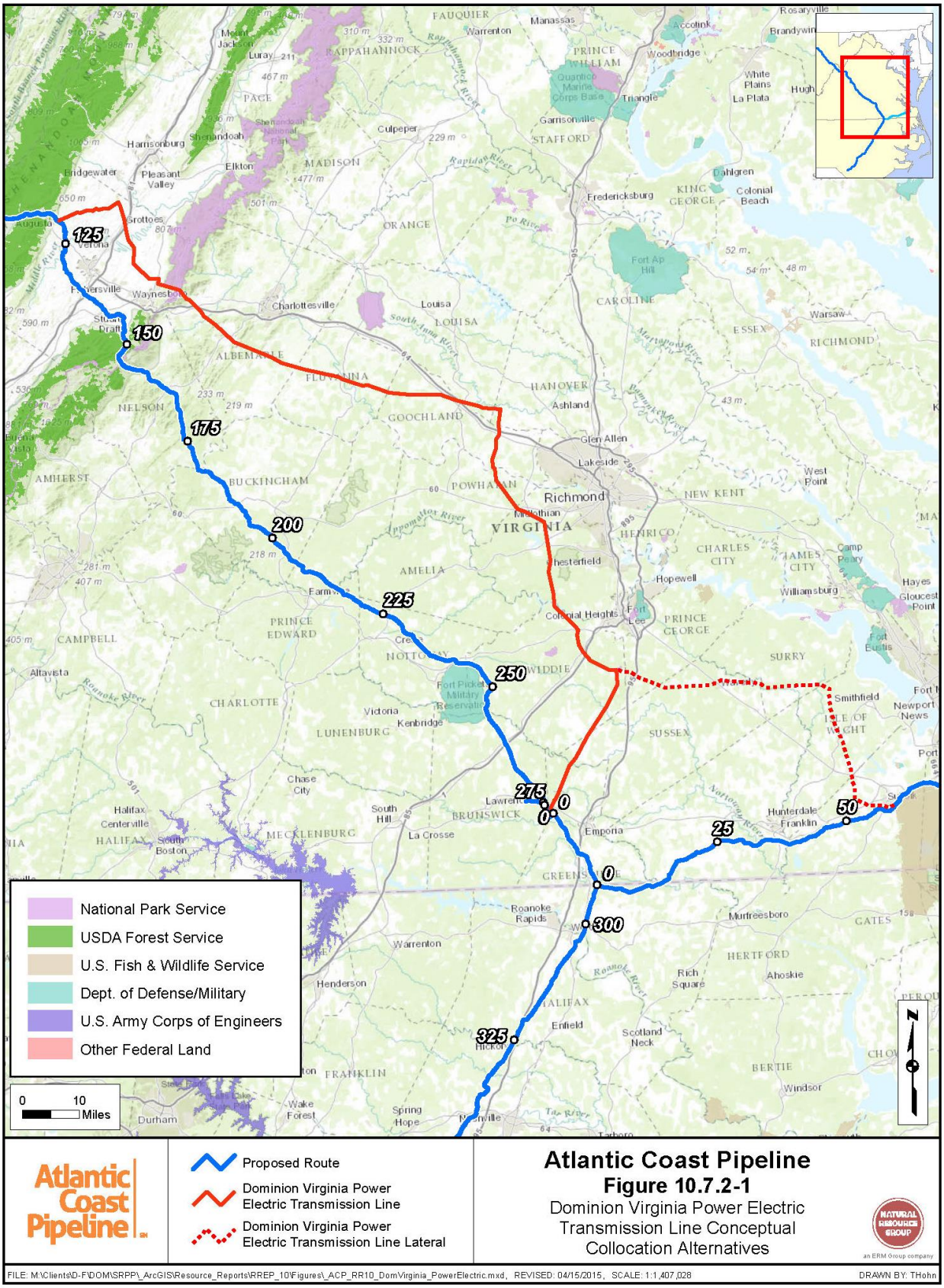
In addition to the AP-1 alternative, an alternate route for the proposed AP-3 lateral would also be required. Starting at a point near Reams, Virginia, the alternate lateral route would follow an existing DVP 500 kV transmission line for approximately 37 miles to the east, crossing Dinwiddie, Prince George, Sussex, and Surry Counties, Virginia. It would then head south for approximately 29 miles across Isle of Wight County and the City of Suffolk, Virginia, terminating approximately at MP 60 of the proposed AP-3 lateral (see Figure 10.7.2-1).

Relative to the corresponding segments of the proposed AP-1 mainline and AP-3 lateral, the conceptual route alternative adjacent to DVP would add a total of approximately 30 miles to the length of the proposed pipelines, which would increase the environmental impact and cost of the Project. The additional length of the pipelines would increase the area of impact for the ACP by a minimum of 419 acres and encumber an additional 254 acres in the permanent, maintained easement for the pipelines. [19]

In addition to these factors, there are topographic and land use constraints along the conceptual route alternative which preclude placing the AP-1 and AP-3 pipelines adjacent to DVP. About 50 miles of the mainline route across Augusta, Albemarle, Fluvanna, and Goochland Counties crosses terrain with side slope. While the pipeline could be placed adjacent to the existing electric transmission line in places along this segment of the route, there would be other places where the pipeline would need to follow an alternate parallel alignment to avoid side slope terrain. This is particularly true where the route crosses the Blue Ridge Mountains in Augusta and Albemarle Counties, Virginia, and in the foothills on the east side of the mountains (see Figure 10.7.2-2).

Land use constraints along the existing DVP corridor include a 0.2-mile-long crossing of NPS lands in the SNP in Augusta and Nelson Counties, Virginia, near Calf Mountain. The NPS has indicated that obtaining a right-of-way to cross NPS lands (other than the Blue Ridge Parkway) requires an authorization from the U.S. Congress. This authorization would be infeasible to obtain within the timeframe required by the purpose and need of the Projects. An alternative greenfield route would be necessary to avoid the SNP. A greenfield route to the south would need to pass south of Waynesboro, which would approximate the current AP-1 mainline route. An alternate route to the north would need to pass north of Front Royal, Virginia. Depending on the route selected, this would add up to 80 miles of pipeline to the conceptual route alternative (an additional 1,212 acres of construction right-of-way and 727 acres of permanent easement), which would increase the area of environmental impact and cost of the ACP.

[19] These estimates are based on a 125-foot-wide construction right-of-way and 75-foot-wide permanent easement for the AP-1 mainline and a 75-foot-wide construction right-of-way and 50-foot-wide permanent easement for the AP-3 lateral. The conceptual AP-1 mainline adjacent to Columbia would result in an additional 364 acres of construction right-of-way and 218 acres of permanent easement. The conceptual route for the AP-3 lateral would result in an additional 55 acres of construction right-of-way and 36 acres of permanent easement.


125
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300
325
National Park Service
USDA Forest Service
U.S. Fish & Wildlife Service
Dept. of Defense/Military
U.S. Army Corps of Engineers
Other Federal Land
0 10 Miles
Atlantic Coast Pipeline
Proposed Route
Dominion Virginia Power Electric Transmission Line
Dominion Virginia Power Electric Transmission Line Lateral
Atlantic Coast Pipeline
Figure 10.7.2-1
Dominion Virginia Power Electric Transmission Line Conceptual Collocation Alternatives
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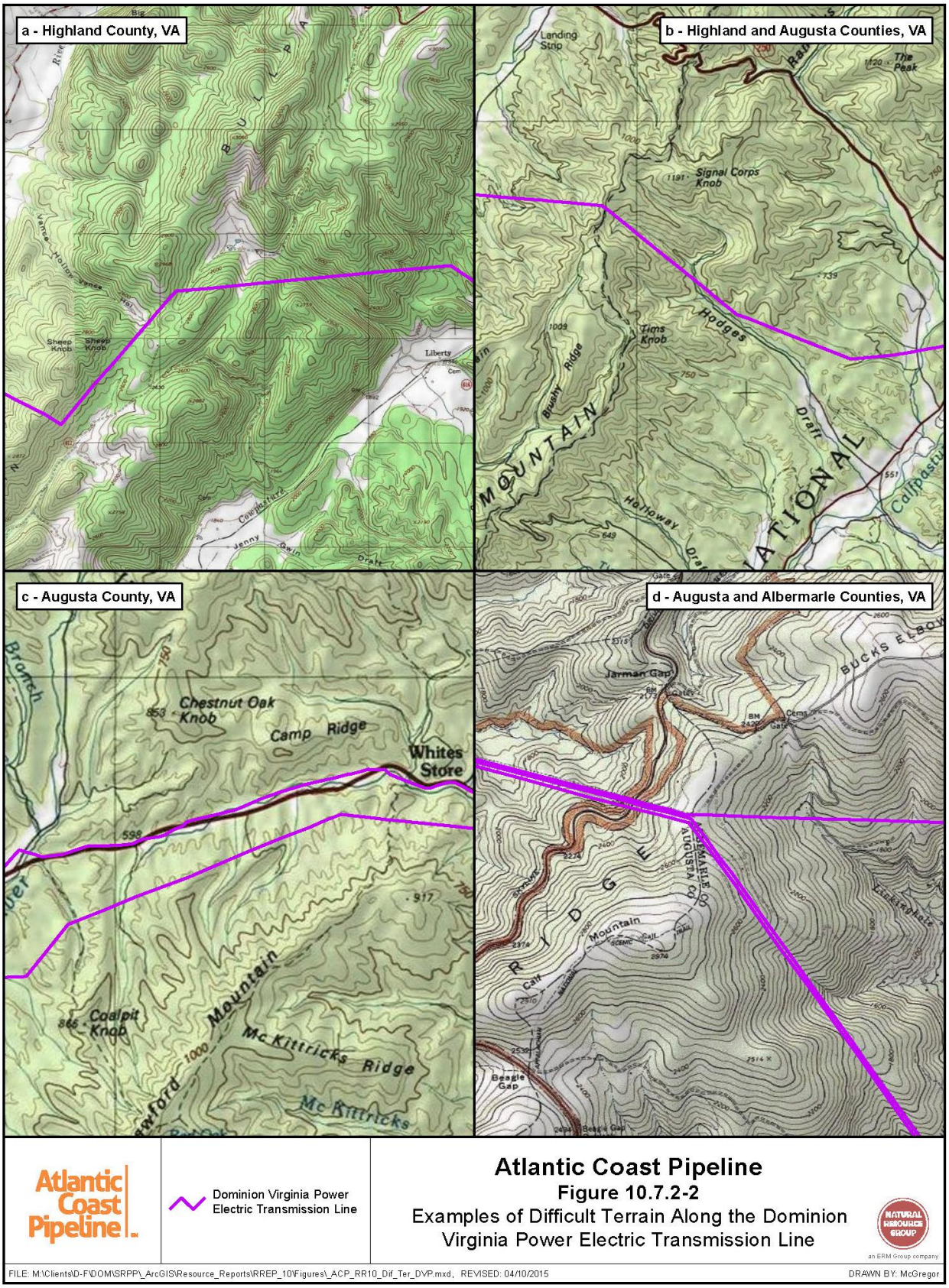
a - Highland County, VA
b - Highland and Augusta Counties, VA
c - Augusta County, VA
d - Augusta and Albermarle Counties, VA
Chestnut Oak Knob
Camp Ridge
Whites Store
Coalpit Knob
Mountain
McKittricks Ridge
Jarman Gap
Beagle Gap
Signal Corps Knob
Tims Knob
Hodges
Brushy Ridge
Hathaway
Sheep Knob
Liberty
Jenny Gwin
Draft
Landing Strip
The Peak
Atlantic Coast Pipeline
Dominion Virginia Power Electric Transmission Line
Atlantic Coast Pipeline
Figure 10.7.2-2
Examples of Difficult Terrain Along the Dominion Virginia Power Electric Transmission Line
NATURAL RESOURCE GROUP
an ERM Group company
FILE: M:\Clients\D-F\DOM\SRPP_ArcGIS\Resource_Reports\RREP_10\Figures_ACP_RR10_Dif_Ter_DVP.mxd, REVISED: 04/10/2015
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The crossing of the SNP aside, there are many places along the existing DVP corridor where residential developments have encroached on the existing right-of-way. In these areas, the proposed pipelines would need to be routed away from the existing corridor, which would increase the length of the pipeline, the area of environmental impact, and the cost, as well as forgo the benefits of collocation. One area, in particular, where a major alternative route off the existing DVP corridor would be required is Midlothian in Chesterfield County, Virginia, on the outskirts of the City of Richmond. A greenfield route alternative measuring approximately 20 to 25 miles in length would be necessary to avoid developments in and around Midlothian. Another developed area along the route occurs in the City of Suffolk. A greenfield route alternative measuring approximately 10 miles in length would be necessary to avoid high density residential subdivisions on the east side of Suffolk. Depending on the routes selected, these two route alternatives alone would add between approximately 10 and 15 miles of additional pipeline to the conceptual route.

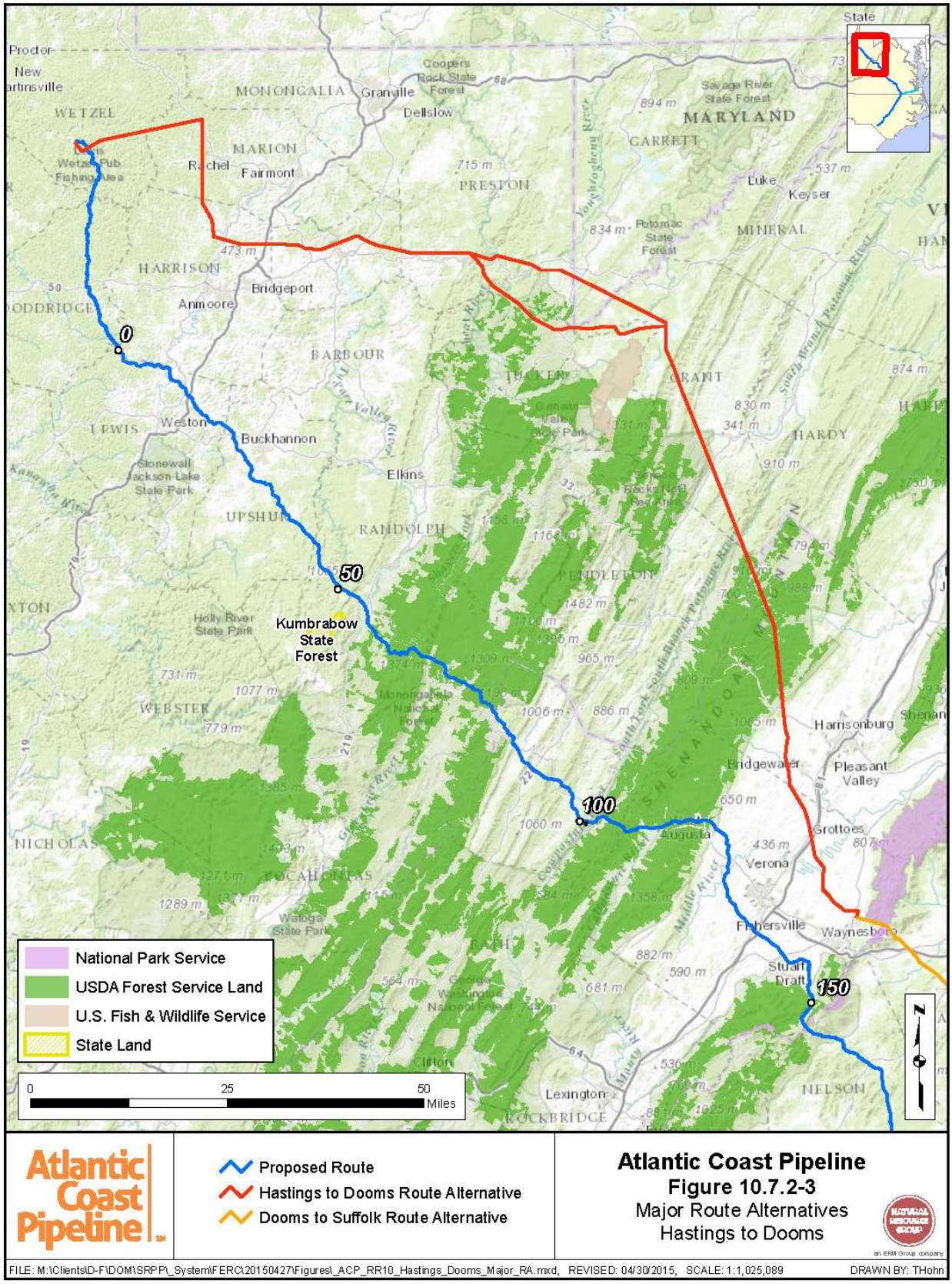
For all the reasons described above, a conceptual route alternative adjacent to DVP would greatly increase the length of the pipelines, the area of environmental impact, and the cost of the ACP. Moreover, significant greenfield route alternatives would be required to avoid difficult side slope terrain or land use features, including a crossing of the SNP. Therefore, the conceptual route alternative along the DVP corridor is not a viable or feasible alternative to the ACP.

10.7.2.2 Multiple Electric Transmission Lines

As noted above, Atlantic and DTI evaluated a conceptual route alternative that parallels portions of various existing electric transmission lines across West Virginia, Virginia, and North Carolina. For purposes of this analysis, the conceptual route alternative was divided into three segments: Hastings to Dooms, Dooms to Suffolk, and Pleasant Shade to St. Pauls. Each of these segments is described below.

The first segment of the conceptual route alternative, Hastings to Dooms, would originate at DTI's existing Mockingbird Hill Compressor Station (i.e., approximately at MP 32.8 of the proposed TL-635 loop) near Hastings in Wetzel County, West Virginia (see Figure 10.7.2-3). Even though the alternative route would originate at this point, approximately 33 miles of new pipeline loop would still be required for the SHP because of receipt obligations south of the Mockingbird Hill Compressor Station. Rather than 36-inch diameter pipe, which is proposed for the TL-635 loop, the new pipeline would consist of about 17 miles of 24-inch diameter pipeline and 16 miles of 20-inch outside diameter pipeline. For these reasons, the Hastings to Dooms segment includes the proposed TL-635 loop as a component of the conceptual route alternative.

Collectively, the three segments of the conceptual route alternative could increase the length of the Projects by over 100 miles. This would increase the area of environmental impact and cost of the Projects and could require additional compression on the system. For these reasons, and as discussed in detail below, the conceptual route alternative is not a viable or feasible alternative to the Projects.


State
Proctor
New
MONONGALIA
Granville
Dellslow
Coopers Rock State Forest
Savage River State Forest
MARYLAND
WETZEL
MARION
Fairmont
PRESTON
GARRETT
Luke
Keyser
MINERAL
Potomac State Forest
HARRISON
Bridgeport
Anmoore
BARBOUR
TUCKER
GRANT
HARDY
LEWIS
Weston
Buckhannon
Stonewall Jackson Lake State Park
Elkins
UPSHUR
RANDOLPH
PENDLETON
Holly River State Park
Kumbrabow State Forest
WEBSTER
Monongahela National Forest
Harrisonburg
Bridgewater
Pleasant Valley
Augusta
Verona
Grottoes
Fishersville
Waynesboro
Stuarts Draft
NICHOLAS
POCAHONTAS
Watoga State Park
Clifton
Lexington
ROCKBRIDGE
NELSON
0
50
100
150
National Park Service
USDA Forest Service Land
U.S. Fish & Wildlife Service
State Land
0
25
50
Miles
N
Atlantic Coast Pipeline
Proposed Route
Hastings to Dooms Route Alternative
Dooms to Suffolk Route Alternative
Atlantic Coast Pipeline
Figure 10.7.2-3
Major Route Alternatives
Hastings to Dooms
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Hastings to Dooms

Starting at the Mockingbird Hill Compressor Station, the Hastings to Dooms route alternative initially would follow an existing MPC 138 kV electric transmission line for approximately 17 miles to the east/northeast to a point near Metz in Marion County, West Virginia. It would then follow an existing West Penn 500 kV electric transmission line to the south for about 15 miles across Marion and Harrison Counties, West Virginia, to a point near Lumberport. The route would then follow an existing 500 kV electric transmission line (operator unknown) to the east for approximately 34 miles crossing Harrison, Taylor, and Preston Counties, West Virginia. This segment of the route generally is on the north side of U.S. Highway 50.

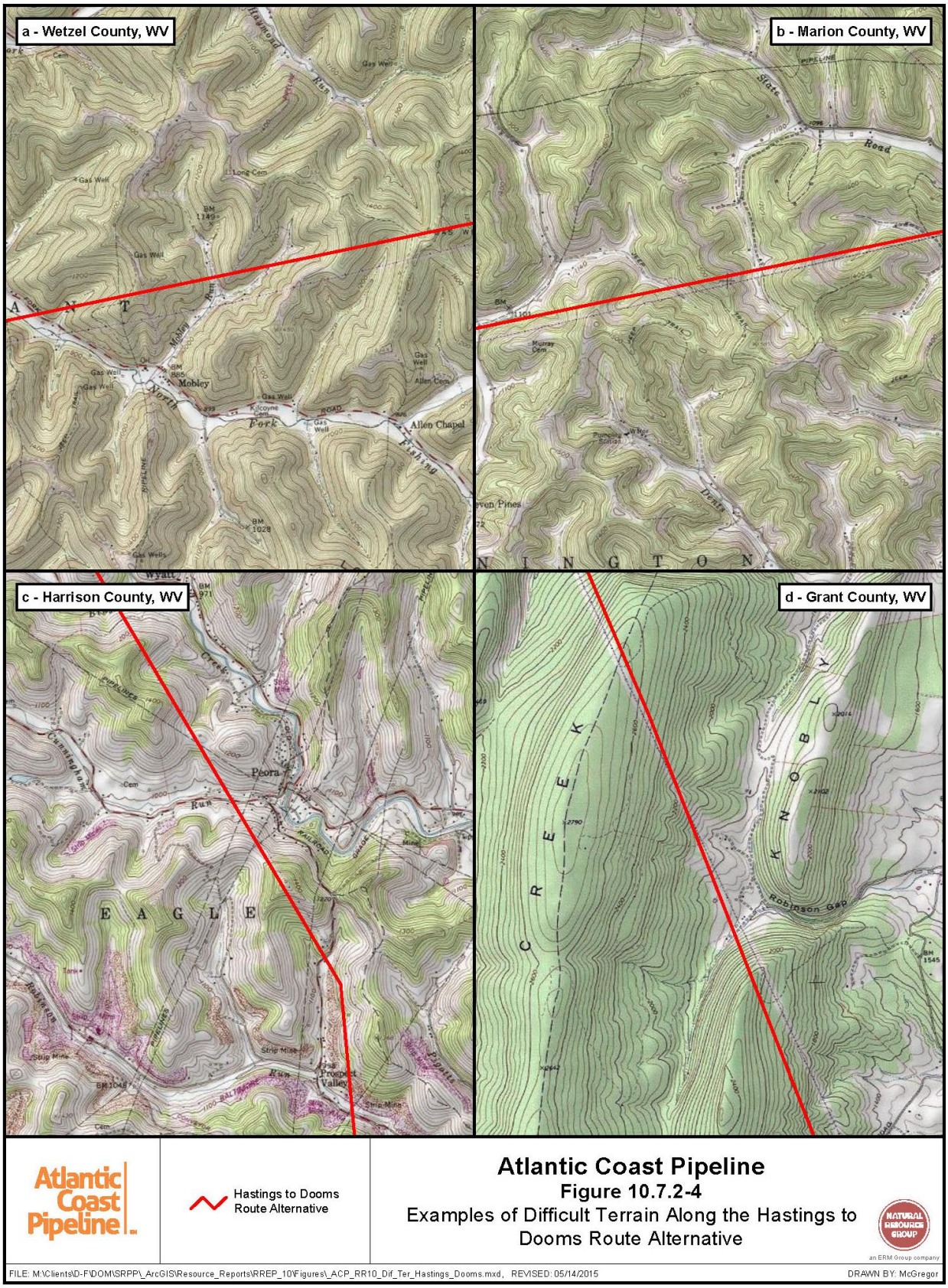
At a point west of Rowlesburg, West Virginia, the existing 500 kV electric transmission line splits into two corridors. The northern corridor continues to the east for 28 miles across Preston County, West Virginia, Garrett County, Maryland, and Grant County, West Virginia. The southern route heads east/southeast for about 30 miles across Preston, Tucker, and Grant Counties, West Virginia. The two routes merge at an existing power station just west of Mount Storm Lake in Grant County, West Virginia. Either corridor could potentially be followed for the conceptual route alternative.

From the power station at Mount Storm Lake, the conceptual route alternative follows an existing MPC 500 kV electric transmission line for about 64 miles to the south/southeast across Grant, Hardy, and Pendleton Counties, West Virginia and Rockingham and Augusta Counties, Virginia. It then follows an existing DVP 500 kV electric transmission line to the south/southeast for about 18 miles across Augusta County. It terminates at an existing substation near Dooms in Augusta County, just north of the City of Waynesboro, Virginia.

Regardless of the alignment selected for the route segment between Rowlesburg and Mount Storm Lake, the Hastings to Dooms conceptual route alternative would measure about 176 miles in length, plus the 33 miles of the TL-635 pipeline loop, for a total of 209 miles. Although the conceptual route alternative is mostly adjacent to existing utilities, this is approximately 31 miles longer than the corresponding segments of the ACP and SHP (a total of about 178 miles consisting of 33 miles on the TL-635 loop and 145 miles on the AP-1 mainline). The increase in length would result in an additional 470 acres of construction right-of-way and 282 acres of permanent easement, which would increase the environmental impact and costs of the Projects. [20]

Topography along much of the conceptual route alternative would preclude placing the pipeline adjacent to the existing electric transmission lines due to difficult terrain. Much of the route between Hastings and Mount Storm Lake in West Virginia, a linear distance of about 90 miles, crosses steep side slope. The pipeline could be placed adjacent to the existing electric transmission lines for short distances along this segment of the route, but for much of this area the pipeline would need to be routed on an alternate path to cross ridges perpendicular to the slope (i.e., along the natural fall of the slope). Examples of difficult terrain along the existing electric transmission lines are depicted in Figure 10.7.2-4.

[20] These estimates are based on a 125-foot-wide construction right-of-way and 75-foot-wide permanent easement for the AP-1 mainline.


a - Wetzel County, WV
b - Marion County, WV
c - Harrison County, WV
d - Grant County, WV
Hastings to Dooms Route Alternative
Atlantic Coast Pipeline
Figure 10.7.2-4
Examples of Difficult Terrain Along the Hastings to Dooms Route Alternative
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South of Mount Storm Lake, there are better opportunities to place the pipeline adjacent to the existing electric transmission lines, but there are still places where the existing facilities cross steep side slope which would need to be avoided by the pipeline. These include Allegheny Front, New Creek Mountain, and Middle Mountain in Grant County, West Virginia; and Shenandoah Mountain and surrounding peaks and Second Mountain and surrounding peaks in Rockingham County, Virginia. In these areas, the pipeline would need to be routed along an alternate path to avoid the side slope.

The new routing required to avoid side slope would result in an alternate route that is generally parallel, but not adjacent, to the existing electric transmission lines. In many places, the pipeline would need to be routed on adjacent ridges, which would increase the length of the pipeline and forgo the benefits of collocation, such as reduced forest fragmentation. Atlantic and DTI estimate that the additional routing required to avoid side slope would increase the length of the pipeline by about 10 percent, excluding the TL-635 loop. This would increase the length of the conceptual route alternative approximately by 18 miles, for a total length of about 227 miles, which is significantly longer than the baseline (178 miles). This would require an additional 273 acres of construction right-of-way and 164 acres of permanent easement relative to the baseline.

In addition to the difficult terrain, there are developed areas along the conceptual route alternative which would need to be avoided by the pipeline. These include the Haywood/ Lumberport area in Harrison County, West Virginia; the area along State Road 28/55 in Grant County, West Virginia; Lilly in Rockingham County, Virginia; and Dooms in Augusta County, Virginia. In these places, residences and other buildings have built up adjacent to the existing electric transmission line. Alternate routes to avoid these areas would increase the length, environmental impact, and cost of the Projects even further.

While the Hastings to Dooms segment avoids the MNF, it crosses about 16.7 miles of the GWNF (compared to 11.8 miles for the ACP) in Pendleton County, West Virginia and Rockingham County, Virginia. This crossing occurs adjacent to the existing MPC 500 kV electric transmission line within a designated utility corridor on the GWNF. The terrain along much of the corridor, however, is unsuitable for pipeline construction. The area includes the crossing of Shenandoah Mountain, which as noted above, is characterized by areas of steep side slope. Alternate routing to avoid the side slope would result in a new corridor across the GWNF in this area.

For all the reasons described above, the Hastings to Dooms segment of the conceptual route alternative would greatly increase the length, area of environmental impact, and cost of the Projects. Significant greenfield route alternatives would be necessary to avoid difficult side slope terrain and developed areas along the route. Therefore, the Hastings to Dooms segment of the conceptual route alternative is not a viable or feasible alternative to the Projects.

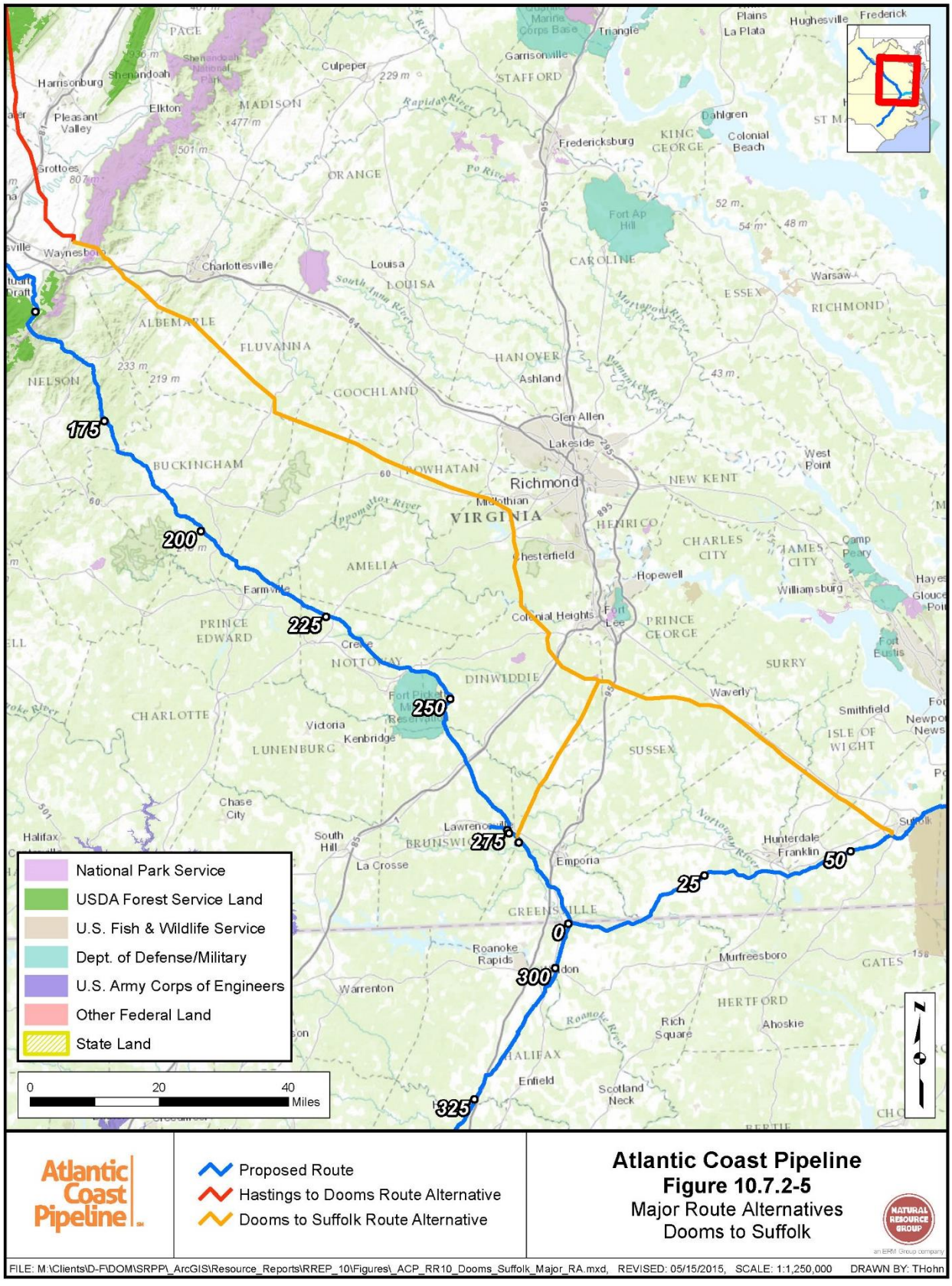
Dooms to Suffolk

The second segment of the conceptual route alternative, Dooms to Suffolk, would originate at the existing substation near Dooms in Augusta County, Virginia (see Figure 10.7.2-5). From this point, the conceptual route alternative would follow an existing DVP 500 kV electric transmission line for approximately 23 miles to the southeast across Augusta and Albemarle Counties, Virginia, crossing I-64 and passing west of Crozet and Charlottesville. The route would then follow an existing 115 kV electric transmission line (operator unknown) for approximately 20 miles to the south/southeast across Albemarle and Fluvanna Counties, Virginia to an existing power plant on the James River near New Canton.

Continuing from the power plant, the alternative route would follow an existing DVP 138 kV electric transmission line for about 40 miles to the southeast, crossing Cumberland, Powhatan, and Chesterfield Counties, Virginia. It would then follow a series of existing DVP electric transmission lines for approximately 54 miles to the south and east, crossing Chesterfield, Dinwiddie, Prince George, and Sussex Counties, Virginia, and passing west of the City of Richmond. The route would then follow a series of existing DVP electric transmission lines for about 33 miles to the southeast across Sussex and Isle of Wight Counties and the City of Suffolk, Virginia. It would terminate at approximate MP 56.6 of the AP-3 lateral west of the Great Dismal Swamp National Wildlife Refuge (GDS-NWR). In total, this route would measure about 170 miles in length.

The Dooms to Suffolk segment of the conceptual route alternative additionally would require a pipeline route to access the AP-4 and AP-5 delivery points for the ACP. Starting at a point north of Carlson, this route would follow a series of existing DVP electric transmission lines for approximately 27 miles to the southeast across Dinwiddie, Sussex, and Greensville Counties, Virginia. It would then follow a similar alignment as the ACP along the AP-1 mainline and AP-4 and AP-5 laterals for about 7 miles.

In total, the Dooms to Suffolk segment of the conceptual route alternative would measure about 204 miles in length. This is almost equivalent to the corresponding segment of the baseline, which includes about 148 miles along the AP-1 mainline (between MPs 145 and 293), 57 miles along the AP-3 lateral (between MPs 0 and 57), 3 miles along the AP-4 lateral (between MPs 0 and 3), and 1 mile along the AP-5 lateral (between MPs 0 and 1), for a total of 209 miles. Additionally, virtually all of the conceptual route alternative is adjacent to existing utilities compared to about 25 miles for the corresponding segment of the baseline. However, there are land use constraints along the Dooms to Suffolk segment of the conceptual route alternative which would increase the overall length of the route and decrease the amount of collocation.


National Park Service
USDA Forest Service Land
U.S. Fish & Wildlife Service
Dept. of Defense/Military
U.S. Army Corps of Engineers
Other Federal Land
State Land
0
20
40
Miles
175
200
225
250
275
300
325
0
25
50
Richmond
Charlottesville
Fredericksburg
Lynchburg
Roanoke
Emporia
Proposed Route
Hastings to Dooms Route Alternative
Dooms to Suffolk Route Alternative
Atlantic Coast Pipeline
Figure 10.7.2-5
Major Route Alternatives
Dooms to Suffolk
FILE: M:\Clients\D-F\DOM\SRPP_ArcGIS\Resource_Reports\RREP_10\Figures_ACP_RR10_Dooms_Suffolk_Major_RA.mxd, REVISED: 05/15/2015, SCALE: 1:1,250,000 DRAWN BY: THohn

The conceptual route alternative crosses about 0.3 mile of NPS lands in the SNP just north of Calf Mountain in Augusta County and about 0.2 mile of NPS lands along the Appalachian Trail in Albemarle County. The NPS has indicated that obtaining a right-of-way to cross NPS lands (other than the Blue Ridge Parkway) requires an authorization from the U.S. Congress. This authorization would be infeasible to obtain within the timeframe required by the purpose and need of the Projects. An alternative route would be necessary to avoid the SNP and Appalachian Trail crossings. An alternative route to the south would need to pass south of the City of Waynesboro, which would add at least 15 miles (an additional 228 acres of construction right-of-way and 136 acres of permanent easement) to the conceptual alternative route. The route could then follow the AP-1 mainline south as currently proposed or double back to the north for 15 miles or more (roughly between Nellysford in Nelson County and North Garden in Albemarle County) to rejoin the conceptual route alternative. This too would add an additional 228 acres of construction right-of-way and 136 acres of permanent easement to the Dooms to Suffolk segment. [21]

A greenfield route to the north to avoid the SNP and Appalachian Trail crossings would need to pass north of Front Royal, Virginia. An alternate route around Front Royal would likely originate along the Dooms to Suffolk segment of the conceptual route alternative near Mount Storm Lake; pass to the north of the GWNF in Frederick County; pass to the north of Front Royal in Warren County; and then head south across eastern Virginia to rejoin the Dooms to Suffolk segment in Chesterfield County. Assuming that this route would parallel existing electric transmission lines, it would measure at least 185 miles in length, which is about 20 miles longer than the corresponding segment of the conceptual route. This would add an additional 303 acres of construction right-of-way and 182 acres of permanent easement to the route.

In addition to the NPS lands, there are several places along the existing electric transmission lines where houses and other buildings have built up to the existing rights-of-way. These include Yancey Mills in Albemarle County; Antioch in Fluvanna County; Hamilton in Cumberland County; Red Land and Holly Hills in Powhatan County; Midlothian in Chesterfield County; the area along the Appomattox River in Chesterfield and Dinwiddie Counties; Sutherland in Dinwiddie County; and the City of Suffolk. Greenfield route variations and adjustments in each of these places would be necessary to avoid developed lands. In particular, a major alternative route off the existing utility corridor would be required in Midlothian, which is a suburb on the outskirts of the City of Richmond. A new greenfield route alternative measuring at least 16 miles in length would be necessary to avoid the developments in and around Midlothian.

For all the reasons described above, the Dooms to Suffolk segment provides no environmental advantage over the Projects. Adjustments to the conceptual route would be necessary to avoid NPS lands in the SNP and along the Appalachian Trail as well as developed lands in several places along the route. Depending on the routes selected to avoid these areas, the increase in length relative to the baseline could be up to 45 miles, which would increase the environmental impact and cost of the Project. Therefore, the Dooms to Suffolk segment of the conceptual route alternative is not a viable or feasible alternative to the Projects.

[21] These estimates are based on a 125-foot-wide construction right-of-way and 75-foot-wide permanent easement for the AP-1 mainline.

Pleasant Shade to St. Pauls

The third section, Pleasant Shade to St. Pauls, would originate at approximate MP 276.2 of the AP-1 mainline route in Brunswick County, Virginia (see Figure 10.7.2-6). From here, the route would follow an existing DVP 500 kV electric transmission line for about 15 miles to the southwest across Brunswick County to the Commonwealth of Virginia/State of North Carolina line. It then would follow an existing Progress Energy Carolinas, LLC (PEC) 500 kV electric transmission line for about 60 miles to the southwest across Northampton, Halifax, Warren, Franklin, and Wake Counties, North Carolina. At a point near Knightdale, the alternative route would continue along the existing PEC 500 kV electric transmission line to the south-southwest for approximately 74 miles, crossing Wake, Johnston, Harnett, and Cumberland Counties, North Carolina, and passing east of the Cities of Raleigh and Fayetteville. The route would then head west along the existing PEC line for about 11 miles across Cumberland and Robeson Counties, North Carolina, to its terminus approximately at MP 455.8 of the AP-2 mainline.

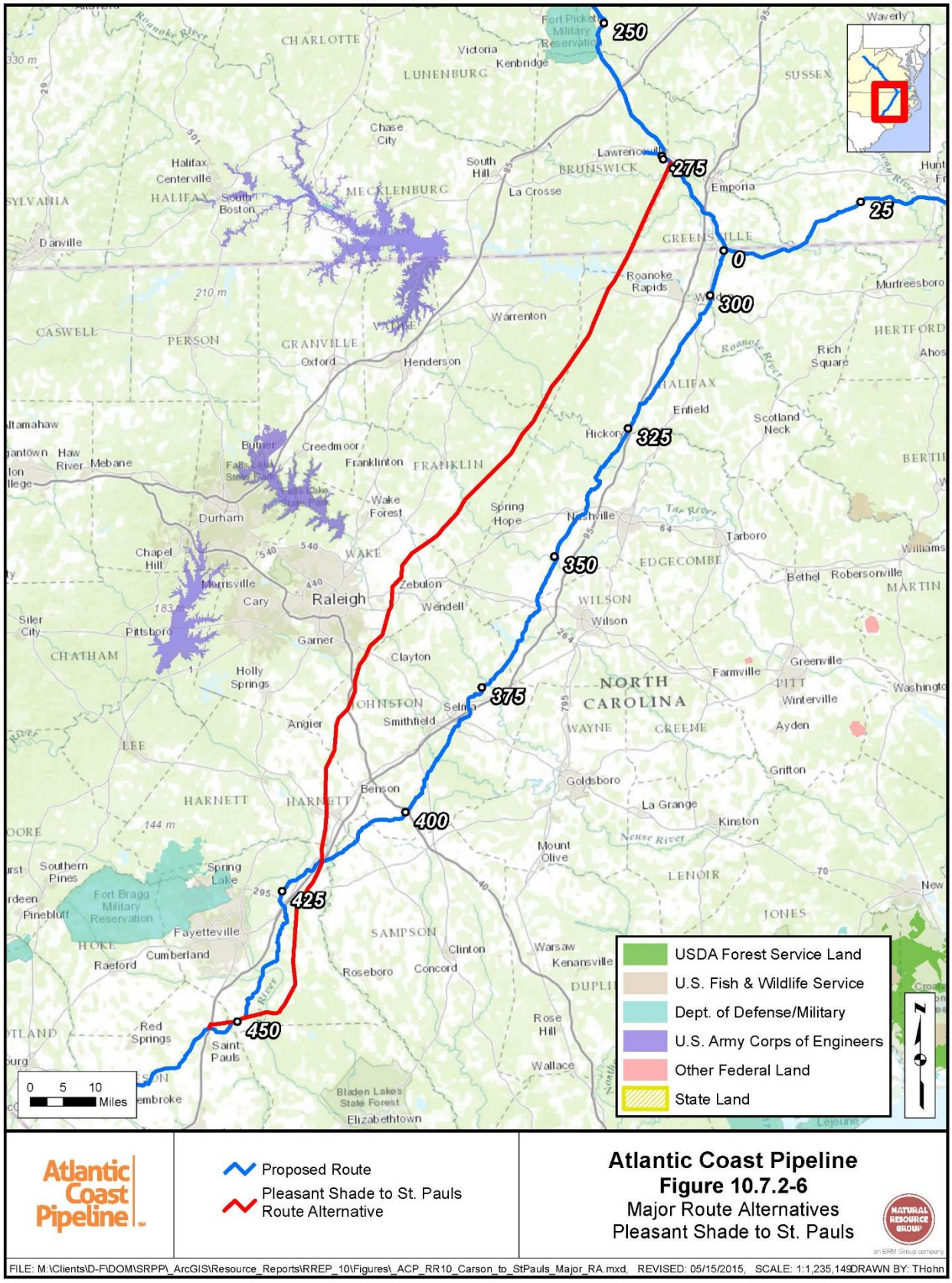
In total, the Pleasant Shade to St. Pauls segment of the conceptual route alternative would measure about 160 miles in length. However, additional laterals would need to be constructed to reach the same delivery points as the ACP in southeastern Virginia and North Carolina. The proposed AP-3 lateral would need to be extended about 15 miles to the west to reach the conceptual route alternative. Laterals also would be required to reach the Greensville M&R Station (about 1 mile), the Smithfield M&R Station (about 19 miles), and the Fayetteville M&R Station (about 3 miles). These additional laterals would increase the length of the conceptual route alternative by about 38 miles to 198 miles. In contrast, the corresponding segment of the baseline, i.e., from approximately MP 276 of the proposed AP-1 mainline to approximately MP 456 of the proposed AP-2 mainline, measures 180 miles in length. The increased length for the conceptual route alternative would result in an additional 164 acres of construction workspace and 109 acres of permanent easement for the ACP. [22]

Approximately 44 miles of the Pleasant Shade to St. Pauls segment crosses developed, residential areas in Franklin, Wake, and Johnston Counties on the outskirts of the City of Raleigh. Encroachment on the existing right-of-way would preclude construction of the pipeline adjacent to the existing electric transmission line in these areas. An alternative greenfield route to the east of these areas would be necessary to avoid the developed lands. The alternative route would measure 48 miles in length or more, increasing the length of the pipeline by at least 4 miles and adding an additional 53 acres of construction right-of-way and 24 acres of permanent easement. [23]

In a letter to Atlantic dated March 25, 2015, the U.S. Fish and Wildlife Service (FWS) commented that impacts on aquatic species could be minimized by reducing the number of stream crossings along the route. The Pleasant Shade to St. Pauls segment of the conceptual route alternative would cross 12 more intermittent and 21 more perennial waterbodies than the baseline route, which could result in more impacts on aquatic species than the baseline.

[22] These estimates are based on a 75-foot-wide construction right-of-way and a 50-foot-wide permanent easement for the AP-3 lateral and the other laterals which would be required for this alternative.

[23] These estimates are based on a 110-foot-wide construction right-of-way and a 50-foot-wide permanent easement, which is what would be required for the AP-2 mainline.


250
275
25
0
300
325
350
375
400
425
450
Fort Pickett Military Reservation
Waverly
CHARLOTTE
Victoria
Kenbridge
LUNENBURG
SUSSEX
Chase City
Halifax
Centerville
South Hill
BRUNSWICK
Lawrenceville
Emporia
MECKLENBURG
HALIFAX
South Boston
La Crosse
Danville
GREENSVILLE
Roanoke Rapids
Murfreesboro
Warrenton
CASWELL
PERSON
GRANVILLE
Oxford
Henderson
HERTFORD
Rich Square
HALIFAX
Enfield
Scotland Neck
Hickory
Creedmoor
Franklinton
FRANKLIN
Mebane
Durham
Wake Forest
Spring Hope
Nashville
Tarboro
Chapel Hill
WAKE
EDGECOMBE
Bethel
Robersonville
Morrisville
Cary
Raleigh
Zebulon
Wendell
Wilson
WILSON
Siler City
Pittsboro
Garner
Clayton
CHATHAM
Holly Springs
Farmville
Greenville
Winterville
NORTH CAROLINA
JOHNSTON
Selma
Smithfield
Angier
WAYNE
GREENE
Ayden
LEE
Goldsboro
Grifton
Benson
HARNETT
La Grange
Kinston
Mount Olive
Neuse River
Southern Pines
Spring Lake
Fort Bragg Military Reservation
Pinebluff
Fayetteville
LENOIR
JONES
HOKE
Cumberland
Raeford
SAMPSON
Clinton
Warsaw
Kenansville
Roseboro
Concord
DUPLIN
Red Springs
Saint Pauls
Rose Hill
Wallace
Bladen Lakes State Forest
Elizabethtown
0 5 10 Miles
USDA Forest Service Land
U.S. Fish & Wildlife Service
Dept. of Defense/Military
U.S. Army Corps of Engineers
Other Federal Land
State Land
Atlantic Coast Pipeline
Proposed Route
Pleasant Shade to St. Pauls Route Alternative
Atlantic Coast Pipeline
Figure 10.7.2-6
Major Route Alternatives
Pleasant Shade to St. Pauls
NATURAL RESOURCE GROUP
an ERM Group company
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The conceptual route alternative would greatly increase the length, area of impact, and cost of the ACP. It additionally could result in greater impact on aquatic species than the baseline. Therefore, the Pleasant Shade to St. Pauls segment of the conceptual route alternative is not a viable or feasible alternative to the ACP.

10.7.3 Interstate Highways

Construction of pipelines within rights-of-way for Interstate highways (typically referred to as longitudinal utility installations) is subject to review by State/Commonwealth Departments of Transportation (DOTs). According to the USDOT's Federal Highway Administration, the use of Interstate highway rights-of-way to accommodate public utilities is permissible if the utility is in the public interest, the utility would not interfere with the safe and free flow of traffic, and the utility would not conflict with future expansions or uses of the highway. Federal Highway Administration regulations provide State/Commonwealth DOTs with broad authority to approve or deny longitudinal installations of utilities in Interstate highway rights-of-ways and to assess fees for these installations (USDOT, 2014).

Large diameter pipelines typically cannot be sited within Interstate highway rights-of-way because they preclude or restrict future expansion of the highway rights-of-way. Similarly, large diameter pipelines cannot be sited adjacent to, but outside of, Interstate highway rights-of-way because they too can preclude future expansion of highways and often conflict with existing land uses along highways. Developments along highways, particularly at intersections, interchanges, bridges, and population centers, are significant constraints to routing a large diameter pipeline along an Interstate highway. Pipelines often need to be routed around these areas, which can increase the length, area of impact, and cost of the pipeline, and reduce or eliminate the benefits of collocation.

Topography along Interstate highways, particularly in areas with rugged terrain, can be another limiting factor. Interstate highways in mountainous areas are often built around and on the sides of mountains (i.e., in side slope terrain). As noted above, pipeline construction in rugged areas must typically cross ridges and hills perpendicular to the slope (i.e., along the natural fall of the slope). For this reason, construction adjacent to an existing Interstate highway in mountainous areas is not typically feasible. In these areas, a pipeline would need to be routed along an alternate parallel alignment to the highway, which would eliminate the benefit of collocation and may result in a larger area of impact for the pipeline. Even in areas where topography is favorable for collocation, pipeline construction along Interstate highways may be impractical due to cut and fill material along highway corridors and infrastructure development at intersections and bridges.

In the vicinity of the ACP, there are no Interstate highways that provide a reasonably direct path between the proposed receipt and delivery points in West Virginia and Virginia.[24] Therefore, any potential route along an Interstate highway in West Virginia and Virginia would add substantially to the total length of the pipelines, which would increase the area of impact and cost of the ACP.

[24] In comments filed with the Commission, various individuals commented that the proposed ACP pipelines should be installed adjacent to interstate highways.

10.7.3.1 Interstate 79 and Interstate 64

Interstate-79 (I-79) crosses the proposed AP-1 mainline route in Lewis County, West Virginia, near the town of Jane Lew. From this point, I-79 heads to the southwest and west, where it joins Interstate-64 (I-64) in Charleston, West Virginia. The highways then head southeast to the town of Beckley, West Virginia. From this point, I-79 and I-64 split, with I-64 continuing to the east across the Appalachian Mountains to Lexington, Virginia, then northeast towards the City of Staunton, Virginia. The proposed AP-1 mainline route intersects I-64 at a point south of the City of Staunton in Augusta County, Virginia.

A conceptual route adjacent to the I-79 and I-64 corridors (see Figure 10.7.3-1) would measure approximately 260 miles in length, which is 138 miles longer than the corresponding segment of the proposed AP-1 mainline route. Construction along this route would result in an additional 2,090 acres of temporary construction impact and 1,255 acres of permanent pipeline easement.[25] Moreover, the additional cost due to the increase in the length of the pipeline would be economically infeasible; therefore, the ACP would not be viable.

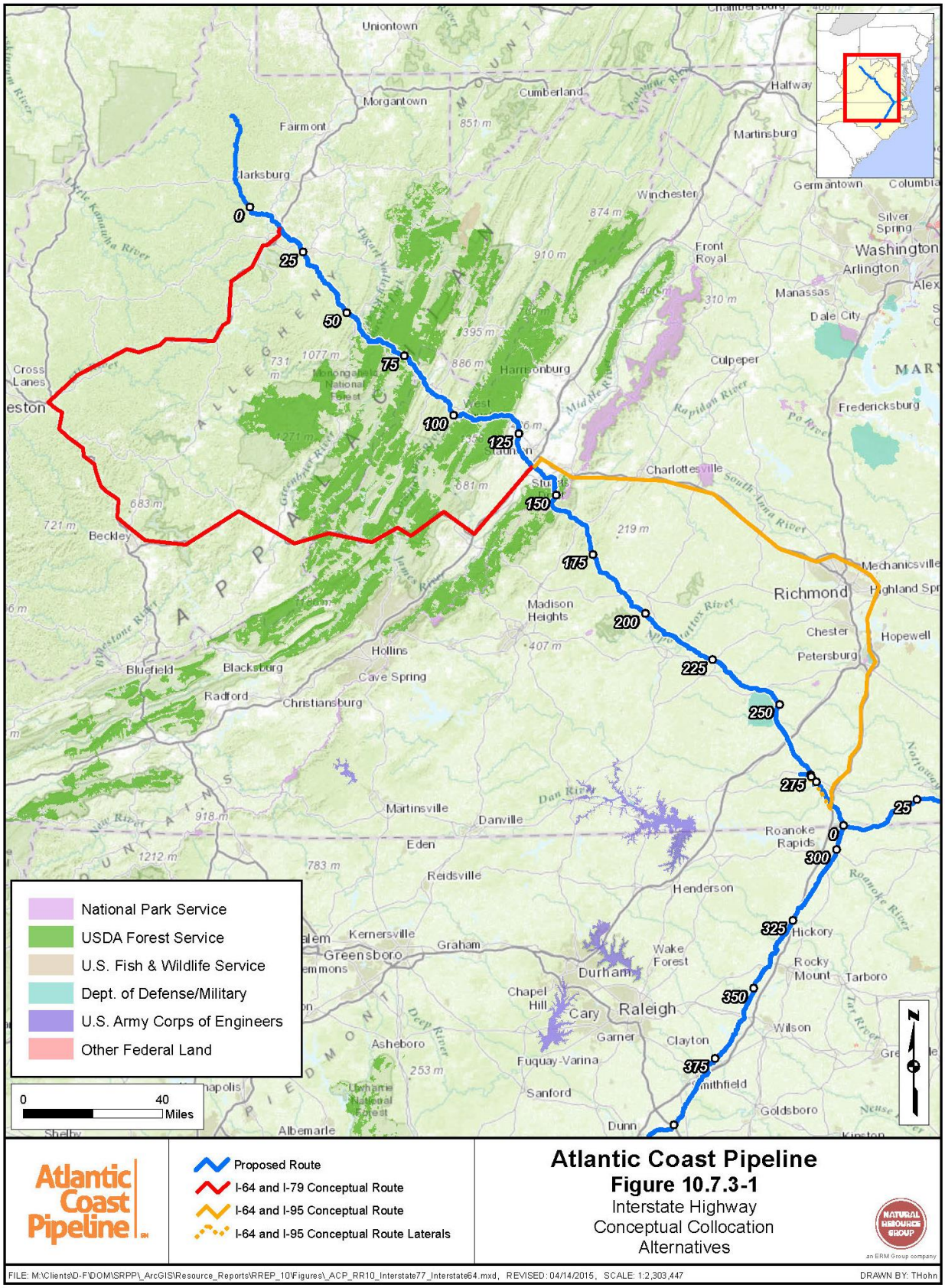
Additionally, for much of the route, the pipeline could not be located immediately adjacent to the I-79 and I-64 corridors due to difficult, mountainous terrain, which would require alternate greenfield routing along parallel ridgelines, and land use constraints along the highways. The latter include the Cities of Charleston and Beckley, West Virginia, and a 16-mile-long segment of I-64 adjacent to the Kanawha River between Charleston and Cabin Creek, which is highly developed. Bypassing these and other developed areas along the highways would require alternative greenfield routes. This would increase the length, area of impact, and cost of the conceptual alternative route, and forgo the benefits of collocation.

For all the reasons described above, the I-79 and I-64 corridors are not viable or feasible alternatives to the proposed AP-1 mainline.

10.7.3.2 Interstate 64, Interstate 295, and Interstate 95

Atlantic reviewed a conceptual alternative route in Virginia along the I-64, Interstate 295 (I-295), and Interstate 95 (I-95) corridors. Starting approximately at MP 136, the conceptual alternative route would follow I-64 southeast to Richmond; then follow I-295 to the north and east of Richmond; then follow I-95 south to Greensville County, Virginia. It would reconnect with the proposed AP-1 mainline route near MP 286 in Greensville County, Virginia (see Figure 10.7.3-1).

[25] These estimates are based on a 125-foot-wide construction right-of-way and 75-foot-wide permanent easement for the AP-1 mainline.


National Park Service
USDA Forest Service
U.S. Fish & Wildlife Service
Dept. of Defense/Military
U.S. Army Corps of Engineers
Other Federal Land
0
40
Miles
Proposed Route
I-64 and I-79 Conceptual Route
I-64 and I-95 Conceptual Route
I-64 and I-95 Conceptual Route Laterals
Atlantic Coast Pipeline
Figure 10.7.3-1
Interstate Highway
Conceptual Collocation
Alternatives
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The conceptual alternative route adjacent to the I-64, I-295, and I-95 corridors would measure approximately 185 miles in length, which is 35 miles longer than the corresponding segment of the AP-1 mainline route. In addition, a new pipeline lateral would be required to access the receipt/delivery point in Brunswick County (i.e., the Brunswick M&R Station). The lateral to Brunswick County would measure approximately 11 miles in length. In total, approximately 46 miles of additional pipeline would need to be constructed for the conceptual alternative route relative to the ACP as proposed. This increased length would result in an additional 631 acres of temporary construction right-of-way and an additional 382 acres of permanent easement.[26] The additional cost due to the increase in the length of the pipeline would be economically infeasible.

Additionally, alternative greenfield routes in many areas would be necessary to avoid mountainous terrain, particularly where I-64 crosses the Blue Ridge Mountains, as well as developed and urban lands along the highways in and around the Cities of Staunton, Waynesboro, Charlottesville, Richmond, and Petersburg, Virginia. In particular, a major route alternative would be necessary to avoid highly developed areas which encroach on I-295 and I-95 around Richmond and Petersburg. The greenfield route alternatives would increase the length of the pipeline, the area of impact, and the cost of the ACP even further.

For all the reasons described above, the I-64, I-295, and I-95 corridors are not viable or feasible alternatives to the proposed AP-1 mainline.

10.8 MAJOR ROUTE ALTERNATIVES

Atlantic and DTI identified initial or "baseline" routes for the proposed ACP and SHP pipelines based on locations of receipt and delivery points, engineering and constructability criteria, terrain, and existing land use. Atlantic and DTI subsequently evaluated and continue to evaluate environmental and other constraints along each of the routes in an effort to refine the baseline configurations. Route alternatives, variations, and minor adjustments were identified and continue to be identified based on a review of desktop constraint data, consultations and discussions with agency staff or other stakeholders, and field review in an effort to optimize the routes. The objective of the process was to identify the shortest possible route between the proposed receipt and delivery points taking into account the ACP and SHP purpose and need, engineering constraints, crossings of public lands, issues identified by stakeholders, and the potential for impacts on sensitive environmental resources.

For the purposes of this analysis, major route alternatives were defined as alignments that deviate substantially from the baseline route to avoid geographically broad or multiple environmental constraints or other sensitive areas. The major route alternatives measure greater than 5 miles in length and trend several miles away from the baseline route.

[26] These estimates are based on a 125-foot-wide construction right-of-way and 75-foot-wide permanent easement for the AP-1 mainline and a 75-foot-wide construction right-of-way and 50-foot-wide permanent easement for the Brunswick lateral. The conceptual AP-1 mainline adjacent to I-64 and I-95 would result in an additional 531 acres of construction right-of-way and 315 acres of permanent easement. The conceptual route for the AP-4 lateral would result in an additional 100 acres of construction right-of-way and 67 acres of permanent easement.

The major route alternatives were compared against the corresponding segment of the baseline route and either selected as offering environmental, constructability, or economic advantages, or rejected if no significant advantages were identified. The primary criterion for comparing route alternatives to the baseline route was cumulative impact avoidance relative to the objective of the alternative. If selected, the route alternative was adopted as part of the proposed route, and the corresponding segment of the baseline route was rejected. Minor route variations (1 to 5 miles in length) were also identified as discussed in Section 10.9 below. Sections of the baseline route where no alternatives or variations were considered were adopted as the proposed pipeline route.

In some cases, all or portions of a major route alternative or minor route variation initially selected as preferred relative to the baseline subsequently were compared to newly identified alternative routes. In these cases, the route initially identified as preferred was considered the baseline for comparison to the new alternative route.

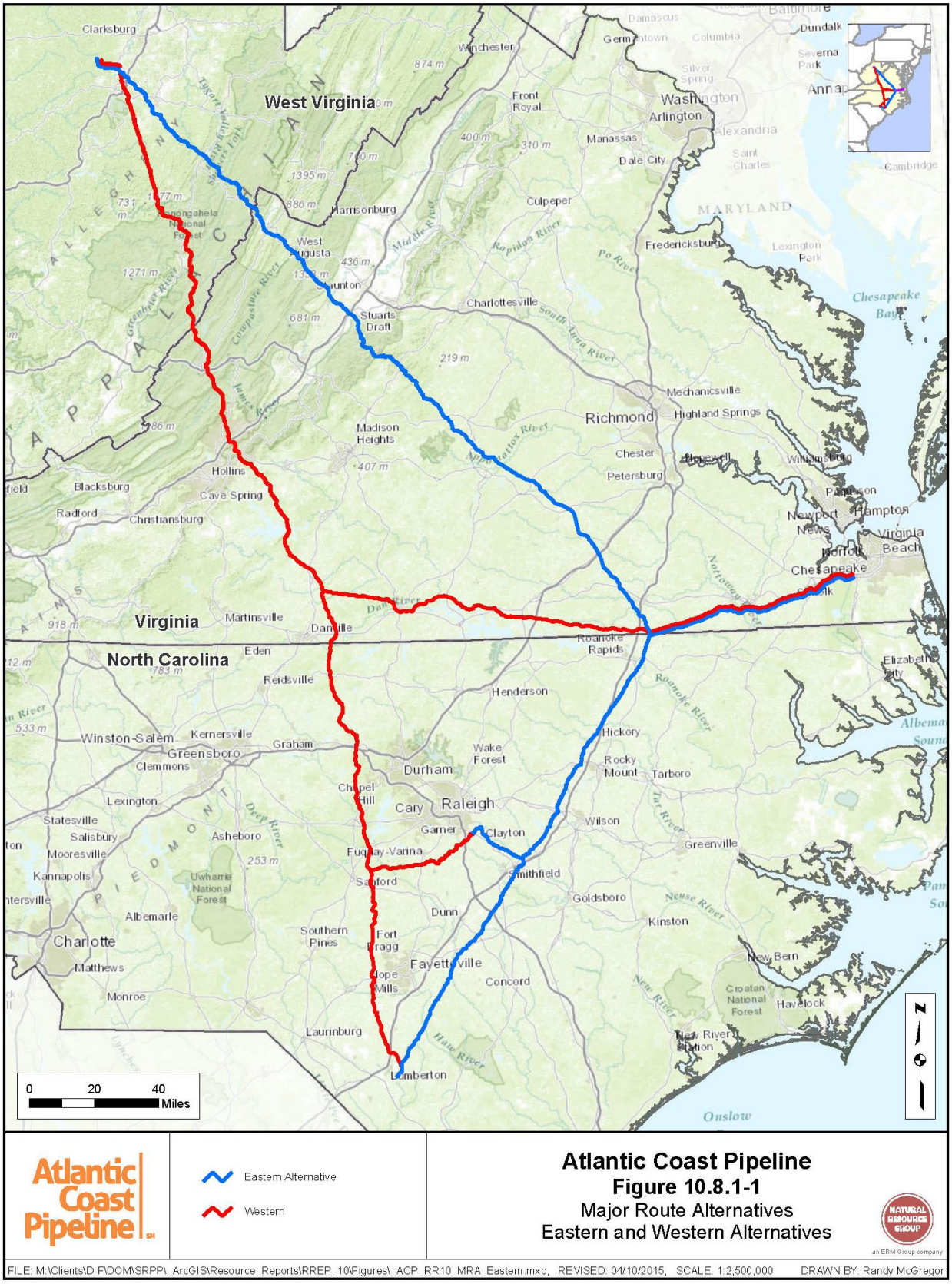
Atlantic's and DTI's analysis of route alternatives and variations used a geographic information system (GIS) to characterize crossings of environmental features and other constraints along the routes. A digital centerline for each route alternative and the corresponding segment of the baseline was compared with a variety of datasets and map resources in the GIS. Features and constraints considered in the analysis included: length, public lands crossed, roads crossed, conservation easements crossed, forested lands crossed (based on the National Land Cover Database), wetlands crossed (based on the National Wetlands Inventory), waterbodies crossed (based on the National Hydrography Dataset), and Civil War battlefields crossed.

10.8.1 Atlantic Coast Pipeline

10.8.1.1 Eastern and Western Route Alternatives

During the initial planning stages for the ACP, Atlantic identified and evaluated two conceptual route alternatives: an eastern route alternative and a western route alternative. As shown on Figure 10.8.1-1, both routes originate south of Clarksburg in West Virginia and terminate near Lumberton in North Carolina, with laterals extending to Hampton Roads in Virginia and Clayton in North Carolina. Comparative information on each route is provided in Table 10.8.1-1.

The eastern route alternative, including the laterals, measures approximately 538.0 miles in length, of which 22.6 miles is adjacent to existing linear corridor facilities. It crosses approximately 66.4 miles of Federal lands, including lands managed by the USFS, FWS, U.S. Army, and NPS. The eastern route crosses both the Blue Ridge Parkway and Appalachian Trail on Federal lands. The route crosses 2.8 miles of State/Commonwealth lands, 12.2 miles of conservation easements, 328 miles of forested land, 60.6 miles of wetland, and 362 perennial waterbodies. It additionally crosses 13.5 miles of areas identified as historic properties, historic landscapes, or historic landmarks, consisting mostly of Civil War battlefields.


West Virginia
Virginia
North Carolina
Clarksburg
Winchester
Front Royal
Washington
Arlington
Alexandria
Manassas
Dale City
Culpeper
Harrisonburg
Fredericksburg
Charlottesville
Stuarts Draft
Richmond
Mechanicsville
Highland Springs
Chester
Petersburg
Madison Heights
Hollins
Blacksburg
Cave Spring
Radford
Christiansburg
Martinsville
Danville
Roanoke Rapids
Eden
Reidsville
Henderson
Winston-Salem
Kernersville
Greensboro
Graham
Clemmons
Durham
Wake Forest
Chapel Hill
Cary
Raleigh
Garner
Clayton
Fuquay-Varina
Sanford
Lexington
Statesville
Salisbury
Mooresville
Asheboro
Kannapolis
Albemarle
Charlotte
Matthews
Monroe
Dunn
Fort Bragg
Southern Pines
Fayetteville
Hope Mills
Concord
Laurinburg
Lumberton
Hickory
Rocky Mount
Tarboro
Wilson
Greenville
Smithfield
Goldsboro
Kinston
New Bern
Havelock
Croatan National Forest
Onslow
Newport News
Hampton
Virginia Beach
Norfolk
Chesapeake
Williamsburg
Elizabeth City
Lexington Park
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MARYLAND
Dundalk
Annapolis
Cambridge
Uwharrie National Forest
Monongahela National Forest
0 20 40 Miles
Eastern Alternative
Western
Atlantic Coast Pipeline
Atlantic Coast Pipeline
Figure 10.8.1-1
Major Route Alternatives
Eastern and Western Alternatives
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TABLE 10.8.1-1

Eastern and Western Route Alternatives for the Atlantic Coast Pipeline

Features	Unit	Eastern Route [a]	Western Route
Length	miles	538.0	607.2
Primary U.S. or State/Commonwealth highways crossed	number	115	103
Adjacent to existing linear corridor facilities	miles	22.6	16.8
Federal lands crossed (total)	miles	66.4	68.4
National Park Service	miles	0.6	0.4
U.S. Forest Service	miles	46.9	44.0
U.S. Fish and Wildlife Service	miles	7.2	7.2
U.S. Army	miles	11.7	14.0
U.S. Army Corps of Engineers	miles	0.0	2.8
Blue Ridge Parkway crossings	number	1	1
Appalachian Trail crossings	number	1	1
State/Commonwealth lands crossed (total)	miles	2.8	7.0
West Virginia	miles	0.0	0.0
Virginia	miles	0.2	0.0
North Carolina	miles	2.6	7.0
Conservation easements crossed	miles	12.2	18.3
Forested lands crossed	miles	328.8	414.7
National Wetland Inventory wetlands crossed (total)	miles	60.7	45.7
Forested	miles	55.0	40.1
Emergent	miles	4.7	4.0
Other	miles	1.0	1.6
Intermittent waterbodies crossed	number	342	481
Perennial waterbodies crossed	number	362	425
Historic properties, historic landscapes, and historic landmarks crossed	miles	13.5	10.4

[a] The eastern route alternate is similar, but not identical, to the baseline route for the ACP. The eastern route alternative was refined into the baseline route based on customer needs and identification of delivery points for the ACP.

The western route alternative, including the laterals, measures approximately 607.2 miles in length, of which 16.8 miles is adjacent to existing linear corridor facilities. The route crosses 68.4 miles of Federal lands, including lands managed by the USFS, FWS, U.S. Army, U.S. Army Corps of Engineers, and NPS. Like the eastern route alternative, the western route crosses both the Blue Ridge Parkway and Appalachian Trail on Federal lands. It crosses 7.0 miles of State/Commonwealth lands, 18.3 miles of conservation easements, 414.7 miles of forested lands, 45.7 miles of wetland, and 425 perennial waterbodies. It also crosses 10.4 miles of areas identified as historic properties, historic landscapes, or historic landmarks, mostly Civil War battlefields.

Relative to the eastern route alternative, the western route alternative is approximately 69.2 miles longer and crosses 2.0 more miles of Federal lands, including lands managed by the U.S. Army Corps of Engineers, which the eastern route avoids. Both routes cross the Blue Ridge Parkway and Appalachian Trail on Federal lands. The western alternative crosses 4.2 more miles of State/Commonwealth land and 6.1 more miles of conservation easements than the

eastern alternative. The western alternative crosses 15.0 miles less of wetland and 3.1 miles less of historic places, but 85.9 more miles of forested land and 63 more perennial waterbodies than the eastern route.

Another issue with the western route alternative became apparent after the receipt and delivery points were confirmed for the ACP. The western route alternative does not provide a direct connection to the delivery point in Randolph, County, West Virginia (i.e., the Long Run M&R Station), or to the receipt and delivery point in Buckingham County, Virginia (i.e., Compressor Station 2). Additional laterals could need to be built to reach these locations if the western route was selected as the preferred alternative. Depending on the routes selected, these laterals would add an additional 75 to 85 miles of pipeline to the ACP, which would result in greater environmental impact and additional cost.

For all these reasons, Atlantic identified the eastern route as the preferred alternative for the ACP. This route subsequently was refined into the baseline route for the ACP.

10.8.1.2 Monongahela National Forest Major Route Alternatives

The MNF encompasses approximately 919,000 acres of Federal lands in the north-central highlands of West Virginia. It is a biologically and geographically diverse area managed by the USFS for a number of uses, including recreation, wilderness, habitat, timber production, mineral extraction, and livestock grazing. The MNF contains eight federally designated Wilderness Areas as well as backcountry recreation areas, special biological areas, a national recreation area, and visually sensitive areas (USFS, 2014b).

Given the northwest-to-southeast orientation of the proposed AP-1 mainline between central West Virginia and southern Virginia, it is not feasible to avoid crossing the MNF altogether. However, several alternative routes or conceptual corridors were evaluated to minimize the crossing of sensitive resources within the forest. These resources include scenic areas, backcountry recreation areas, habitat for sensitive species (e.g., West Virginia northern flying squirrel and Cheat Mountain salamander), other sensitive habitats (e.g., red spruce forest and botanical areas), and Civil War battlefield sites. Atlantic's initial baseline route across the MNF primarily traversed less sensitive resource areas, such as areas managed for general wildlife habitat, spruce and spruce-hardwood development, and vegetation diversity. However, the baseline also crossed areas managed for scenic quality and backcountry recreation, habitat for West Virginia northern flying squirrel and Cheat Mountain salamander, and forest areas containing a medium to high percentage of red spruce cover.

Atlantic considered alternative routes or conceptual corridors extending either north and east or south and east of the baseline as well as variations of the baseline across the MNF. Alternatives were developed based on consultations with MNF staff and through review of the *Monongahela National Forest Land and Resource Management Plan* (USFS, 2011) and GIS data layers provided by USFS staff. Evaluations of the alternatives are provided in the subsections below.

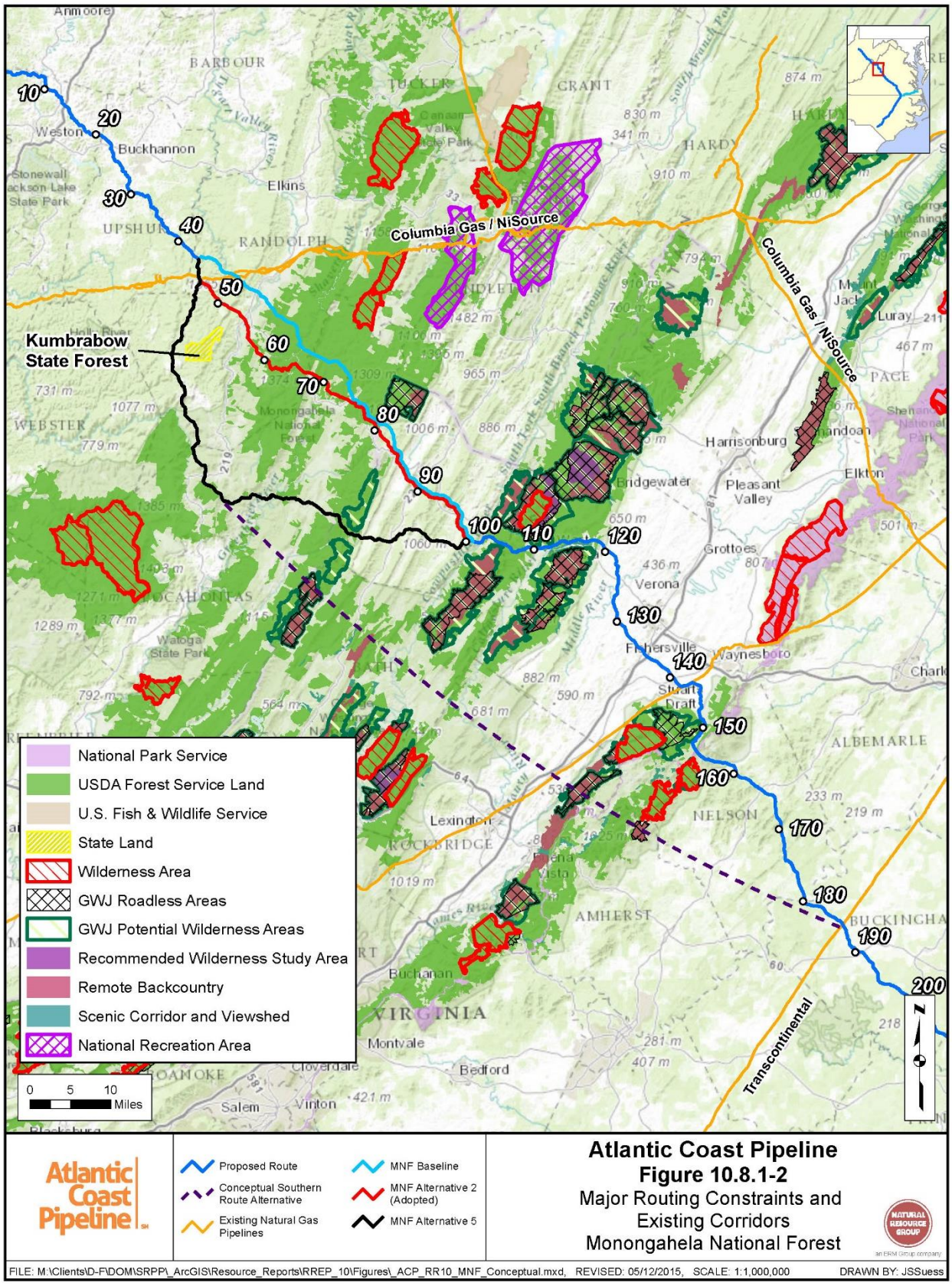
Northern and Eastern Route Alternatives

Conceptually, Atlantic considered heading east and north of its baseline crossing of the MNF in an effort to avoid sensitive resources within the forest. A potential routing opportunity considered was an alternative route parallel and adjacent to the existing Columbia system (see Figure 10.8.1-2 and the discussion above in Section 10.7.1.1). Several issues were identified, however, which preclude use of this existing corridor as a viable alternative route. As discussed in more detail in Section 10.7.3.2 above, collocation or partial utilization of the existing Columbia corridor is not feasible due to space constraints and rugged topography along the corridor where it crosses the MNF. Most of the existing Columbia corridor in this area contains three pipelines of 26- or 36-inch-diameter. Because this corridor crosses very rugged terrain where space for safe and stable pipeline construction is limited, there is insufficient room for a new 42-inch pipeline along or adjacent to the existing corridor. As a result, the AP-1 mainline would need to be routed along a new right-of-way, which would eliminate the benefits of collocation with an existing utility, such as reduced forest clearing.

Another issue with this alternative is that the existing Columbia corridor crosses or passes near several sensitive management areas, including the Laurel Fork North, Otter Creek, Roaring Plains, and Dolly Sods Wilderness Areas, and the Spruce Knob-Seneca Rocks NRA (see Figure 10.8.2-1). The Columbia corridor is adjacent to the northern boundary of the Laurel Fork North Wilderness Area for 2.4 miles, and crosses approximately 11.4 miles of the NRA. A new pipeline corridor extending approximately 15 miles north of the Columbia system would be necessary to avoid both the NRA and nearby Wilderness Areas. The Wilderness Areas in particular are significant constraints because crossings of these areas would require authorizations from the U.S. Congress which would be infeasible to obtain within the timeframe required by the purpose and need of the Projects. A route further to the south to avoid these same resources would be located near the baseline and cross many of the same sensitive areas, such as habitat for sensitive species, backcountry recreation areas, and forest areas with a medium to high percentage of red spruce cover.

Finally, an alternative route to the north and east following a similar path as the existing Columbia corridor would eventually have to proceed south to reconnect with Atlantic's proposed route heading southeast. A significant routing constraint that would have to be crossed is the SNP, which extends from Waynesboro, Virginia northeast to Front Royal, Virginia, a distance of approximately 70 miles, much of which is designated Wilderness Area. Crossings of the SNP and Wilderness Area would require authorizations from the U.S. Congress. These authorizations would be infeasible to obtain within the timeframe required by the purpose and need of the Projects.

For all the reasons described above, attempts to identify potential route corridors to the north and east of Atlantic's proposed route across the MNF were abandoned.


Kumbrabow State Forest
Columbia Gas / NiSource
Columbia Gas / NiSource
Transcontinental
10
20
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120
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180
190
200
National Park Service
USDA Forest Service Land
U.S. Fish & Wildlife Service
State Land
Wilderness Area
GWJ Roadless Areas
GWJ Potential Wilderness Areas
Recommended Wilderness Study Area
Remote Backcountry
Scenic Corridor and Viewshed
National Recreation Area
0 5 10 Miles
Proposed Route
Conceptual Southern Route Alternative
Existing Natural Gas Pipelines
MNF Baseline
MNF Alternative 2 (Adopted)
MNF Alternative 5
Atlantic Coast Pipeline
Figure 10.8.1-2
Major Routing Constraints and Existing Corridors
Monongahela National Forest
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MNF Baseline Route and Alternatives

Atlantic identified and evaluated two alternative routes (MNF 1 and MNF 2) in an effort to avoid sensitive resource areas within the MNF along the baseline, including the Gaudineer Scenic Area and a backcountry recreation area. Both routes are south of and generally parallel to the baseline, crossing Cheat and Back Allegheny Mountains south of U.S. Highway 250. MNF 1 was identified first, and then approximately 20 percent of this route (about 9.0 miles) was modified and optimized to create MNF 2, which avoids sensitive habitats identified in GIS data sets provided by USFS staff.

The baseline route measures approximately 56.4 miles in length. Starting at MP 43.3, the route initially heads east/southeast for approximately 11.7 miles, passing south of Nettle Mountain, and crossing Rich Mountain and the Tygart Valley. It enters the MNF approximately 2.5 miles southeast of Mill Creek in Pocahontas County, West Virginia, and then continues east/southeast for approximately 23.8 miles, crossing Cheat, Back Allegheny, Burner, and Frank Mountains. The route exits the MNF near the West Virginia/Virginia State/Commonwealth line west of Tamarack Ridge. It then continues in a southeasterly direction for approximately 20.9 miles, crossing Bearcamp Knob, Lantz Mountain, Bluegrass Valley, and Jack Mountain. It terminates south of McDowell on Bullpasture Mountain in Highland County, Virginia approximately at MP 100.1.

Beginning at MP 43.3, MNF 1 initially extends to the southeast of the baseline for approximately 16.7 miles, passing south of Huttonsville and entering the MNF at Cheat Mountain. It then heads east/southeast for 13.1 miles, crossing Cheat, Back Allegheny, and Burner Mountains. After crossing the East Fork of the Greenbrier River, the route follows the same alignment as the baseline for 5.2 miles across Frank Mountain and Little Spruce Ridge. It then passes south of the baseline for approximately 3.3 miles to avoid a conservation easement at Bearcamp Knob. MNF 1 then follows the same alignment as the baseline to the terminus approximately at MP 100.1.

MNF 2 initially follows the same alignment as MNF 1 for the first 18.8 miles. At Cheat Mountain, it deviates away from MNF 1, following an abandoned strip mine for approximately 4.7 miles across Cheat and Back Allegheny Mountains. It then parallels U.S. Highway 250 for 1.3 miles, before heading east/southeast for 3.9 miles across Burner Mountain. MNF 2 then follows the same alignment as MNF 1 to the terminus at MP 100.1.

Figure 10.8.1-3 depicts the baseline and alternative routes, and Table 10.8.1-2 provides comparative data on each route. MNF 1 and MNF 2 are approximately the same length as the baseline, but they reduce the crossing length of the MNF by 7.0 and 5.1 miles, respectively. This primarily is due to the routes following a mix of cleared agricultural and forested private lands between approximate MPs 53.8 and 58.8 across the Tygart Valley and along Becky Creek before entering Federal lands in the MNF. Both alternatives cross 1.7 miles of State/Commonwealth-owned lands, compared to 0.4 mile for the baseline. The alternatives avoid crossings of conservation easements on private lands, whereas the baseline crosses 2.3 miles of conservation easement at Bearcamp Knob. Except as discussed below, crossings of other resource types are similar for the three routes, though MNF 1 and MNF 2 both cross 3.6 fewer miles of forested land than the baseline.

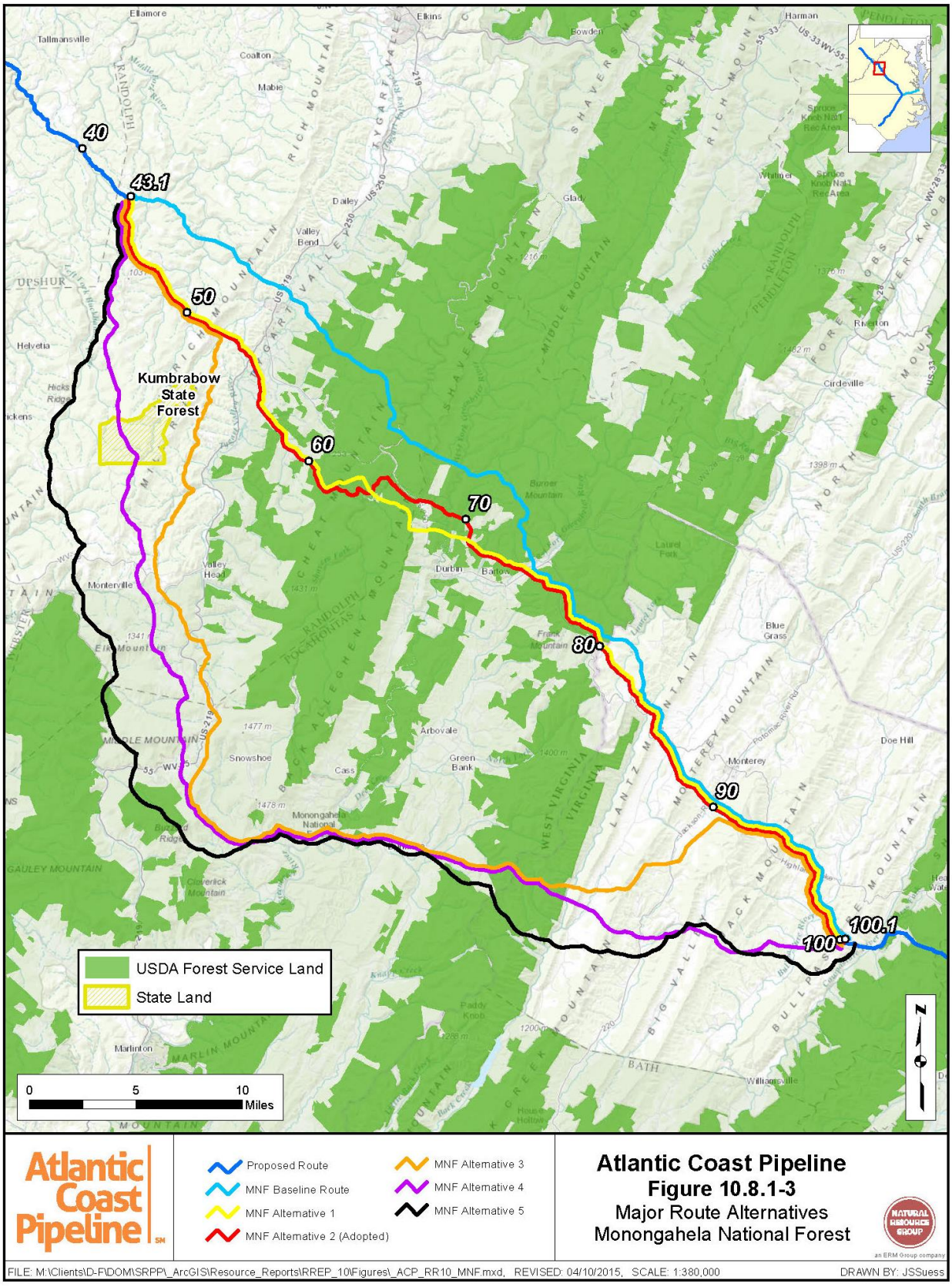
40
43.1
50
60
70
80
90
100
100.1
Kumbrabow State Forest
USDA Forest Service Land
State Land
0 5 10 Miles
Proposed Route
MNF Baseline Route
MNF Alternative 1
MNF Alternative 2 (Adopted)
MNF Alternative 3
MNF Alternative 4
MNF Alternative 5
Atlantic Coast Pipeline
Figure 10.8.1-3
Major Route Alternatives
Monongahela National Forest
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TABLE 10.8.1-2

Monongahela National Forest Major Route Alternatives for the Atlantic Coast Pipeline

Features	Unit	Baseline Route	MNF 1	MNF 2	MNF 3	MNF 4	MNF 5
Length (total)	miles	56.4	55.7	56.8	74.3	67.6	73.0
Land crossed with slope greater than 35 percent	miles	8.9	8.9	9.6	19.0	13.1	14.6
Primary U.S. or State/Commonwealth Highway	number	10	11	11	10	9	9
Other State/Commonwealth or local roads	number	18	18	21	18	27	19
Adjacent to existing linear corridor facilities (total)	miles	0.0	0.0	1.0	3.8	1.7	0.7
Federal lands crossed (total)	miles	23.0	16.0	17.9	5.2	5.3	8.0
U.S. Forest Service (total)	miles	23.0	16.0	17.9	5.2	5.3	8.0
Monongahela National Forest	miles	23.0	16.0	17.9	2.2	2.2	4.8
George Washington National Forest	miles	0.0	0.0	0.0	3.0	3.1	3.2
State/Commonwealth lands crossed (total)	miles	0.4	1.7	1.7	0.5	4.8	1.6
West Virginia	miles	0.0	1.3	1.3	0.1	3.5	0.1
Virginia	miles	0.4	0.4	0.4	0.4	1.3	1.5
Private lands crossed	miles	33.0	38.0	37.2	68.6	57.5	63.4
Conservation easements crossed	miles	2.3	0.0	0.0	2.1	0.0	0.0
U.S. Forest Service management prescription units crossed							
Vegetation diversity	miles	11.6	5.7	7.1	0.0	0.0	1.7
Spruce and spruce-hardwood ecosystems management	miles	5.4	6.4	6.9	0.0	0.0	0.0
Wildlife habitat emphasis	miles	4.8	3.7	3.7	2.2	2.2	2.6
Backcountry recreation	miles	1.0	0.0	0.0	0.0	0.0	0.5
Special areas – scenic areas	miles	0.3	0.0	0.0	0.0	0.0	0.0
Mosaics of wildlife habitat (George Washington National Forest)	miles	0.0	0.0	0.0	3.0	3.1	3.2
Big-eared bat habitat	miles	4.6	4.8	4.5	0.0	0.0	0.0
Indiana bat habitat	miles	0.9	1.9	2.5	0.6	0.6	2.4
Northern flying squirrel habitat	miles	5.6	4.7	5.2	0.0	0.0	0.0
Cheat Mountain salamander habitat	miles	2.4	2.2	0.2	0.0	0.0	0.0
Red spruce crossing percent cover							
Greater than 50 percent cover	miles	0.8	0.9	0.0	0.0	0.0	0.0
10 to 50 percent cover	miles	3.5	1.4	1.1	0.0	0.8	0.5
10 percent cover	miles	5.1	6.2	5.5	1.1	1.6	2.0
No spruce present	miles	16.9	16.3	19.4	12.8	28.8	16.9
Land use types crossed							
Agricultural	miles	5.1	7.9	8.9	7.8	8.6	4.8
Developed	miles	0.5	0.5	0.6	0.7	0.8	0.7
Forested	miles	50.8	47.2	47.2	65.9	58.1	66.6
Open water	miles	0.0	0.1	0.1	0.0	0.0	0.1
Mine	miles	0.0	0.0	0.0	0.0	0.0	0.9
Recreational trails crossed	number	21	16	36	21	20	18
Wetlands crossed – forested	miles	0.0	0.1	0.1	<0.1	<0.1	0.1
Wetlands crossed – emergent	miles	<0.1	0.0	0.0	0.0	0.0	<0.1
Wetlands crossed – other	miles	0.1	0.1	0.1	<0.1	<0.1	<0.1
Intermediate waterbodies crossed	number	25	29	27	48	35	22
Perennial waterbodies crossed	number	20	27	30	30	19	25
Battlefield areas (total)	miles	0.7	1.7	3.4	1.0	0.0	0.0
McDowell	miles	0.7	0.7	0.7	0.7	0.0	0.0
Cheat Mountain	miles	0.0	0.9	2.6	0.3	0.0	0.0

The major optimization of MNF 1 to MNF 2 was accomplished by adjusting the latter route to follow a bench along the side of Cheat Mountain that was used during the mid- to late-twentieth century for strip mining of coal. The bench consists of a stabilized and previously graded, relatively flat, side-cut area measuring approximately 150 feet wide. It follows along the south side of an east-west trending ridgeline north of Lambert Run between Cheat and Back Allegheny Mountains about at the 4,000-foot contour. The bench is relatively flat, rocky, and covered by grass or shrubs, and portions of it are in the process of being replanted with red spruce seedlings by the USFS and private stakeholder groups.

Starting approximately at MP 60.6, MNF 2 follows the previously mined and graded strip mine bench for a distance of approximately 4.7 miles through areas mapped by the MNF as red spruce forest and potential habitat for West Virginia northern flying squirrel. Relative to the baseline and MNF 1, MNF 2 optimizes existing, cleared, or very recently replanted corridors within the forest. Atlantic's engineers have reviewed aerial photography and topographic maps of this area, and flown along the route. Based on this desktop and aerial review, MNF 2 appears to be a constructible route that would avoid significant tree clearing as well as areas of steep slope along Cheat and Back Allegheny Mountains. Moreover, based upon review of aerial photography, MNF 2 crosses approximately 3.8 miles less of forested land than MNF 1 in the area where it follows the abandoned strip mine. MNF 2 additionally runs immediately adjacent to a 1.3-mile-long section of U.S. Route 250 on the northeast side of Back Allegheny Mountain and the south side of Blister Run, to maximize collocation with an existing corridor and road access.

Several digital environmental resource data layers provided by USFS staff were reviewed to evaluate the alternative routes across the Cheat/Back Allegany Mountain area of the MNF. These include suitable and high probability habitat for the West Virginia northern flying squirrel, habitat for Cheat Mountain salamander, a special botanical area (Blister Run Swamp), a spruce restoration area (Lambert Spruce Restoration Area), a potential wild and scenic river crossing, and red spruce cover. Salient points relative to these data layers include the following:

Suitable and High Probability Habitat for the West Virginia Northern Flying Squirrel

Both MNF 1 and MNF 2 cross areas mapped as suitable or high potential habitat for the West Virginia northern flying squirrel. Unlike the baseline route and MNF 1, MNF 2 mostly crosses these areas within or adjacent to existing, previously cleared corridors. These include the abandoned strip mine areas (graded bench) along the east-west trending ridgeline north of Lambert Run and the area adjacent to U.S. Route 250 (which itself is separated from the main forested habitat area on Back Allegheny Mountain by an adjacent, cleared power line corridor). The abandoned strip mine areas are mostly cleared of trees, and based on this fact, do not appear to provide suitable habitat for northern flying squirrel. Much of this area occurs at elevations of 4,000 feet or less, on the south facing slope of the ridgeline, and/or areas mapped as containing no or less than 10 percent red spruce cover. Atlantic understands that suitable habitat for northern flying squirrel generally occurs at elevations greater than 3,000 feet, on north facing slopes, in red spruce and mixed red spruce/northern hardwood forest, and adjacent areas with these characteristics.

Habitat for Cheat Mountain Salamander

Both the baseline and MNF 1 routes cross areas mapped by the USFS as habitat for Cheat Mountain salamander along Back Allegheny Mountain. MNF 1 crosses 2.2 miles of mapped habitat areas, including areas on Cheat Mountain. MNF 2 avoids mapped habitat areas on Cheat Mountain, but crosses 0.2 mile of mapped habitat area on Grassy Knob off Little Spruce Ridge. Field surveys, which are planned to occur in the Spring of 2015, will confirm the presence or absence of the Cheat Mountain salamander within characteristic habitat areas along the proposed route across the MNF (including the 0.2 mile of mapped habitat). After surveys are conducted, Atlantic will evaluate if a route adjustment is necessary.

Blister Run Swamp Botanical Area

The baseline, MNF 1, and MNF 2 avoid the Blister Run Swamp Botanical Area, though MNF 2 is adjacent to this area where the route parallels U.S. Highway 250.

Lambert Spruce Restoration Area

Both MNF 1 and MNF 2 cross the Lambert Spruce Restoration Area along the east-west trending ridgeline north of Lambert Run. Unlike MNF 1, MNF 2 mostly crosses this area within previously cleared abandoned strip mines. Atlantic understands that the USFS, in collaboration with different stakeholders, has begun a process to reclaim these areas. Although MNF 2 crosses some areas that have been reclaimed, Atlantic would restore these areas with additional red spruce plantings following construction for no net loss.

Potential Wild and Scenic Rivers

The baseline, MNF 1, and MNF 2 each cross an area mapped as potential wild and scenic river along Shavers Fork. Atlantic believes that impacts on Shavers Fork could be mitigated through implementation of best management practices during construction (including implementation of the Commission's *Wetland and Waterbody Construction and Mitigation Procedures*, which are USFS-approved, and the West Virginia Department of Environmental Protection's *Erosion and Sediment Control Best Management Practice Manual*) as well as by restoration of the right-of-way.

Red Spruce Cover

The baseline route crosses large areas mapped as containing medium (10-50 percent) and high (>50 percent) red spruce cover on Back Allegheny Mountain. MNF 1 and MNF 2 mostly cross areas mapped as containing no or low red spruce cover on Back Allegheny Mountain. MNF 2 crosses the least amount of high and medium red spruce cover across Back Allegheny Mountain because it follows the abandoned strip mine, which is mapped as having no red spruce cover present. MNF 2 additionally avoids areas mapped as containing medium or high spruce cover on Cheat Mountain.

Battlefield Areas

Compared to the baseline route, MNF 1 and MNF 2 cross an additional 0.9 and 2.6 miles, respectively, in battlefield areas. However, Atlantic understands that a good portion of these

areas have been previously disturbed through mining or other activities, and are not intact. Atlantic will perform cultural resources surveys of designated battlefield areas prior to construction.

Based on review of digital desktop data and discussions with USFS staff, Atlantic believes that MNF 2 has the potential to avoid or minimize impacts on sensitive resources within the MNF. Atlantic has applied for and received a temporary use permit from the MNF to access MNF lands for the purposes of conducting environmental field surveys, including surveys for sensitive habitats, species, and cultural resource sites, along MNF 2. Field surveys are planned for this route in the Spring of 2015 to verify constructability of the route and collect data on known and unrecorded resources along the route.

Southern Route Alternatives

After consultation with staff at the MNF, the West Virginia Field Office of the FWS, and the West Virginia Department of Natural Resources, three routes to the south of Atlantic's MNF 2 alternative were identified and evaluated. These include alternative routes MNF 3, MNF 4, and MNF 5. The intent of these route alternatives was to reduce the crossing length of the MNF and avoid sensitive resources in the Cheat/Back Allegheny Mountain area, particularly habitat for West Virginia northern flying squirrel and Cheat Mountain salamander. Figure 10.8.1-3 depicts the baseline and alternative routes, and Table 10.8.1-2 provides comparative data on the three alternatives.

The alternative routes leave the baseline at MP 43.3 following the same path as MNF 2 until reaching MP 46.2 (MNF 3 and MNF 4) or 52.2 (MNF 5). The southern alternative routes then proceed due south for between 27.0 and 34.0 miles, turning east just south of the Snowshoe Ski Area at Thorny Flat, West Virginia. The routes then proceed east past Dunmore, West Virginia for approximately 15.8 miles, crossing the West Virginia/Virginia State/Commonwealth border east of Dunmore, West Virginia. From here, MNF 3 proceeds to the northwest for 10.3 miles, then follows the same path as the baseline to approximate MP 100.1, while MNF 4 and 5 continue east for approximately 15.0 miles to the terminus of the routes. MNF 3, 4, and 5 are longer than the corresponding segments of the baseline and its variant routes, adding between 11.2 and 17.9 miles of route relative to the baseline.

MNF 3, 4, and 5 cross 2.2 miles, 2.2 miles, and 4.8 miles, respectively, of the MNF, compared with 23.0 miles for the baseline and 16.0 miles and 17.9 miles, respectively, for MNF 1 and MNF 2. MNF 3, 4, and 5 cross between 3.0 and 3.2 miles of the GWNF in areas managed for wildlife habitat. MNF 3 and 4, however, are in areas identified in the *George Washington National Forest Revised Land and Resource Management Plan* (USFS, 2014a) as potential wilderness areas.

In addition to adding substantial mileage to the ACP, there are several other disadvantages and challenges associated with MNF 3, 4, and 5. First and foremost is the difficulty of the terrain crossed by these routes, particularly in the areas west, south, and east of Snowshoe/Thorny Flats and at the points where the alternative routes reconnect to the proposed pipeline. Of particular significance along the southern routes is the jumbled arrangement of ridgetops in the area surrounding Thorny Flat. The mountain ridges in this area generally run in

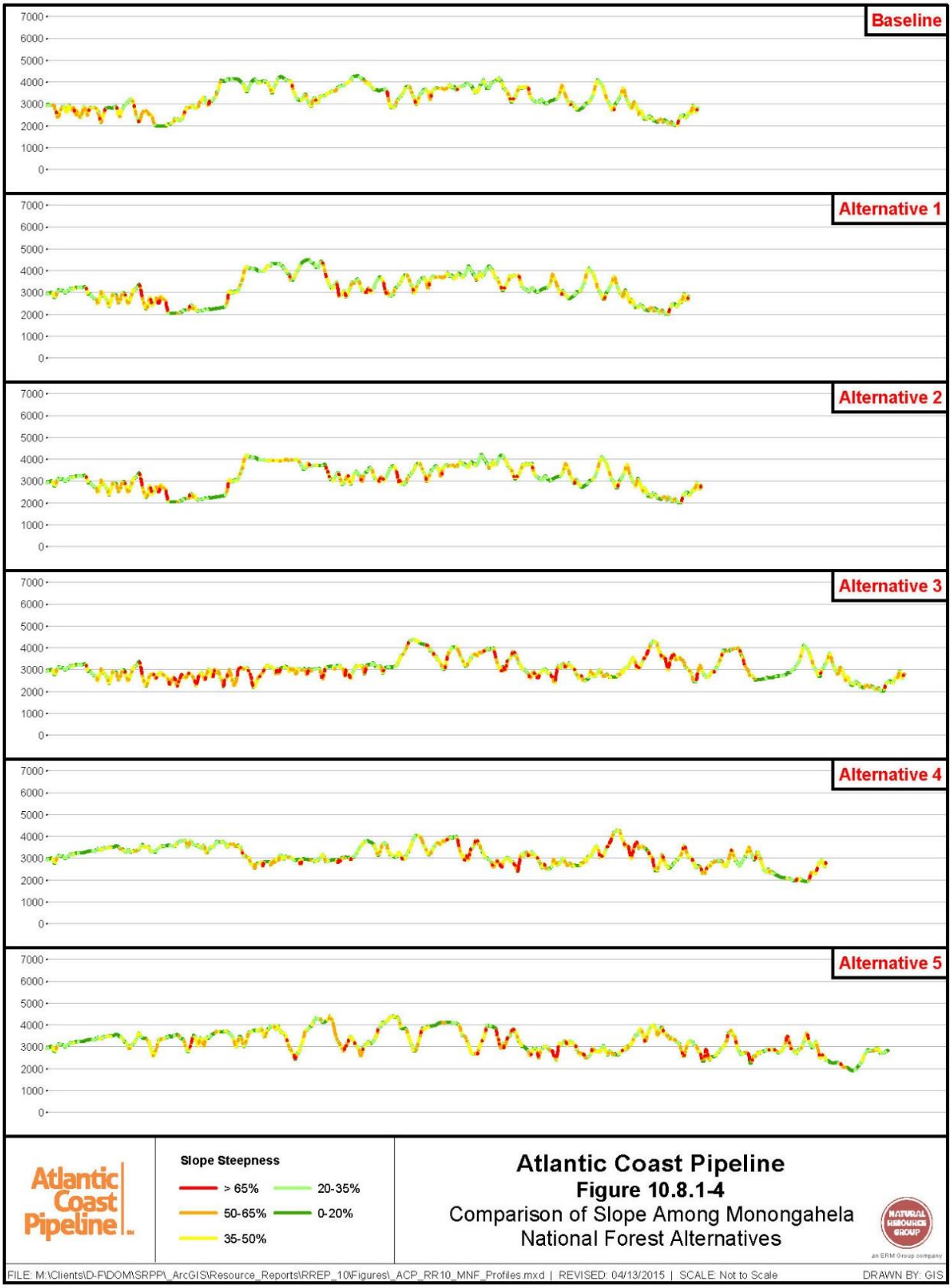
a north/south direction (the AP-1 mainline trends northwest to southeast) or have no primary orientation and consist of a jumbled mass of peaks and ridge tops.

Crossing this terrain with a 42-inch-diameter pipeline while attempting to minimize or avoid traversing steep side slopes would result in multiple, steeply graded, up-and-down approaches to ridgetops that would in many instances require heavy equipment winching on both sides of the ridge from a single or multiple staging areas on the ridge top. In identifying possible routes south of the Monongahela National Forest, Atlantic tried to find alternative routes that minimized steep slopes where excessive equipment winching (i.e., lowering down and/or hauling up) would be required. For the construction of a 42-inch-diameter pipeline, a large class of construction equipment (e.g., bulldozers, trackhoes, and side boom tractors) would be required to safely work and carry the pipe joints and move the fabricated pipeline sections. Areas where this class of equipment would likely require winching are ridges and hills where slopes exceed 35 percent. While slopes exceeding 50 percent are occasionally traversed on the proposed route, including within the MNF along MNF 2, Atlantic tried to reduce the number and occurrence of these steep slopes while routing to the south to the greatest extent possible due to construction safety, slope stability, and right-of-way restoration concerns.

While the corresponding section of the baseline route crosses slopes exceeding 35 percent for a distance of approximately 8.9 miles, MNF 3, 4, and 5 cross slopes exceeding 35 percent for 19.0 miles, 13.1 miles, and 14.6 miles, respectively. Figure 10.8.1-4 provides a profile of slopes crossed along all the MNF route alternatives. As discussed in Resource Report 1, special construction methods, including use of winched tractors and other vehicles, are necessary in areas where the slope exceeds 35 percent.

Because of the narrowness and remoteness of the ridgetops, most of these areas would require the construction of a graded winching platform on top of the ridge, and depending on the slope, could require construction of an access road along the ridge to access the winch platform for delivery of construction equipment and pipe sections. Access to the remote areas crossed by the three southern alternative routes would be difficult due to the lack of existing nearby roads (see below), which could require the construction of new roads into these areas. Slope restoration and stabilization would also be difficult to achieve in many of the steep areas crossed by the southern alternative routes.

The lack of existing roads along the southern alternatives is a significant and limiting constraint for MNF 3, 4, and 5. A general rule of thumb for pipeline construction is to provide ingress and egress points along the right-of-way approximately at 1-mile intervals wherever feasible. To quantify the lack of roads along the alternative routes, Atlantic measured the total length of each route where there are no crossings of public roads within a mile along the route. For the southern route alternatives, there are approximately 15.8 miles, 10.5 miles, and 22.5 miles, respectively, where there are no crossings of public roads within a mile along the MNF 3, MNF 4, and MNF 5 routes. By contrast, there are approximately 6.8 miles of MNF 2 where there are no crossings of public roads within a mile of the route. For these reasons, more and longer access roads would need to be built along the southern alternative routes relative to MNF 2.


Baseline
Alternative 1
Alternative 2
Alternative 3
Alternative 4
Alternative 5
7000
6000
5000
4000
3000
2000
1000
0
Slope Steepness
> 65%
50-65%
35-50%
20-35%
0-20%
Atlantic Coast Pipeline
Atlantic Coast Pipeline
Figure 10.8.1-4
Comparison of Slope Among Monongahela National Forest Alternatives
NATURAL RESOURCE GROUP
an ERM Group company
FILE: M:\Clients\D-F\DOM\SRPP_ArcGIS\Resource_Reports\RREP_10\Figures_ACP_RR10_MNF_Profiles.mxd | REVISED: 04/13/2015 | SCALE: Not to Scale
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Another potential issue is that the routes cross a National Radio Quiet Zone associated with the Green Bank Telescope in the town of Green Bank, West Virginia. Potential impacts on the quite zone along the MNF 3, 4, and 5 routes are still being evaluated.

Based on desktop review and aerial reconnaissance of the three southern alternative routes, Atlantic's engineers concluded that MNF 5 would be the least difficult to construct and re-stabilize of the three routes, although it would be significantly more difficult than either MNF 1 or MNF 2. Additionally, MNF 5 avoids the portion of the GWNF identified in the *George Washington National Forest Revised Land and Resource Management Plan* (USFS, 2014a) as potential wilderness area. However, even with the avoidance of this land, the aggregation of the terrain and accessibility on MNF 5 makes this route difficult from a construction standpoint.

To try to gauge how much more difficult construction of MNF 5 would be than MNF 2, Atlantic performed a detailed slope evaluation of the entire study area, and quantified for comparison purposes the length of very steep slope (i.e., greater than 45 percent) along the centerline of these routes. This comparison is shown on Figure 10.8.1-5. Note that both profiles have a vertical exaggeration of 10:1 to highlight changes in elevation. Additionally, refer to Appendix 10B for a detailed topographic map set which provides a breakdown of slope along a 300-foot-wide study corridor for MNF 2 and MNF 5 (Note – the construction right-of-way will only require 125 feet). To provide a further indication of the difficulty of constructing MNF 5, Table 10.8.1-3 provides a detailed listing of the construction issues and concerns along this route.

In addition to construction, access and restoration/stabilization issues, the greater length required for the three southern alternative routes would result in significant additional land disturbance and forest clearing. For example, in addition to MNF 5 adding 16.6 miles to the Project relative to the baseline route, it also crosses 15.8 more miles of forested lands than the corresponding segment of the baseline and 19.4 more miles of forested land than MNF 2. Assuming a construction right-of-way width of 125 feet, this would result in the clearing and grading of an additional 238.5 acres of forested land compared with the baseline or an additional 293.9 acres of forested land compared with MNF 2.

In addition to MNF 3, MNF 4, and MNF 5, Atlantic conceptually evaluated the possibility of a southern alternative corridor that would start at or near MP 43.3 on the proposed route and initially would follow the same alignment as MNF 5 to the Snowshoe Ski area near Thorny Flats. Rather than continuing to the east/northeast and rejoining the proposed route near the northern boundaries of the GWNF as MNF 3, MNF 4, and MNF 5 do, Atlantic evaluated a conceptual route extending in a southeast direction, crossing the Blue Ridge Parkway and Appalachian Trail near Raphine, Virginia, and rejoining the proposed route in the vicinity of Norwood, Virginia (see the route labeled "Conceptual Southern Route Alternative" on Figure 10.8.1-2).

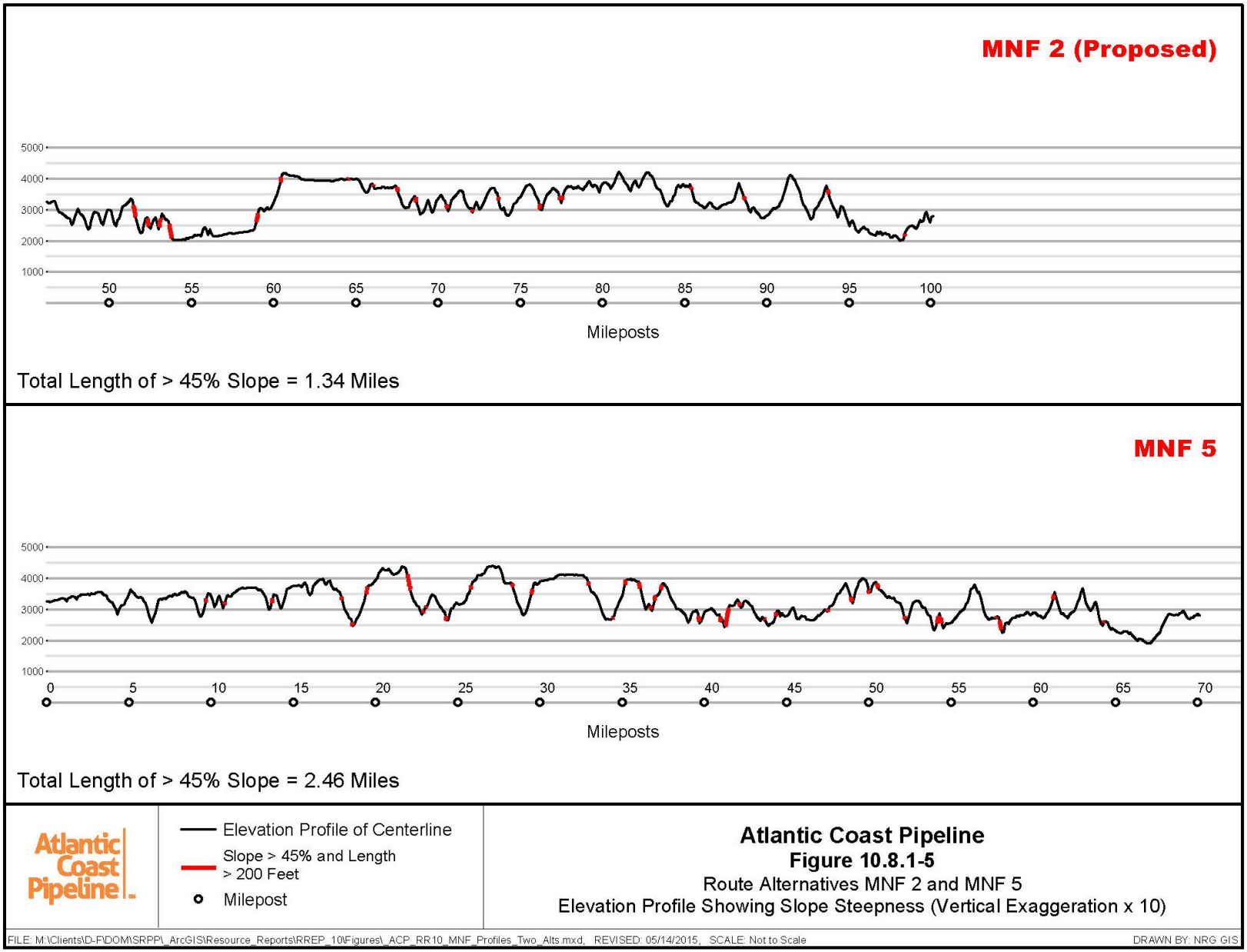
MNF 2 (Proposed)
5000
4000
3000
2000
1000
50
55
60
65
70
75
80
85
90
95
100
Mileposts
Total Length of > 45% Slope = 1.34 Miles
MNF 5
5000
4000
3000
2000
1000
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
Mileposts
Total Length of > 45% Slope = 2.46 Miles
Atlantic Coast Pipeline
Elevation Profile of Centerline
Slope > 45% and Length > 200 Feet
Milepost
Atlantic Coast Pipeline
Figure 10.8.1-5
Route Alternatives MNF 2 and MNF 5
Elevation Profile Showing Slope Steepness (Vertical Exaggeration x 10)
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TABLE 10.8.1-3

Constructability Issues Along the Monongahela National Forest (MNF) 5 Alternative Route

Site Number	Milepost Location	Land Ownership	Landscape Feature	Issue/Comment [a]
1	12.0	Private	Beech Mountain	Steep slope requiring a graded equipment winch site on ridge top and a new access road along the ridge top
2	12.6	Private	Round Knob Mountain	Steep slope on west slope of Round Knob requiring a graded equipment winch site on ridge top and a new access road along the ridge top
3	12.8	Private	Round Knob Mountain	Steep slope on east side of Round Knob; would utilize same graded equipment winch site and access road as on the west side of the ridge
4	13.3	Private	Unnamed Ridge Top	Steep slope requiring a graded equipment winch site on ridge top and a new access road along the ridge top
5	13.4	Private	Unnamed Ridge Top, Long Run	Steep slope on an unnamed ridge above the west side of Long Run Stream requiring a graded equipment winch site on ridge top and a new access road along the ridge top
6	13.8	Private	Unnamed Ridge Top, Long Run	Steep slope on an unnamed ridge above the east side of Long Run Stream requiring a graded equipment winch site on ridge top and a new access road along the ridge top
7	16.1	Private	Unnamed Ridge Top, Back Fork Elk River	Steep slope on an unnamed ridge above the west side of Back Fork Elk River requiring a graded equipment winch site on ridge top and a new access road along the ridge top; little space for construction access at the stream crossing
8	16.7	Private	Unnamed Ridge Top, Back Fork Elk River	Steep slope on unnamed ridge above the east side of Back Fork Elk River requiring a graded equipment winch site on ridge top and a new access road along the ridge top; little space for construction access at the stream crossing
9	16.9	Private	Unnamed Ridge Top, Coalbank Fork	Steep slope on an unnamed ridge above the west side of Coalbank Fork requiring a graded equipment winch site on ridge top and a new access road along the ridge top
10	17.5	Private	Unnamed Ridge Top, Coalbank Fork	Steep slope on an unnamed ridge above the east side of Coalbank Fork requiring a graded equipment winch site on ridge top and a new access road along the ridge top
11	21.5	Private	Valley Fork, Elk River Fish Hatchery	Steep slopes on both sides of the Valley Creek and Route 49 approach to the waterbody and road; no room for equipment to build the waterbody and road crossing due to adjacent slopes
12	21.5 to 27.2	Private	Elk Mountain, Mingo Knob Area	Limited access with steep and rocky terrain
13	22.4	Private	Elk Mountain	Steep slope on the western approach requiring a graded equipment winch site on ridge top and a new access road along the ridge top
14	24.7	Private	Mingo Mountain	Steep slope on the east side requiring a graded equipment winch site on ridge top and new access road along the ridge top
15	27.3	State of West Virginia	Douglas Fork to Elk River	Difficult stream crossing with no landing spaces or work area at the bottom of the slopes adjacent to both sides of the stream and road; high potential for runoff issues
16	27.4	Private	Douglas Fork to Elk River (East Side)	Steep slope above the east side of Douglas Fork requiring a graded equipment winch site on ridge top and new access road along the ridge top
17	30.6	Private	East Slope of Middle Mountain	Steep slope on the east side of Middle Mountain requiring a graded equipment winch site on ridge top and new access road along the ridge top
18	31.2	Private	East Slope of Eastern Peak of Middle Mountain	Steep slope of the east side of the Eastern Peak of Middle Mountain requiring a graded equipment winch site on ridge top and a new access road along the ridge top
19	31.9	Private	Big Spring Fork	Difficult road/stream crossing combination with little room between the bottom of slope and road/stream; roadside park at road crossing location
20	32.5	MNF	Slaty Ridge	Steep slope on the north side of Buzzard Ridge Mountain requiring a graded equipment winch site on ridge top and a new access road along the ridge top
20	35.7 to 42.2	Private	Unnamed Ridge Tops; Elk Lick and Woods Run	This area would require 12 winch sites; each site has limited construction access; the sites would likely require new ridge top access roads

TABLE 10.8.1-3 (cont'd)

Constructability Issues Along the Monongahela National Forest – 5 Alternative Route

Site Number	Milepost Location	Land Ownership	Landscape Feature	Issue/Comment [a]
21	42.4 to 42.7	Private	Moses Spring Run	Steep slope on the west and east sides of Moses Spring Run; the crossing is about 0.4 mile upstream of Greenbrier River; each slope would require a graded equipment winch site on the ridge top; the stream crossing has steep slopes abutting the waterbody with little room for construction; the crossing is adjacent to Seneca State Forest
22	43.8 to 43.9	Private	Unnamed Tributary to Greenbrier River; Greenbrier River	Steep slopes on the west and east sides of a tributary to Greenbrier River and steep slope on the west side of Greenbrier River, each requiring a graded equipment winch site on the ridge top and new access roads along ridge tops; Greenbrier hiking trail at the bottom of the slope
23	44.0 to 44.4	MNF	Greenbrier River, Peters Mountain	Long, steep slope on the east side of Greenbrier River (west side of Peters Mountain) that would require grading of a winch site on top of the hill; the steep slope leads directly into the river, with minimal room for construction of the river crossing
24	45.7	MNF/Private	Peters Mountain	Steep slope descending off the east side of Peters Mountain requiring the grading of a new equipment winch site and access road along the ridge top
25	47.2 and 47.4	Private	Lower Mountain	Steep slope descending off the west and east side of Lower Mountain requiring the grading of new equipment winch sites and access roads along the mountain ridge top
26	48.2	Private	Charley Ridge	30 – 45 percent slope descending off the east side of Charley Ridge requiring the clearing and grading of a new equipment winch site and access road along the ridge top
27	51.5 to 51.8	Private	Stoney Run	Steep slopes in excess of 45 percent off the east side of an unnamed mountain down to Stoney Run; limited access to Stoney Run and limited landing areas on either side of the waterbody
28	51.8 to 52.0	Private/GWNF	Chestnut Ridge	Steep slopes in excess of 45 percent off the west side of Chestnut Ridge down to Stoney Run; limited access o Stoney Run and limited landing areas on either side of the waterbody
29	52.0 to 56.7	GWNF	Big Ridge, Erwin Draft , Gregory Ridge, Back Creek	Eight steep, extended length slopes, all of which would require the grading of winch sites for construction equipment
30	56.9 to 57.3	Private	Little Mountain, on the south side of Mill Gap	Two steep slopes on the west and east sides of Little Mountain requiring a single winching platform site to be cleared and graded; no construction access is available
31	58.8 to 59.9	Private	Back Creek Mountain	A series of long, steep slopes traversing the west and east sides of Back Creek Mountain requiring at least two winching platforms on the ridge top; access to the ridge top does not currently exist
32	60.8 to 60.9	Private	Unnamed Mountain west of Jackson River	Steep slope down to the river valley floor requiring a graded winching platform on the top of the mountain; an access road would need to be cleared to this location
33	61.1 to 61.2	Private	Dixon Hills east of Jackson River	Steep slope down to the river valley floor requiring a graded winching platform on top of the mountain; an access road would need to be cleared to this location
34	61.0	Private	Jackson River	No existing equipment access to the east side of the Jackson River
35	63.8 to 64.6	Private	Western Leg of Jack Mountain	Steep slopes on both the east and west sides of the west ridge of Jack Mountain; the ascent on both sides of the mountain would require the grading of a single construction equipment winching area; no construction access is available on top of this ridge line
36	65.3 to 67.5	Highland WMA	Jack Mountain, south Buck Hill	Steep slopes requiring at least three winching platforms and construction of new access roads
37	72.0 to 72.2	Private	Sheep Knob	Steep slope on the northeast side of Sheep Knob requiring a winching platform and an access road on the ridge top of Sheep Knob

[a] Steep slope refers to slopes in excess of 45 percent that would require excessive winching of construction equipment (e.g., trenching, pipe laying, lowering-in, and grading equipment) up and down the slope during pipeline construction activities.

From an operations perspective, as long as the conceptual alternative route could rejoin the proposed route upstream of Compressor Station 2, it would be compatible with Atlantic's proposed operations and natural gas deliveries. If possible to find a corridor preferable to MNF 3, 4 and 5 from an environmental and constructability perspective, it would avoid backtracking sharply to the east to connect back to the proposed route north of Staunton, Virginia and could also reduce the overall length of the MNF alternative routes.

While many of the same constructability and construction access issues posed by MNF 3, 4, and 5 would also apply to the Conceptual Southern Route Alternative, environmental routing constraints associated with crossing the GWNF and JNF south of the proposed route appear to be insurmountable. These routing constraints include large sections of special management areas such as designated Wilderness Areas, potential wilderness areas, designated roadless areas, remote backcountry areas, and designated scenic areas. Atlantic's assessment of potential route corridors in the general vicinity of the Conceptual Southern Route Alternative as shown on Figure 10.8.1-2 determined that there is not a feasible route across the Blue Ridge Mountains in this area.

MNF Route Selection

Atlantic's review of potential alternative routes north and east of the baseline across the MNF indicates that for reasons of steep, rugged topography and existing sensitive management areas (e.g., the Laurel Fork North Wilderness Area and the Spruce Knob-Seneca Rocks NRA), it is not possible to collocate the AP-1 mainline with the existing Columbia pipeline infrastructure heading north and east of the proposed ACP route. Moreover, any route to the north and east of the proposed route would eventually have to go south to reconnect to the proposed pipeline, and in doing so, would cross the SNP, which would require an authorization from the U.S. Congress. This authorization would be infeasible to obtain within the timeframe required by the purpose and need of the Projects. Therefore, Atlantic determined that potential alternatives to the north and east are not feasible.

Atlantic evaluated five major alternative routes south of the baseline route: two alternatives (MNF 1 and MNF 2) which optimize the baseline, and three alternatives (MNF 3, MNF 4, and MNF 5) which trend farther to the south. MNF 1 and MNF 2 range from 0.7 mile shorter to 0.4 mile longer than the baseline, while MNF 3, MNF 4, and MNF 5 add between 11.2 and 17.9 miles to the AP-1 mainline relative to the baseline. Of the five alternative routes, Atlantic believes that, based on desktop studies, detailed slope evaluations, and aerial reconnaissance to date, construction along MNF 2 appears to result in the least environmental impact by following existing cleared corridors through potential habitat for protected species, or by avoiding these habitat areas entirely. Construction of this route along previously disturbed and in some cases previously graded areas, would avoid the most rugged terrain of all the alternatives, have the best existing access through the area (primarily via U.S. Highway 250) and, due to its comparably shorter length, would appear to result in the least impact to previously undisturbed lands.

Field surveys scheduled to be completed in the Spring of 2015 are needed to confirm that sensitive habitats along MNF 2 would be avoided to the extent practicable and that the route is constructible within the previously disturbed strip mine areas and in other terrain along this route. Consequently, Atlantic will continue to refine and study alternative routes to the south (i.e., MNF 5) as well as the proposed route (i.e. MNF 2). Figure 10.8.1-6 depicts the proposed route and MNF 5.

10.8.1.3 George Washington National Forest Major Route Alternatives

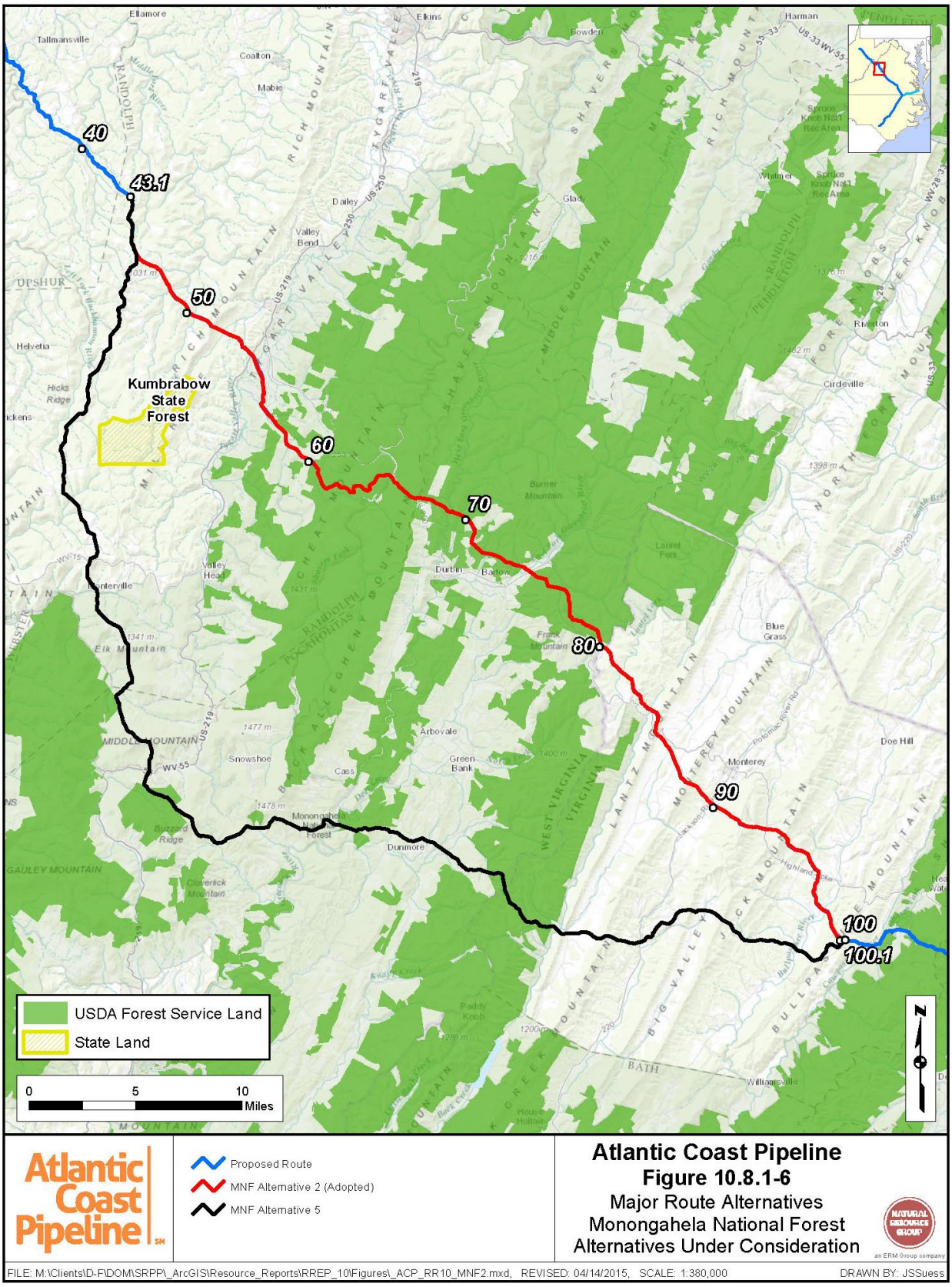
The GWNF encompasses approximately 1 million acres of Federal lands along the Appalachian Mountain chain in Virginia, West Virginia, and Kentucky. It contains portions of the Appalachian Trail and Blue Ridge Parkway as well as eight federally designated Wilderness Areas and a number of backcountry recreation areas, special biological areas, and visually sensitive areas. Portions of the GWNF are managed for timber production and wood products (USFS, 2014c).

Given the northwest-to-southeast orientation of the proposed AP-1 mainline between central West Virginia and southern Virginia, it is not feasible to avoid crossing the GWNF altogether. However, Atlantic and DTI identified and evaluated several route alternatives based on review of the *George Washington National Forest Revised Land and Resource Management Plan* (LRMP) (USFS, 20114a) and input from USFS staff in an effort to minimize the crossing length and avoid sensitive areas within the forest. In addition to the baseline, Atlantic identified three alternative routes (GWNF 1, GWNF 2, and GWNF 3) between approximate MPs 102.2 and 170.0 in Highland, Augusta, and Nelson Counties, Virginia. The baseline route and each alternative are depicted on Figure 10.8.1-7, and comparative information on each route is provided in Table 10.8.1-4.

The LRMP identifies a designated utility corridor that is roughly parallel to and between approximately 0.1 and 1.0 mile to the south of the proposed AP-1 mainline route on the GWNF. This corridor contains an existing DVP 500 kV electric transmission line. Atlantic evaluated the designated utility corridor as a potential route, but determined the terrain unsuitable for pipeline construction. The utility corridor traverses numerous steep side slopes and spans steep ravines which could not be crossed by a pipeline. Consequently, the designated utility corridor was rejected as a viable alternative route for the ACP.

GWNF – Baseline

At 58.8 miles in length, the baseline route is the shortest of the four alternatives. Beginning at MP 102.2, the baseline initially heads southeast for approximately 33.0 miles, passing between Deerfield and West Augusta and east of Staunton, Stuarts Draft, and Waynesboro. At a point east of Greenville, the route turns south for approximately 15.0 miles, passing east of Montebello and north of Nash. It crosses the Blue Ridge Parkway approximately 7 miles south of Greenville, and the Appalachian Trail approximately 6 miles east of Montebello. At a point near Tyro, the route heads southeast for approximately 11.0 miles, terminating east of Lovingston.


40
43.1
50
60
70
80
90
100
100.1
Kumbrabow State Forest
USDA Forest Service Land
State Land
0 5 10 Miles
Proposed Route
MNF Alternative 2 (Adopted)
MNF Alternative 5
Atlantic Coast Pipeline
Figure 10.8.1-6
Major Route Alternatives
Monongahela National Forest
Alternatives Under Consideration
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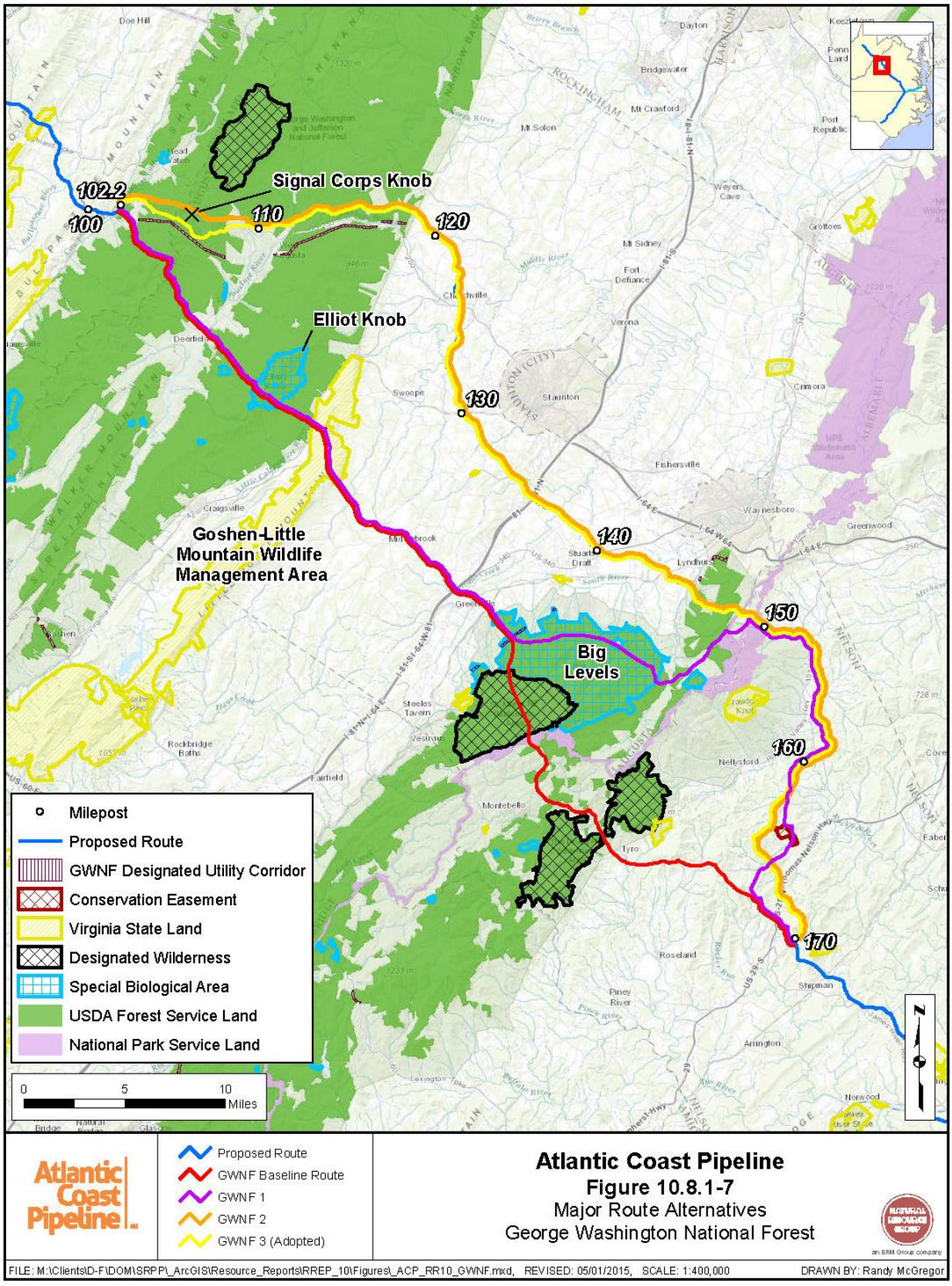
Signal Corps Knob
Elliot Knob
Goshen-Little Mountain Wildlife Management Area
Big Levels
102.2
100
110
120
130
140
150
160
170
Milepost
Proposed Route
GWNF Designated Utility Corridor
Conservation Easement
Virginia State Land
Designated Wilderness
Special Biological Area
USDA Forest Service Land
National Park Service Land
0 5 10 Miles
Proposed Route
GWNF Baseline Route
GWNF 1
GWNF 2
GWNF 3 (Adopted)
Atlantic Coast Pipeline
Figure 10.8.1-7
Major Route Alternatives
George Washington National Forest
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TABLE 10.8.1-4

George Washington National Forest Major Route Alternatives for the Atlantic Coast Pipeline

Features	Unit	Baseline Route	GWNF 1 Route Alternative	GWNF 2 Route Alternative	GWNF 3 Route Alternative (proposed)
Length	miles	58.8	68.4	68.7	69.1
Primary U.S. or Commonwealth highway crossed	number	9	10	14	14
Other Commonwealth or local roads crossed	number	54	64	75	79
Adjacent to existing linear corridor facilities	miles	0.0	0.0	0.0	0.0
Federal lands crossed (total)	miles	24.5	26.7	12.8	13.0
National Park Service (total)	miles	0.6	0.7	0.5	0.5
Blue Ridge Parkway	miles	0.6	0.2	0.2	0.2
Appalachian Trail corridor	miles	0.0	0.5	0.3	0.3
U.S. Forest Service (total)	miles	23.9	26.0	12.3	12.5
Commonwealth lands crossed	miles	3.5	3.5	0.0	0.0
Private lands crossed	miles	30.8	38.2	55.9	56.1
Conservation easements crossed	miles	2.5	2.6	0.0	0.0
U.S. Forest Service management prescription units crossed (total)	miles	23.9	26.0	12.3	12.5
Blue Ridge Parkway corridor	miles	0.1	0.1	0.0	0.0
Designated wilderness	miles	3.5	0.0	0.0	0.0
Dispersed recreation	miles	0.0	1.2	0.0	0.0
Eligible recreation river corridor	miles	0.2	0.0	0.0	0.0
Mosaics of wildlife habitat	miles	10.3	10.7	12.3	12.5
Pastoral landscapes and rangelands	miles	0.0	0.5	0.0	0.0
Remote backcountry	miles	3.0	2.5	0.0	0.0
Scenic corridor and viewshed	miles	1.6	0.3	0.0	0.0
Special biological area	miles	5.2	10.7	0.0	0.0
Utility corridor	miles	0.1	0.1	0.0	0.0
U.S. Forest Service roadless areas	miles	2.5	3.5	0.0	0.0
Forested lands crossed	miles	46.8	54.3	41.6	42.1
Wetlands crossed – freshwater emergent	miles	<0.1	<0.1	0.1	0.1
Wetlands crossed – freshwater forested/shrub	miles	<0.1	0.3	0.4	0.4
Intermittent waterbodies crossed	number	23	52	68	69
Perennial waterbodies crossed	number	24	41	39	38
McDowell Battlefield study area crossed	miles	0.0	0.0	0.6	0.3

The baseline route crosses approximately 23.9 miles of the GWNF, including 3.0 miles in the St. Mary's Wilderness Area and 0.5 mile in the Three Ridges Wilderness Area. As noted above, crossings of Wilderness Areas require an authorization from the U.S. Congress that would be infeasible to obtain within the timeframe required by the purpose and need of the Projects. The baseline route additionally crosses management prescription units in the forest designated as special biological areas, scenic corridors and viewsheds, remote backcountry, and roadless areas. Staff from the GWNF advised Atlantic that utility corridors generally are prohibited in these areas.

Outside the GWNF, the baseline route crosses 0.6 mile of NPS lands, including the Blue Ridge Parkway and Appalachian Trail; approximately 3.5 miles of Commonwealth lands in the Goshen-Little Mountain Wildlife Management Area; and approximately 2.5 miles of private lands subject to conservation easements held by the Virginia Outdoors Foundation (VOF). The baseline route crosses the fewest amount of wetlands and waterbodies, but the second most miles of forested land.

GWNF 1

GWNF 1 is approximately 68.4 miles long, which is 9.6 miles longer than the baseline. It follows the same alignment as the baseline for approximately 32.0 miles, then heads east-northeast for approximately 17.0 miles to avoid crossing the St. Mary's and Three Ridges Wilderness Areas. The route crosses the Blue Ridge Parkway and Appalachian Trail approximately 3.0 miles south of I-64 at Afton Mountain. In Rockfish Valley, the route turns south and continues for approximately 32.0 miles, where it intersects the baseline near Woods Mountain in Nelson County. It then follows the same alignment as the baseline to the terminus approximately at MP 170.0, east of Lovingston.

GWNF 1 crosses approximately 26.0 miles of GWNF lands, including areas designated as remote backcountry, scenic corridors and viewsheds, special biological areas, and roadless areas. One of the special biological areas, Elliott Knob, provides habitat for several sensitive species, including the cow knob salamander, which is protected under a special conservation agreement between the USFS and the FWS. Another special biological area, Big Levels, contains unique groundwater features, vernal pools, dense concentrations of prehistoric archaeological sites, as well as habitat for several sensitive species. Staff from the GWNF recommended avoiding these areas.

Outside the national forest, GWNF 1 crosses approximately 0.7 mile of NPS land at the Blue Ridge Parkway and Appalachian Trail; 3.5 miles of Commonwealth land in the Goshen-Little Mountain Wildlife Management Area; and 2.6 miles of private land subject to conservation easements held by the VOF and Virginia Department of Forestry. It crosses more wetlands and waterbodies than the baseline route, but less than the other alternatives. It also crosses the most forested land.

GWNF 2

GWNF 2 is approximately 68.7 miles long, which is 9.9 miles longer than the baseline. Starting at MP 101.9, the route initially heads east for approximately 16.0 miles, passing north of West Augusta. It then heads south-southeast for approximately 34.0 miles, passing north of Stuarts Draft and south of Staunton and Waynesboro. Like GWNF 1, it crosses the Blue Ridge Parkway approximately 3.0 miles south of I-64 at Afton Mountain. After crossing Rockfish Valley Road, the route heads south for another 19 miles, passing east of Wellsford and Lovingston, and terminating at MP 170.0.

GWNF 2 crosses approximately 12.3 miles of USFS lands, all within the mosaic of wildlife habitat management prescription unit. Based on discussions with USFS staff, lands

within this management prescription unit would be considered suitable for a utility crossing of the national forest. Relative to GWNF 1, the route avoids the Elliott Knob and Big Level special biological areas and designated roadless areas, but crosses approximately 0.6 mile of the study area for the McDowell Battlefield site. It additionally crosses Signal Corps Knob, which USFS staff identified as an important site used as a signal station by both the Union and Confederate Armies during the Civil War.

Outside the national forest, GWNF 2 crosses approximately 0.5 mile of NPS land at the Blue Ridge Parkway and Appalachian Trail, but avoids the Goshen-Little Mountain Wildlife Management Area as well as crossings of conservation easements. It crosses the same amount of wetlands and waterbodies as GWNF 3, but crosses more waterbodies than the baseline and GWNF 1 route alternatives. It also crosses the least amount of forested land of all four routes.

GWNF 3

GWNF 3 has a total length of 69.1 miles, which is 10.3 miles longer than the baseline route. It follows the same alignment as GWNF 2, with the exception of a short segment between MPs 103.4 and 109.6, where it passes approximately one mile to the south in the vicinity of Signal Corps Knob. GWNF 3 crosses 12.5 miles of USFS lands, all within the mosaic of wildlife habitat management prescription unit. Like GWNF 2, the route avoids the Elliot Knob and Big Level special biological areas and designated roadless areas. It also avoids the Civil War site on Signal Corp Knob and crosses 0.3 mile less of the McDowell Battlefield site.

As originally conceived, GWNF 3 crossed the Blue Ridge Parkway and Appalachian Trail 0.5 mile of NPS lands. As explained in Section 10.8.1.5, Atlantic subsequently modified the route to cross the Appalachian Trail on lands owned and administered by the GWNF as part of the Appalachian Trail South Major Route Alternative. The route avoids the Goshen-Little Mountain Wildlife Management Area and conservation easements, crosses the same amount of wetlands and waterbodies as GWNF 2, and crosses just 0.5 more mile of forested land.

GWNF Route Selection

Although it is the longest of the four alternatives, Atlantic identified GWNF 3 as the preferred alternative. This route minimizes impacts on sensitive resources in the GWNF, including areas with special management designations, designated roadless areas, and Civil War sites. It reduces the crossing of NPS lands at the Blue Ridge Parkway and Appalachian Trail, and avoids Commonwealth lands and conservation easements. It crosses more wetlands and waterbodies than the baseline and GWNF 1 alternatives, primarily due to the increased length of the route, and the same amount of these features as GWNF 2. It also crosses the second fewest miles of forested lands. For all these reasons, Atlantic incorporated GWNF 3 into the proposed route.

10.8.1.4 Stuarts Draft Major Route Alternatives

Atlantic initially identified and evaluated two alternative routes (Stuarts Draft 1 and Stuarts Draft 2) in Augusta County, Virginia at the request of the County Board of Supervisors in

an effort to increase the distance between the baseline route (a segment of GWNF 3 for purposes of this analysis) and a three-school complex in Stuarts Draft, Virginia. The County also requested that Atlantic work to avoid water recharge and water protection areas.

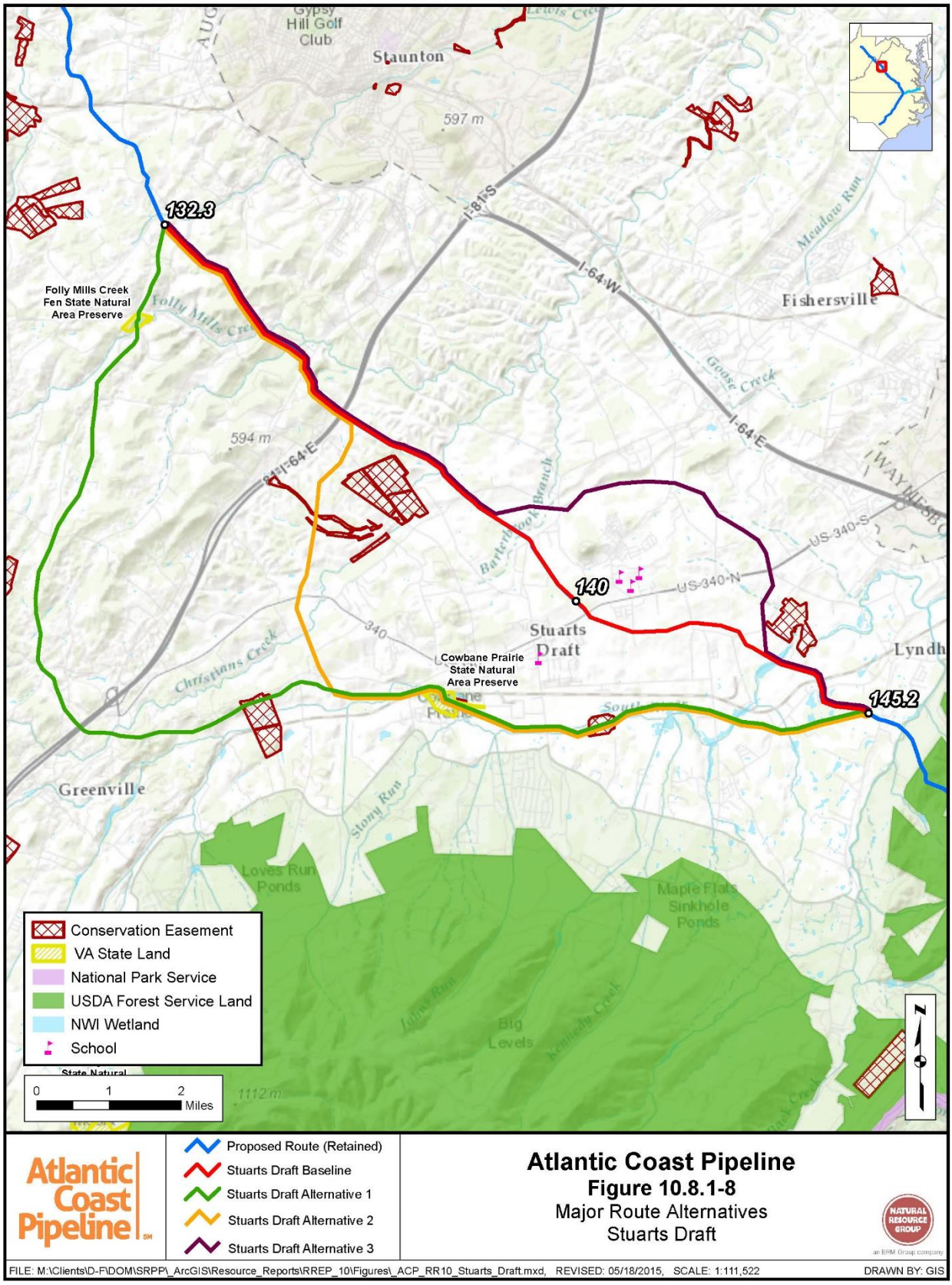
The baseline route for the AP-1 mainline passes to the northeast of Stuarts Draft where it crosses U.S. Highway 340 at MP 140.5. The alternatives originate at MP 132.3, pass west and south of Stuarts Draft, and terminate along the baseline route approximately at MP 145.2. Stuarts Draft 1 initially heads south for 8 miles, crosses I-64/I-81 north of Greenville, and then heads east for 11 miles, where it rejoins the current route southwest of Lyndhurst. Stuarts Draft 2 follows the same alignment as the baseline route for 4 miles, heads south for 4 miles on the east side of the Interstate, then follows the same path as Stuarts Draft 1 to the terminus at MP 145.2. The baseline route and both alternatives are depicted on Figure 10.8.1-8, and comparative data on each route is provided in Table 10.8.1-5.

TABLE 10.8.1-5

Stuarts Draft Major Route Alternatives for the Atlantic Coast Pipeline

Features	Unit	Baseline Route (GWNF 3)	Stuarts Draft 1 Route Alternative	Stuarts Draft 2 Route Alternative	Stuarts Draft 3 Route Alternative
Length	miles	12.7	19.1	15.7	13.8
Primary U.S. or Commonwealth highway crossed	number	5	4	5	5
Other Commonwealth or local roads crossed	number	14	30	20	14
Adjacent to existing linear corridor facilities	miles	0.0	0.0	0.0	0.0
Federal lands crossed	miles	0.0	0.0	0.0	0.0
Commonwealth lands crossed	miles	0.0	0.4	0.2	0.0
Private lands crossed	miles	12.7	18.7	15.5	13.8
Conservation easements crossed	miles	0.0	1.1	0.8	0.0
Forested lands crossed	miles	3.6	5.1	3.1	3.3
Wetlands crossed – freshwater emergent	miles	0.0	0.1	0.1	0.0
Wetlands crossed – freshwater forested/shrub	miles	0.1	0.2	0.2	0.1
Intermittent waterbodies crossed	number	13	6	12	17
Perennial waterbodies crossed	number	6	12	11	6
Augusta County Source Water Protection Area	miles	0.0	3.1	3.1	1.3

At 19.1 miles, Stuarts Draft 1 is 6.4 miles longer than the corresponding segment of the baseline route. It increases the distance between the proposed pipeline and the three-school complex from 0.5 to 1.6 miles, but passes within 0.9 mile of another school in Stuarts Draft. The alternative route crosses 0.8 mile of conservation easements, compared to none for the baseline route, and 0.4 mile of Commonwealth lands in the Cowbane Prairie Natural Area Preserve, which the baseline route avoids. Stuarts Draft 1 additionally crosses 0.5 mile more of forested land, 3.1 miles more of Augusta County Source Water Protection Area, 0.2 mile more of wetland, and 6 more perennial waterbodies than the baseline route.


Gypsy Hill Golf Club
Staunton
597 m
132.3
Folly Mills Creek Fen State Natural Area Preserve
I-81-S
I-64-W
Fishersville
Meadow Run
Goose Creek
I-64-E
594 m
I-64-E
Barterbrook Branch
US-340-S
US-340-N
140
Stuarts Draft
Cowbane Prairie State Natural Area Preserve
Christians Creek
340
145.2
Lyndh
Greenville
Stony Run
Loves Run Ponds
Maple Flats Sinkhole Ponds
Idlins Run
Big Levels
Kennedy Creek
1112 m
Conservation Easement
VA State Land
National Park Service
USDA Forest Service Land
NWI Wetland
School
0 1 2 Miles
Proposed Route (Retained)
Stuarts Draft Baseline
Stuarts Draft Alternative 1
Stuarts Draft Alternative 2
Stuarts Draft Alternative 3
Atlantic Coast Pipeline
Atlantic Coast Pipeline
Figure 10.8.1-8
Major Route Alternatives
Stuarts Draft
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Stuarts Draft 2 is 3.4 miles shorter than Stuarts Draft 1, but 3.0 miles longer than the baseline route. Like Stuarts Draft 1, it increases the distance between the proposed pipeline and the three-school complex from 0.5 to 1.6 miles, but introduces a new route component that passes within 0.9 mile of another school in Stuarts Draft. Stuarts Draft 2 crosses less Commonwealth land and conservation easements than Stuarts Draft 1, but approximately 0.2 and 0.4 mile more, respectively, than the baseline route. Additionally, like Stuarts Draft 1, Stuarts Draft 2 crosses 3.1 miles of Augusta County Source Water Protection Area compared to 0.0 miles for the baseline route. Stuarts Draft 2 crosses 0.6 mile less forested land than the baseline route, but 0.2 mile more of wetland and 5 more perennial waterbodies.

Relative to the baseline route, each of the alternative routes would require substantial additional acreage to be disturbed. Moreover, both Stuarts Draft 1 and Stuarts Draft 2 present additional exposure to designated conservation easements, and increase the Project's impact on perennial waterbodies and designated Source Water Protection areas. For these reasons, neither alternative route provides an environmental advantage over the baseline.

Subsequent to the initial analysis, Atlantic identified a third alternative route (Stuarts Draft 3) based on information provided by FERC staff. Unlike Stuarts Draft 1 and 2, which are south of the baseline, Stuarts Draft 3 is north of the baseline (see Figure 10.8.1-8). The route initially follows the same alignment as the baseline approximately between MPs 132.3 and 138.6. It then heads east for about 2.7 miles to a point near Augusta Farms Road. Stuarts Draft 3 then heads south/southeast for about 3.0 miles, crossing Route 340 and reconnecting with the baseline on the west side of the South River approximately at MP 142.8. It then follows the same route as the baseline to the terminus approximately at MP 145.2.

At 13.8 miles in length, Stuarts Draft 3 is 1.1 miles longer than the baseline route. It passes about 1.2 miles north of the three-school complex and 0.7 mile east of the other school. Stuarts Draft 3 crosses 1.2 miles of designated Source Water Protections Areas, which is less than Stuarts Draft 1 and 2 but more than the baseline, which avoids these areas. Stuarts Draft 3 crosses one additional intermittent waterbody compared with the baseline route, although perennial waterbody and wetland crossings are the same. Additionally, like the baseline, Stuarts Draft 3 avoids Commonwealth lands and conservation easements.

While Stuarts Draft 3 increases the distance from the three-school complex, it is longer than the baseline and crosses 1.2 miles of designated Source Water Protection Areas. Like Stuarts Draft 1 and 2, Stuarts Draft 3 provides no environmental advantage over the baseline. For these reasons, Atlantic retained the baseline route in this area.

10.8.1.5 Appalachian Trail South Major Route Alternative

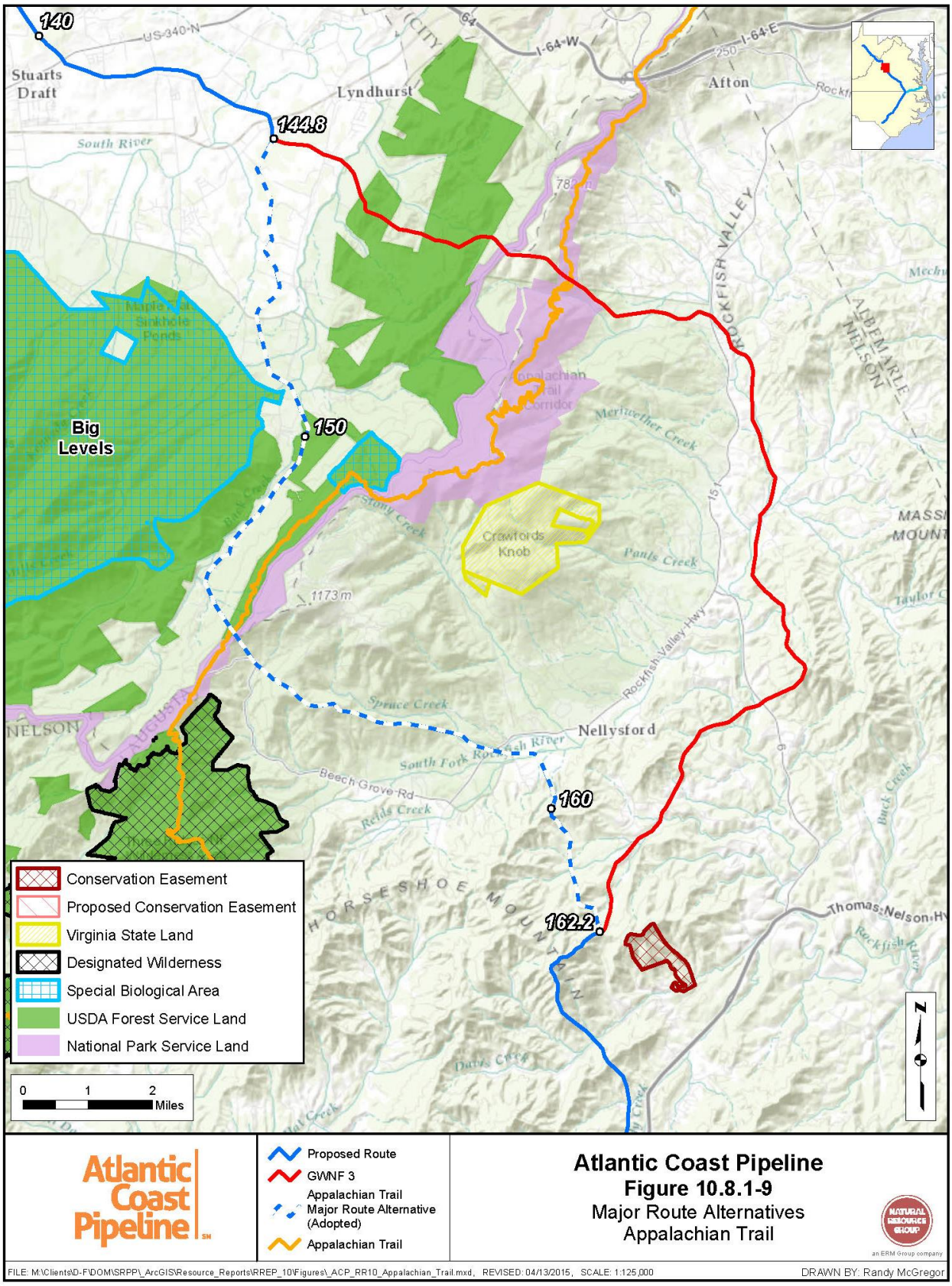
The Appalachian Trail is a designated National Scenic Trail corridor, which runs for approximately 2,185 miles from Georgia to Maine. The Appalachian Trail was first built in 1921 by private citizens, but today it is managed by the NPS, USFS, Appalachian Trail Conservancy, and various local and State/Commonwealth agencies. The baseline route for the Project (a segment of GWNF 3 for purposes of this analysis) crosses the Appalachian Trail on NPS lands in Nelson County, Virginia, approximately 3.6 miles to the southwest of Afton Mountain.

In various telephone calls and in a meeting on February 23, 2015, the NPS's Appalachian Trail Park Office advised Atlantic that the NPS lacks general legal authority to approve rights-of-way for natural gas transmission pipelines across NPS lands (other than the Blue Ridge Parkway). Based on these conversations, Atlantic investigated potential routing options and alternative crossing locations within the same general area that would avoid crossing the trail on NPS lands. North of the baseline crossing, the Appalachian Trail is wholly located on NPS lands to the point where it enters SNP. South of the baseline crossing, Atlantic identified a potential crossing of the trail on USFS lands in the GWNF approximately 7.4 miles to the southwest at a point near Reeds Gap in Augusta County, Virginia. Atlantic's engineers subsequently studied this potential crossing and approaches to and from the trail, and concluded that a route across the Appalachian Trail at this location is technically feasible and constructible. Atlantic then identified an alternative route to the baseline (the Appalachian Trail South Major Route Alternative) using this alternate crossing of the trail. The baseline and alternative routes are depicted on Figure 10.8.1-9, and comparative information on the two routes is provided in Table 10.8.1-6.

TABLE 10.8.1-6

Appalachian Trail Major Route Alternative for the Atlantic Coast Pipeline

Features	Unit	Baseline Route (GWNF 3)	Appalachian Trail South Route Alternative
Length (total)	miles	19.9	17.5
Primary U.S. or Commonwealth highways crossed	number	3	3
Other Commonwealth or local roads crossed	number	19	21
Adjacent to existing linear corridor facilities	miles	0.0	0.0
Federal lands crossed (total)	miles	2.4	1.2
Appalachian Trail (NPS)	miles	0.5	0.0
Blue Ridge Parkway (NPS)	miles	0.1	0.1
George Washington National Forest (USFS)	miles	1.8	1.1
Commonwealth lands crossed	miles	0.0	0.0
Conservation easements crossed (VDOF)			
Existing easements	miles	0.1	0.0
Proposed easements	miles	1.3	0.0
Recreational trails crossed	number	3	6
Forested land crossed	miles	14.2	14.1
Wetlands crossed – forested/shrub	miles	0.2	0.2
Intermittent waterbodies crossed	number	26	23
Perennial waterbodies crossed	number	14	7
Battlefields crossed	miles	0.0	0.0


140
144.8
150
160
162.2
US-340-N
I-64-W
I-64-E
Stuarts Draft
Lyndhurst
Afton
South River
Big Levels
Crawfords Knob
Nellysford
Spruce Creek
Beech Grove Rd
Reids Creek
Pauls Creek
Stony Creek
Meriwether Creek
Rockfish Valley Hwy
Thomas Nelson Hwy
Rockfish River
Davis Creek
Buck Creek
ROCKFISH VALLEY
ALBEMARLE
NELSON
HORSESHOE MOUNTAIN
1173 m
Conservation Easement
Proposed Conservation Easement
Virginia State Land
Designated Wilderness
Special Biological Area
USDA Forest Service Land
National Park Service Land
0 1 2 Miles
N
Proposed Route
GWNF 3
Appalachian Trail Major Route Alternative (Adopted)
Appalachian Trail
Atlantic Coast Pipeline
Figure 10.8.1-9
Major Route Alternatives
Appalachian Trail
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DRAWN BY: Randy McGregor

The baseline route begins approximately at MP 144.8 east of Stuarts Draft. From this point, the baseline heads southeast for approximately 8.1 miles, crossing USFS lands in the GWNF, NPS lands along the Blue Ridge Parkway, [27] and NPS lands along the Appalachian Trail. After crossing Virginia Highway 151, the baseline route heads south for approximately 7.2 miles across Rockfish Valley and Pilot Mountain to a point just east of Virginia Highway 6. It then turns to the east/southeast and continues for 4.6 miles, crossing Rockfish River and McLean Mountain and passing east of Gullysville. The baseline route terminates at a point along Roberts Mountain.

The baseline route measures approximately 19.9 miles in length. It crosses 2.1 miles of Federal lands, including 1.8 miles of USFS lands in the GWNF, 0.1 mile of NPS lands at the Blue Ridge Parkway, and 0.2 mile of NPS lands at the Appalachian Trail. The route additionally crosses 0.1 mile of existing conservation easement and 1.3 mile of proposed easement. A majority of the route (14.2 miles) crosses forested lands. The route also crosses 0.2 mile of wetland, 26 intermittent waterbodies, and 14 perennial waterbodies.

Relative to the baseline, the Appalachian Trail South Major Route Alternative initially heads south from MP 144.8 for approximately 8.1 miles, running paralleling to Mount Torrey Road. At a point just south of Torry Ridge, the route alternative then heads east for approximately 6.2 miles, crossing USFS lands in the GWNF, including the Appalachian Trail, NPS lands along the Blue Ridge Parkway, and an east trending ridge along Piney and Bryant Mountains. After crossing Rockfish Valley, the route heads southeast for 3.2 miles, crossing Horseshoe Mountain and terminating at a point along Roberts Mountain.

The alternative route measures approximately 17.5 miles in length. It crosses 1.1 miles of USFS lands in the GWNF (including the Appalachian Trail) and 0.1 mile of NPS lands along the Blue Ridge Parkway. The route avoids existing and proposed easements. It crosses 14.1 miles of forested lands, 0.2 mile of wetlands, 23 intermittent waterbodies, and 7 perennial waterbodies.

Relative to the proposed route, the Appalachian Trail South Major Route Alternative is 2.4 miles shorter, avoids NPS lands along the Appalachian Trail, avoids existing and proposed conservation easements, and reduces the crossing length of the GWNF by 0.7 mile. The route alternative additionally crosses seven fewer perennial waterbodies and three fewer intermittent waterbodies than the baseline. Both routes cross the Blue Ridge Parkway and Appalachian Trail along the spine of the Blue Ridge Mountains. As discussed in Resource Report 1, Atlantic is evaluating the use of a single horizontal directional drill (HDD) to install the pipeline beneath both of these crossings simultaneously. This method would avoid direct impacts on the Blue Ridge Parkway and Appalachian Trail. For all these reasons, the Appalachian Trail South Major Route Alternative was identified as the preferred alternative and incorporated into the proposed route.

[27] Unlike the Appalachian Trail and other NPS lands, the NPS has the authority to grant a right-of-way for a natural gas pipeline across the Blue Ridge Parkway under Public Law 74-848.

10.8.1.6 East of Lovingston Major Route Alternative

Atlantic identified and evaluated a major route alternative (the East of Lovingston Major Route Alternative) in Nelson County, Virginia, in an effort to reduce the crossing length of a core forest area identified by The Nature Conservancy (TNC). TNC is an international organization that works to protect natural areas by purchasing land or creating conservation easements or conservation areas. In a letter to Atlantic dated September 8, 2014, and in subsequent meetings, TNC identified the Sugarloaf Mountain/Rockfish/Shields Gap Complex as a forest area of concern. The complex contains a large block of unfragmented hardwood forest, including 11,000 acres which are considered valuable, interior forest habitat. The baseline route (which for purposes of this analysis includes parts of the Appalachian Trail South and GWNF 3 Major Route Alternatives) bisects the complex in the vicinity of Horseshoe Mountain. The baseline and alternative routes are depicted on Figure 10.8.1-10, and comparative information on the two routes is summarized in Table 10.8.1-7.

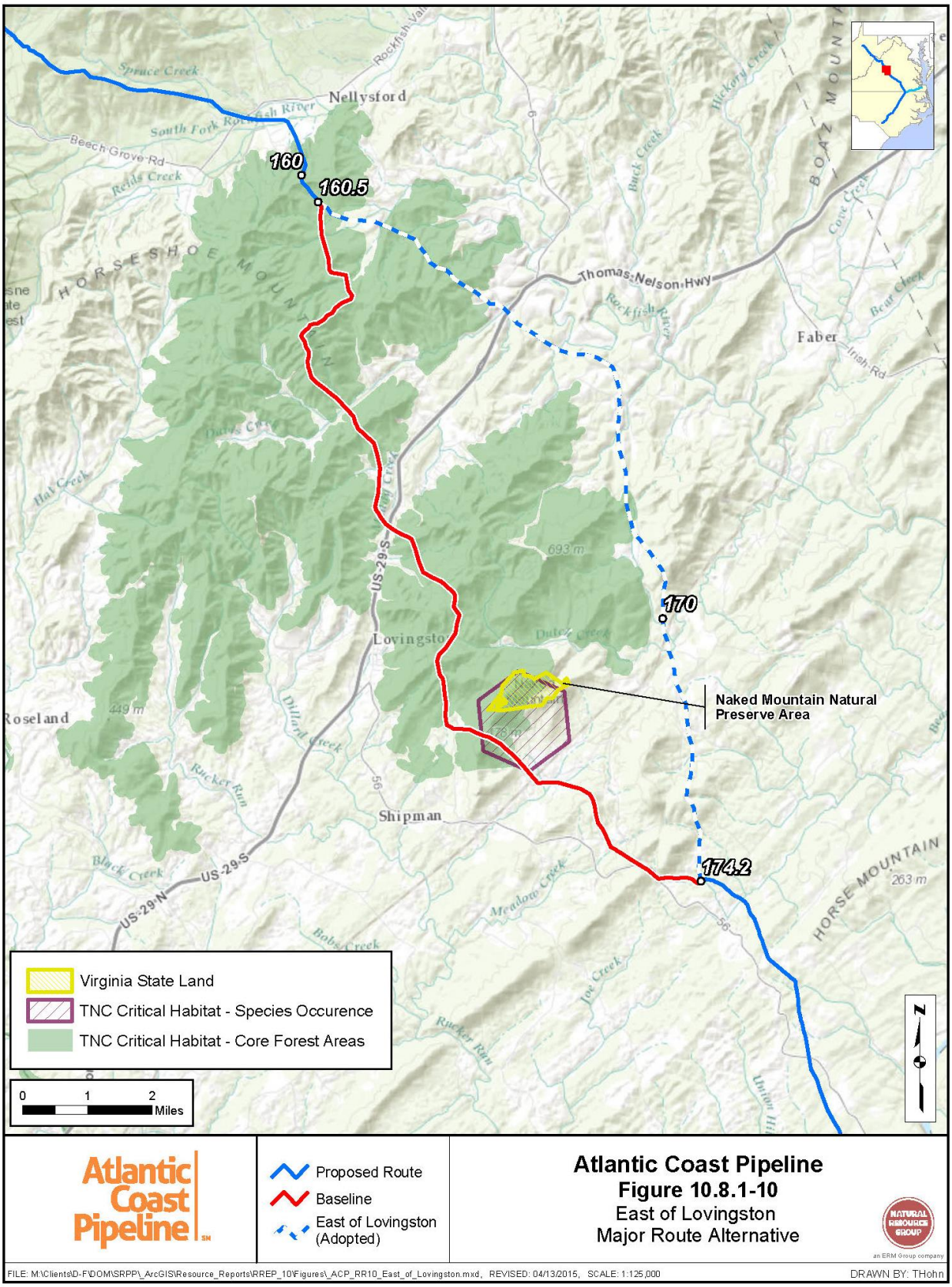
TABLE 10.8.1-7

East of Lovingston Major Route Alternative for the Atlantic Coast Pipeline

Features	Unit	Baseline Route [a]	East of Lovingston Route Alternative
Length (total)	miles	15.0	13.7
Primary U.S. or Commonwealth highways crossed	number	4	1
Other Commonwealth or local roads crossed	number	15	17
Adjacent to existing linear corridor facilities (electric transmission line)	miles	0.9	0.0
Federal lands crossed (total)	miles	0.0	0.0
Commonwealth lands crossed	miles	0.0	0.0
Conservation easements crossed	miles	0.5	0.1
The Nature Conservancy Critical Habitat	miles	10.0	2.9
The Nature Conservancy Species Occurrence Area	miles	0.9	0.0
Recreational trails crossed	number	0	0
Forested land crossed	miles	12.5	11.1
Wetlands crossed – Open water	miles	0.0	<0.1
Intermittent waterbodies crossed	number	13	14
Perennial waterbodies crossed	number	6	11
Battlefields crossed	miles	0.0	0.0

[a] The baseline route at this location includes a portion of the Appalachian Trail South and GWNF 3 Major Route Alternatives.

Starting at MP 161.4 east of Gullysville, the baseline route initially trends to the south/southeast for approximately 15.0 miles, crossing Roberts Mountain, Horseshoe Mountain, Thomas Nelson Highway, Peebles Mountain, High Peak, and Findley Mountain. The baseline passes approximately 1.0 mile east of the community at Lovingston where the route crosses Peebles Mountain. The baseline terminates at a point just north of Red Apple Orchard approximately at MP 174.2.


160
160.5
170
174.2
Nellysford
Faber
Lovingston
Roseland
Shipman
Thomas Nelson Hwy
US-29-S
US-29-N
HORSE MOUNTAIN
263 m
693 m
449 m
Naked Mountain Natural Preserve Area
Virginia State Land
TNC Critical Habitat - Species Occurence
TNC Critical Habitat - Core Forest Areas
0 1 2 Miles
N
Proposed Route
Baseline
East of Lovingston (Adopted)
Atlantic Coast Pipeline
Figure 10.8.1-10
East of Lovingston
Major Route Alternative
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The baseline route is approximately 15.0 miles long, of which approximately 0.9 mile is adjacent to an existing electric transmission line. The route crosses approximately 10.0 miles of the Sugarloaf Mountain/Rockfish/Shields Gap Complex as mapped by TNC. This includes approximately 0.9 mile identified by TNC as containing critically imperiled, imperiled, or priority species habitat and 0.5 mile of a TNC conservation easement. The baseline route additionally crosses 12.5 miles of forested land and 13 intermittent and 6 perennial waterbodies.

Beginning at MP 161.4, the East of Lovingston Major Route Alternative initially heads to the southeast for approximately 4.5 miles, crossing Roberts Mountain and the Thomas Nelson Highway near Woods Mill. The route then heads to the south for approximately 9.2 miles, crossing Sugarloaf Mountain, Bailey Mountain, and Piney Mountain. It passes approximately 4.4 miles to the east of Lovingston in the vicinity of Peavine Mountain. The route terminates at MP 174.2.

At 13.7 miles in length, the East of Lovingston Major Route Alternative is 1.3 miles shorter than the baseline, though it is not collocated with any existing linear corridor facilities. The route alternative reduces the crossing length of the Sugarloaf Mountain/Rockfish/Shields Gap Complex by 7.1 miles, from 10.0 miles to 2.9 miles. It also avoids the area identified by TNC as containing critically imperiled, imperiled, or priority species habitat as well as the TNC conservation easement, but it crosses 0.1 mile of VOF conservation easement land. [28] The alternative route crosses 11.1 miles of forested land, which is 1.4 miles less than the baseline. The alternative route crosses one more intermittent waterbody and five more perennial waterbodies than the baseline.

Although it crosses more waterbodies than the baseline, the East of Lovingston Major Route Alternative is shorter, significantly reduces the crossing length of the TNC core forest area, avoids an area designated by TNC as containing sensitive species habitat, and reduces the crossing length of conservation easements. It additionally reduces the crossing length of forested lands relative to the baseline. For all these reasons, Atlantic incorporated the East of Lovingston Major Route Alternative into the proposed route.

10.8.1.7 Farmville Major Route Alternative

Atlantic identified and evaluated a major route alternative for the AP-1 mainline (the Farmville Major Route Alternative) adjacent to a series of existing electric transmission lines in Buckingham, Cumberland, Prince Edward, and Nottoway Counties, Virginia. The baseline and Farmville Major Route Alternative are depicted on Figure 10.8.1-11, and comparative information on the two routes is summarized in Table 10.8.1-8.

[28] Atlantic and DTI are currently evaluating route variations to avoid this easement.

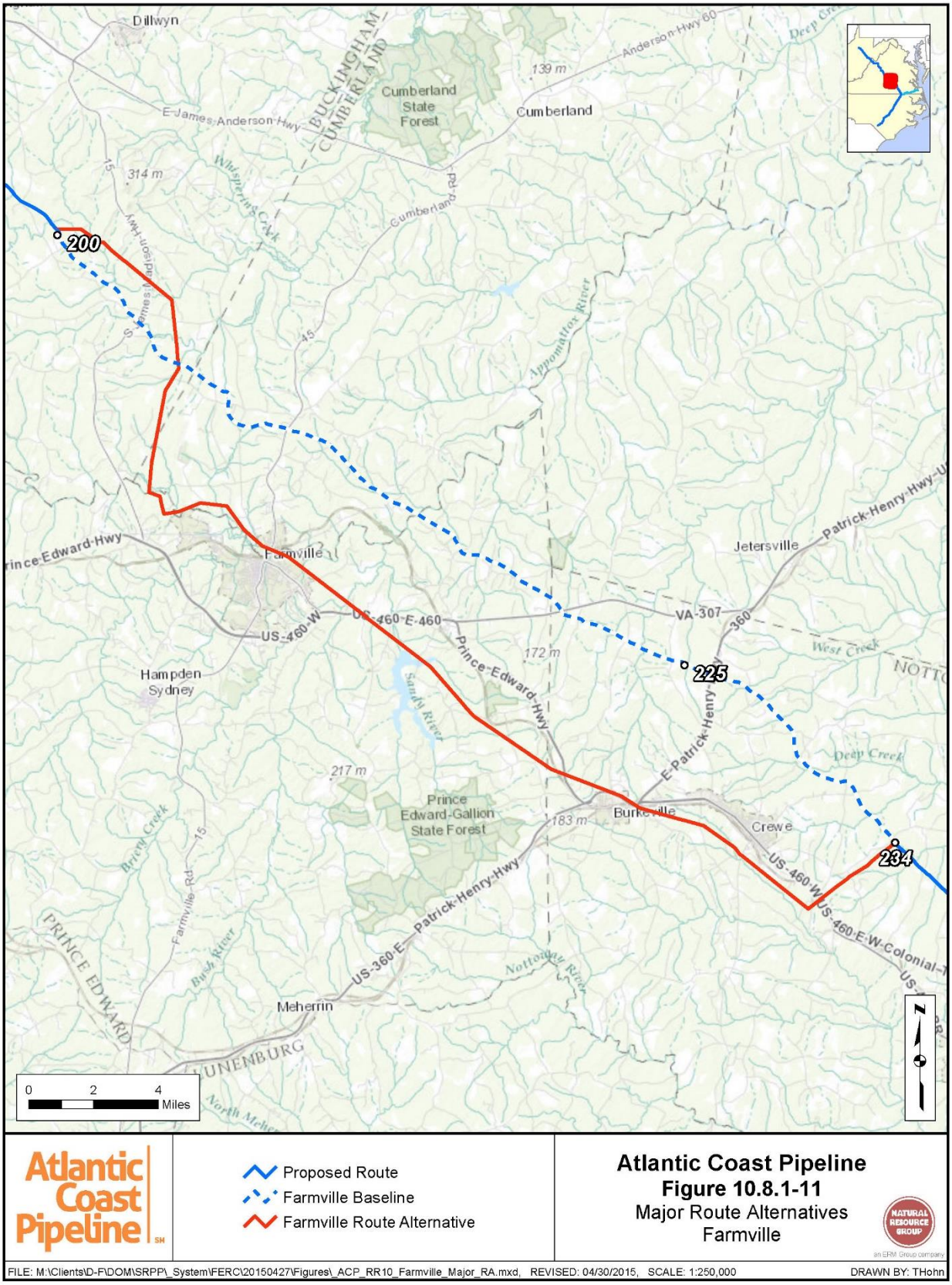
Dillwyn
Cumberland State Forest
Cumberland
Anderson Hwy
E James Anderson Hwy
Buckingham Cumberland
139 m
314 m
Whispering Creek
Cumberland Rd
Appomattox River
200
225
234
Farmville
Prince Edward Hwy
US-460-W
US-460-E-460
VA-307
Jetersville
Patrick Henry Hwy
West Creek
Hampden Sydney
Sandy River
172 m
217 m
Prince Edward-Gallion State Forest
183 m
Burkeville
Crewe
E Patrick Henry
Deep Creek
Briery Creek
Farmville Rd
Bush River
US-360-E
Patrick Henry Hwy
US-460-W US-460-E W Colonial
Nottoway River
Meherrin
PRINCE EDWARD
LUNENBURG
0 2 4 Miles
Proposed Route
Farmville Baseline
Farmville Route Alternative
Atlantic Coast Pipeline
Figure 10.8.1-11
Major Route Alternatives
Farmville
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TABLE 10.8.1-8

Farmville Major Route Alternative for the Atlantic Coast Pipeline

Features	Unit	Baseline Route	Farmville Route Alternative
Length (total)	miles	34.3	39.0
Primary U.S. or Commonwealth highways crossed	number	9	23
Other Commonwealth or local roads crossed	number	18	18
Adjacent to existing linear corridor facilities	miles	0.0	35.6
Federal lands crossed (total)	miles	0.0	0.0
Commonwealth lands crossed (High Bridge Trail State Park)	miles	0.0	0.1
Conservation easements crossed	miles	0.0	0.0
Recreational trails crossed (High Bridge Trail)	number	0	2
Forested land crossed	miles	24.7	17.4
Wetlands crossed – forested/shrub	miles	1.2	1.4
Wetlands crossed – emergent	miles	0.2	0.6
Intermittent waterbodies crossed	number	40	51
Perennial waterbodies crossed	number	19	23
Battlefields crossed (High Bridge and Cumberland Church Battlefields)	miles	1.4	0.8

The baseline route extends to the southeast from a point near Arcanum in Buckingham County to a point near Crewe in Nottoway County. The baseline passes about 3.5 miles to the northwest of Farmville in Prince Edward County, 4.5 miles to the northwest of Burkeville in Nottoway County, and 1.9 miles to the northwest of Crewe. It measures about 34.3 miles in length, all of which is greenfield. It crosses 59 waterbodies, including 19 perennial waterbodies, 1.4 miles of wetlands, and 24.7 miles of forested land. The baseline avoids Commonwealth lands, conservation easements, and recreational trails, but crosses approximately 1.4 miles of battlefield study areas associated with battles at Cumberland Church, High Bridge, and Rice's Station.

Starting approximately at MP 199.8, the Farmville Major Route Alternative initially heads east/southeast along a greenfield corridor for about 1.6 miles to a point east of the Willis River. It then follows an existing 138 kV electric transmission line (operator unknown) to the southeast for approximately 2.2 miles to a point along Mills Road. The route then turns to the south and continues for approximately 7.6 miles adjacent to an existing 115 kV electric transmission line (operator unknown), crossing Stage Coach Road and passing west of the Heartland Golf Club. From here, the route heads south for about 24.6 miles adjacent to existing DVP electric transmission lines (230 kV and 115 kV), crossing Farmville and Burkeville and passing west of Crewe. It then heads northwest along a greenfield, terminating approximately at MP 234.1 north of Woody Creek.

The Farmville Major Route Alternative measures approximately 39.0 miles in length, of which about 35.6 miles is adjacent to existing electric transmission line. The route crosses 79 waterbodies, of which 19 are perennial, 2.0 miles of wetlands, and 17.4 miles of forested land. It crosses about 0.1 mile of Commonwealth lands at High Bridge Trail State Park and the High Bridge Trail in two locations, but avoids Civil War battlefields. The route crosses developed land in both Farmville and Burkeville, including residential areas. The route additionally is directly adjacent to the Sandy River Reservoir dam and crosses about 0.2 mile of the reservoir, which has been identified by Prince Edward County as a future water supply water for Farmville.

Although it is mostly adjacent to existing electric transmission lines, the Farmville Major Route Alternative is 4.7 miles longer than the baseline, it crosses more wetlands and waterbodies than the baseline (including two additional crossings of the Appomattox River), and it crosses both High Bridge Trail State Park and High Bridge Trail, which the baseline avoids. The alternative crosses 7.3 miles less of forested land than the baseline, but this in part is due to crossing more developed lands than the baseline, including crossings of Farmville and Burkeville. Greenfield adjustments to the route alternative most likely would be required to avoid these areas. The alternative route additionally is adjacent to a dam and crosses a reservoir, which the baseline avoids. For all these reasons, Atlantic retained the baseline route in this area.

10.8.1.8 Fort Pickett Major Route Alternatives

The Fort Pickett Military Reservation is an Army National Guard training facility located near Blackstone, Virginia. It encompasses approximately 42,000 acres owned by the U.S. Department of Defense, but is managed and operated by the Virginia National Guard. The fort has been used as a maneuver training facility since World War II (Virginia National Guard, 2014).

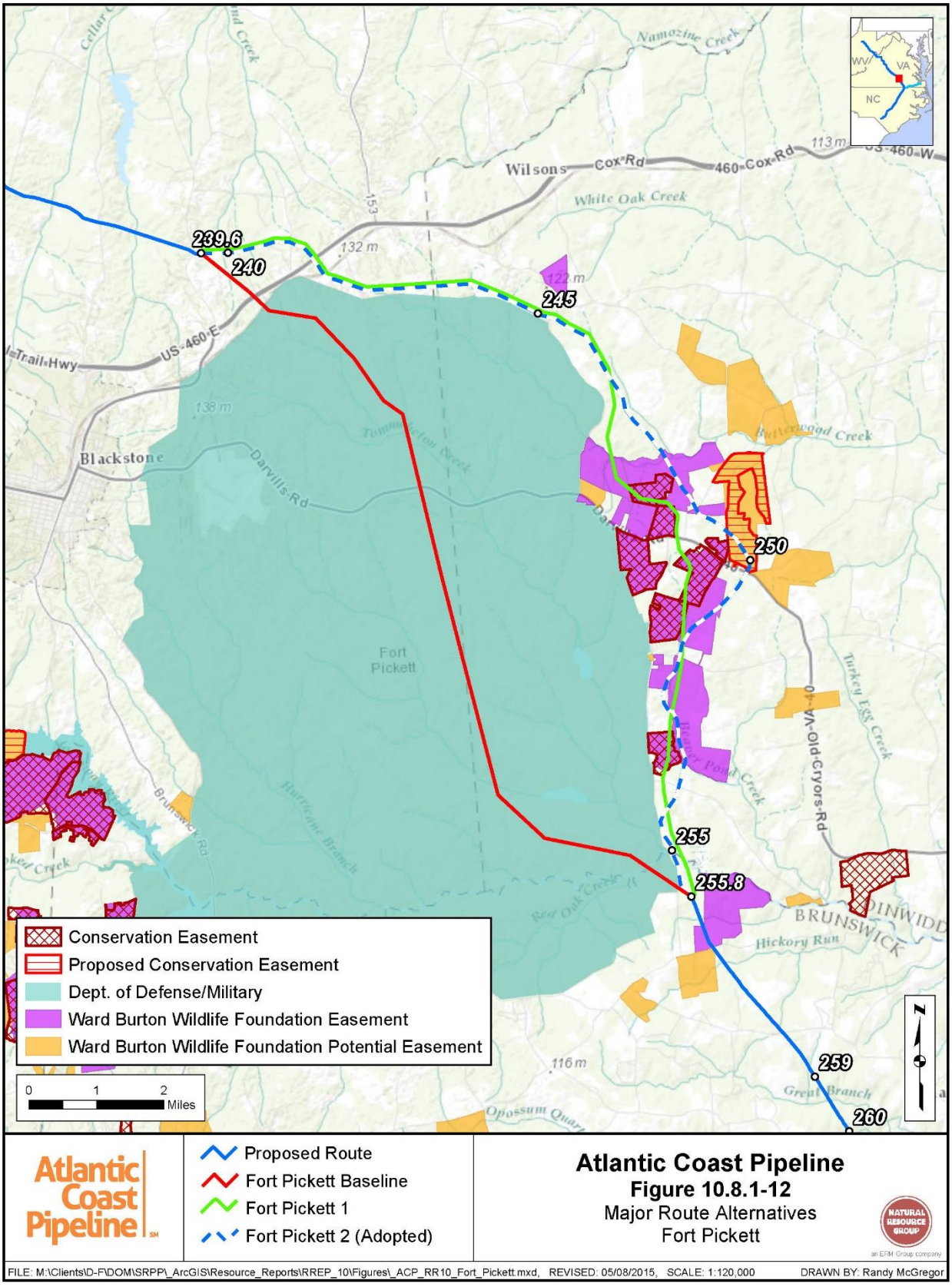
The baseline route for the proposed AP-1 mainline extends across portions of Fort Pickett in Nottoway, Dinwiddie, and Brunswick Counties, Virginia. Because this area is an active military training facility, Atlantic identified and evaluated two major route alternatives (Fort Pickett 1 and Fort Pickett 2) to avoid crossing the site. Both alternative routes begin north of the Colonial Trail Highway approximately at MP 239.6 in Nottoway County, and end north of Miry Run approximately at MP 255.7 in Brunswick County. Fort Pickett 1 generally runs parallel to, but outside of, the northern and western boundaries of the military reservation. Fort Pickett 2 is similar to Fort Pickett 1, but passes further to the east at the crossing of Virginia Route 40 to avoid conservation easements. The baseline and Fort Pickett route alternatives are depicted on Figure 10.8.1-12, and comparative information on each route is provided in Table 10.8.1-9.

TABLE 10.8.1-9

Fort Pickett Major Route Alternatives for the Atlantic Coast Pipeline

Features	Unit	Baseline Route	Fort Pickett 1 Route Alternative	Fort Pickett 2 Route Alternative (Proposed)
Length	miles	13.1	15.6	16.0
Primary U.S. or Commonwealth highway crossed	number	4	2	2
Other Commonwealth or local roads crossed	number	19	9	9
Adjacent to existing linear corridor facilities	miles	0.0	0.0	0.0
Federal lands crossed (Fort Pickett)	miles	11.7	0.0	0.0
Commonwealth lands crossed	miles	0.0	0.0	0.0
Private lands crossed	miles	1.4	15.6	16.0
VOF – Conservation easements crossed	miles	0.0	2.4	0.0
VOF – Recently adopted conservation easements crossed	miles	0.0	0.0	0.7
WBWF – Conservation easements crossed [a]	miles	0.0	3.5	3.1
WBWF – Potential conservation easements crossed [a]	miles	0.0	0.0	0.7
Forested lands crossed	miles	9.8	10.3	11.7
Wetlands crossed – freshwater emergent	miles	0.2	0.2	0.1
Wetlands crossed – freshwater forested/shrub	miles	0.4	0.6	0.8
Intermittent waterbodies crossed	number	10	24	23
Perennial waterbodies crossed	number	9	11	9

[a] Ward Burton Wildlife Foundation easements may overlap with Virginia Outdoor Foundation easements.


Conservation Easement
Proposed Conservation Easement
Dept. of Defense/Military
Ward Burton Wildlife Foundation Easement
Ward Burton Wildlife Foundation Potential Easement
0 1 2 Miles
Proposed Route
Fort Pickett Baseline
Fort Pickett 1
Fort Pickett 2 (Adopted)
Atlantic Coast Pipeline
Figure 10.8.1-12
Major Route Alternatives
Fort Pickett
FILE: M:\Clients\D-F\DOM\SRPP_ArcGIS\Resource_Reports\RREP_10\Figures_ACP_RR10_Fort_Pickett.mxd, REVISED: 05/08/2015, SCALE: 1:120,000 DRAWN BY: Randy McGregor
239.6
240
245
250
255
255.8
259
260
Blackstone
Fort Pickett
Wilsons
White Oak Creek
Butterwood Creek
Hickory Run
BRUNSWICK
Darvills Rd
US-460-E
Cox Rd
460 Cox Rd
VA-Old Cryors Rd
Namozine Creek
Hurricane Branch
Opossum Quarter
Great Branch
Turkey Ess Creek
132 m
138 m
122 m
116 m
113 m

Fort Pickett 1 is 2.5 miles longer than the baseline route but avoids the military reservation. It crosses 2 fewer highways and 10 fewer County/local roads, but 0.5 more mile of forested land, 14 more intermittent waterbodies, and 2 more perennial waterbodies. Both routes cross 0.2 mile of emergent wetland, but Fort Pickett 1 crosses 0.2 mile more of forested/shrub wetland. The route alternative also crosses five conservation easements with a combined crossing length of 2.4 miles. One easement is held by the Virginia Department of Forestry and the others are held by the VOF.

The Fort Pickett 2 route alternative is 2.9 miles longer than the baseline route, but avoids the military reservation. It crosses 2 fewer highways and 10 fewer County/local roads, but 1.9 more miles of forested land and 13 more intermittent waterbodies than the baseline route. The alternative route crosses 0.1 mile less of emergent wetland, but 0.6 more mile of forested/shrub wetland. Like the baseline route, Fort Pickett 2 avoids designated VOF conservation easements, but crosses 0.7 mile of an area recently listed as a conservation easement with the VOF. However, the VOF confirmed with Atlantic that the conservation easement agreement includes language which allows the pipeline to cross, and the landowner is in favor of the ACP. Therefore, the proposed easement was not considered a constraint in this analysis.

The U.S. Army in 2007 initiated a program of conservation easement acquisition within a 3 to 4 mile zone surrounding the Fort Pickett Military Reservation for purposes of limiting certain types of development (e.g., cell phone towers, urban sprawl, and light pollution) that could be incompatible with Fort Pickett's military mission. The program, which is called the Army Compatible Use Buffer Program, is managed in collaboration with the Ward Burton Wildlife Foundation (WBWF). Currently, the Fort Pickett 1 and Fort Pickett 2 route alternatives cross nine and five parcels, respectively, which are encumbered by conservation easements under this program. Atlantic will meet with staff from Fort Pickett and the WBWF to determine whether the easement agreements contain restrictions pertinent to pipeline facilities and to discuss routing in this area. Additional alternative routes may be identified and evaluated as a result of this meeting. [29] Resource Report 8 provides additional information regarding the Army Compatible Use Buffer Program.

Based on information available to date, Atlantic identified Fort Pickett 2 as the preferred alternative and incorporated this alignment into the proposed route. Although it is the longest of the three analyzed alternatives, and crosses the most forested land and wetlands, Fort Pickett 2 appears to have the least impact by avoiding the military reservation and VOF conservation easements, and minimizing crossings of highways and other roads. As noted above, however, additional route alternatives could be identified pending the results of a meeting with Fort Pickett staff and the WBWF.

10.8.1.9 Brunswick Major Route Alternative

Atlantic identified and evaluated a major route alternative for the AP-1 mainline (the Brunswick Major Route Alternative) adjacent to a recently constructed DVP electric

[29] Some people who attended the ACP Open Houses or filed comments with the FERC said the AP-1 mainline should be within Fort Pickett; others said it should be further away from Fort Pickett.

transmission line in Brunswick and Greensville Counties, Virginia. The transmission line is associated with the Brunswick Power Station, which is a new DVP electric generating facility currently under construction (see Section 1.11.1 of Resource Report 1). The baseline and Brunswick Major Route Alternative are depicted on Figure 10.8.1-13, and comparative information on each route is provided in Table 10.8.1-10.

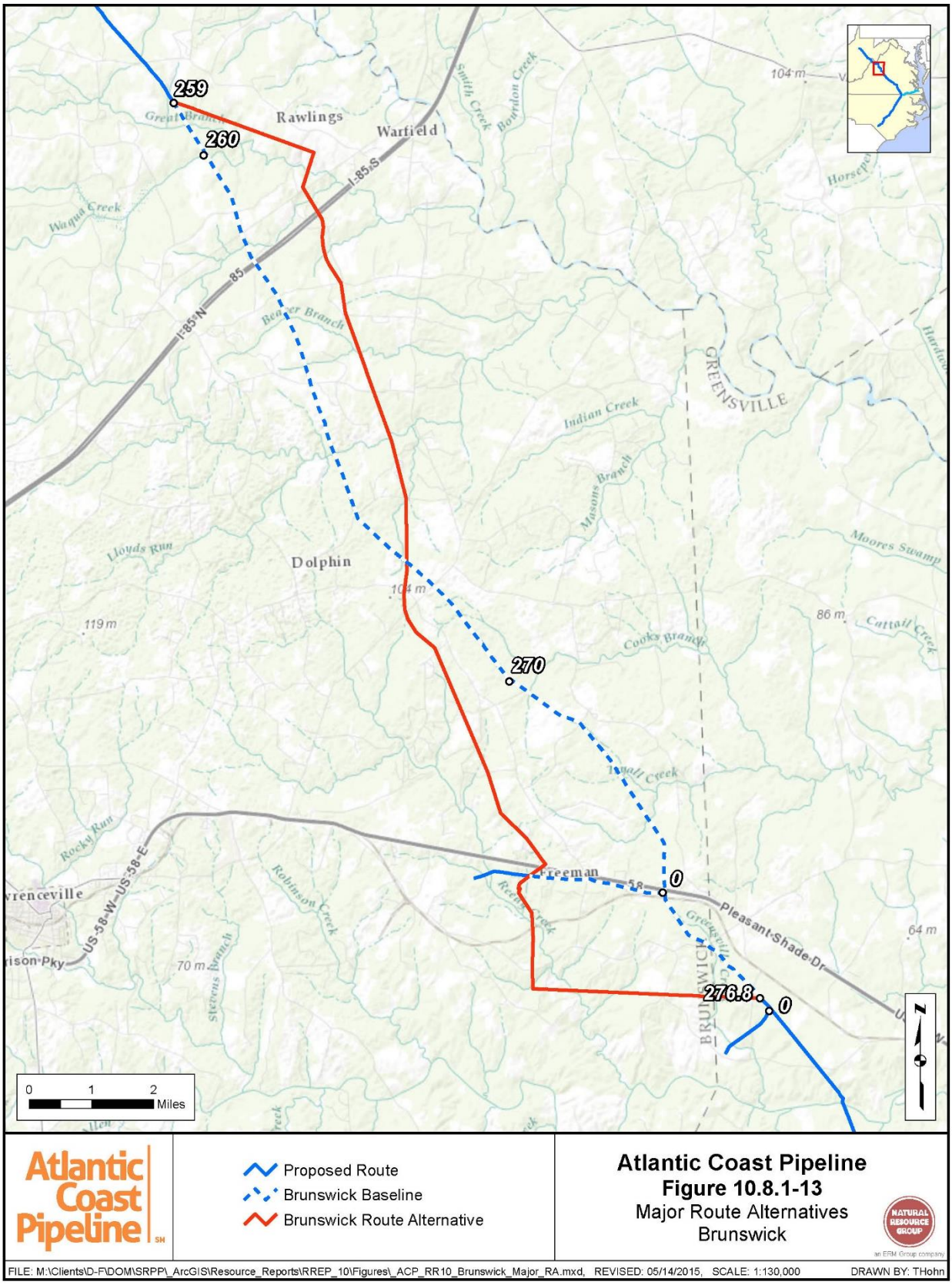
TABLE 10.8.1-10

Brunswick Major Route Alternative for the Atlantic Coast Pipeline

Features	Unit	Baseline Route [a]	Brunswick Route Alternative
Length (total)	miles	20.0	20.9
Primary U.S. or Commonwealth highways crossed	number	5	5
Other Commonwealth or local roads crossed	number	14	34
Adjacent to existing linear corridor facilities	miles	0.0	18.5
Federal lands crossed (total)	miles	0.0	0.0
Commonwealth lands crossed	miles	0.0	0.0
Conservation easements crossed	miles	<0.1	0.4
Recreational trails crossed (Tobacco Heritage Trail)	number	1	1
Forested land crossed	miles	16.4	17.4
Wetlands crossed – forested/shrub	miles	0.4	0.3
Intermittent waterbodies crossed	number	10	16
Perennial waterbodies crossed	number	12	17
Battlefields crossed	miles	0.0	0.0

The baseline route extends to the south/southeast for about 17.8 miles approximately between MPs 259.0 and 276.8 of the AP-1 mainline. Relative to the baseline, the Brunswick Major Route Alternative initially heads east/southeast from MP 259.0 for approximately 2.2 miles to a point where it intersects the newly built DVP electric transmission line. The alternative route then follows the electric transmission line to the south for about 14.7 miles, crossing I-85, Old Stage Road, and U.S. Highway 58. This segment of the route additionally crosses the proposed AP-4 lateral approximately at MP 2.2 on the south side of U.S. Highway 58. The route then follows an existing DVP 115 kV electric transmission line to the east for about 3.7 miles to its terminus approximately at MP 276.8 of the AP-1 mainline. If adopted, the Brunswick Major Route Alternative would reduce the length of the AP-4 lateral by 2.2 miles; therefore, this segment of the AP-4 lateral was included in the baseline for the alternatives analysis.

The baseline route measures approximately 20.0 miles in length (17.8 miles along the AP-1 mainline and 2.2 miles along the AP-4 lateral), none of which is adjacent to existing linear corridor facilities. It crosses 22 waterbodies, including 12 perennial waterbodies, 0.4 mile of wetlands, and 16.4 miles of forested land. It additionally crosses the Tobacco Heritage Trail, which is part of a conservation easement held by the Virginia Department of Conservation and Recreation. The baseline avoids public lands and battlefields.


259
260
270
0
276.8
0
Rawlings
Warfield
Dolphin
Freeman
GREENSVILLE
Pleasant Shade Dr
I-85 S
I-85 N
85
US-58-W
US-58-E
58
Wagna Creek
Beaver Branch
Indian Creek
Masons Branch
Moores Swamp
Cattail Creek
Cooks Branch
Lloyds Run
Rocky Run
Robinson Creek
Stevens Branch
Greenville Creek
Reedy Creek
Smith Creek
Bourdon Creek
104 m
119 m
86 m
70 m
64 m
0 1 2 Miles
Atlantic Coast Pipeline
Proposed Route
Brunswick Baseline
Brunswick Route Alternative
Atlantic Coast Pipeline
Figure 10.8.1-13
Major Route Alternatives
Brunswick
NATURAL RESOURCE GROUP
an ERM Group company
FILE: M:\Clients\D-F\DOM\SRPP_ArcGIS\Resource_Reports\RREP_10\Figures_ACP_RR10_Brunswick_Major_RA.mxd, REVISED: 05/14/2015, SCALE: 1:130,000 DRAWN BY: THohn

The Brunswick Major Route Alternative measures approximately 20.9 miles in length, which is 0.1 mile longer than the baseline. A majority of the route (about 18.5 miles or 89 percent) is adjacent to existing DVP electric transmission lines. The Brunswick Major Route Alternative crosses 33 waterbodies, including 17 perennial waterbodies, which is greater than the baseline. The route crosses 0.3 mile of wetlands and 17.4 miles of forested land, which is 0.1 mile less and 1.0 mile more than the baseline, respectively. In addition to crossing the Tobacco Heritage trail, the alternative route crosses 0.4 mile of a proposed VOF conservation easement, though this crossing most likely could be avoided with a slight shift in the centerline of the alternative route. Like the baseline, the alternative route avoids public lands and battlefields.

The Brunswick Major Route alternative is 0.9 mile longer and crosses more waterbodies and forested land than the baseline, but it is adjacent to existing electric transmission lines for 18.5 miles. Despite the additional tree clearing required for the alternative route, this would minimize impacts associated with forest fragmentation. The route alternative crosses a VOF conservation easement, but this area most likely could probably be avoided with a slight adjustment in the route. For these reasons, Atlantic is continuing to evaluate the Brunswick Major Route Alternative.

10.8.1.10 Johnston County, North Carolina Major Route Alternative

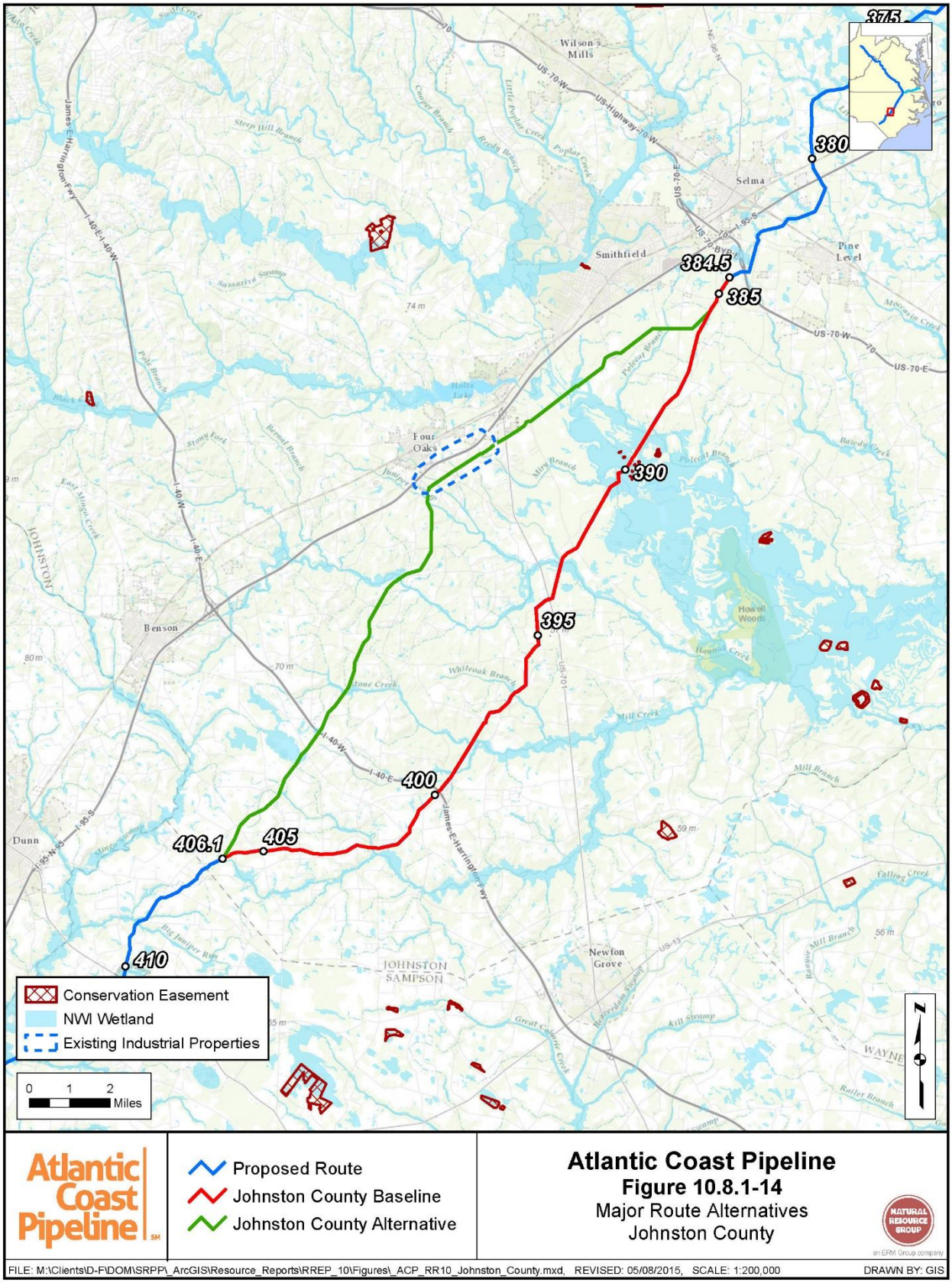
Atlantic identified and evaluated an alternative route for the AP-2 mainline at the request of the Johnston County, North Carolina Economic Development Authority in an effort to move the pipeline closer to existing industrial properties along the I-95 corridor and U.S. Highway 701 south of the town of Four Oaks. The baseline route for the AP-2 mainline in this area crosses Johnston County east of the towns of Smithfield and Four Oaks.

Beginning at MP 384.5 near Smithfield, the alternative route follows an existing electric transmission line southwest of the baseline for approximately 7 miles to a point just south of Four Oaks. The route then heads to the south-southwest for approximately 14 miles, where it rejoins the baseline west of Jumping Run Swamp at MP 406.0. The baseline and Johnston County route alternative are depicted on Figure 10.8.1-14, and comparative information on each route is provided in Table 10.8.1-11.

TABLE 10.8.1-11

Johnston County Major Route Alternative for the Atlantic Coast Pipeline

Features	Unit	Baseline (Proposed) Route	Johnston County Route Alternative
Length (total)	miles	21.5	20.7
Primary U.S. or State highways crossed	number	7	7
Other State or local roads crossed	number	23	22
Adjacent to existing linear corridor facilities	miles	0.0	6.1
Federal lands crossed	miles	0.0	0.0
State lands crossed	miles	0.0	0.0
Conservation easements crossed	miles	0.0	0.0
Forested land crossed	miles	8.0	5.4
Wetlands crossed – forested/shrub	miles	2.5	0.7
Intermittent waterbodies crossed	number	33	28
Perennial waterbodies crossed	number	8	8
Bentonville Battlefield (total)	miles	0.1	0.2


375
380
384.5
385
390
395
400
405
406.1
410
Wilson's Mills
Selma
Smithfield
Pine Level
Four Oaks
Benson
Dunn
Newton Grove
JOHNSTON
SAMPSON
WAYNE
Conservation Easement
NWI Wetland
Existing Industrial Properties
0 1 2 Miles
Proposed Route
Johnston County Baseline
Johnston County Alternative
Atlantic Coast Pipeline
Figure 10.8.1-14
Major Route Alternatives
Johnston County
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The Johnston County route alternative is approximately 4.0 miles closer to the town of Four Oaks than the baseline. Consistent with this proximity, the proposed alternative route crosses 239 parcels of property, compared to the baseline route which affects 163 parcels.

The alternative route is 0.8 mile shorter and crosses 2.6 fewer miles of forested lands and 1.8 fewer miles of forested wetland than the baseline. Of particular note, the alternative route minimizes the crossing of a forested wetland complex adjacent to the Neuse River. Both routes cross a portion of the Bentonville Battlefield area, though the alternative crosses 0.1 mile more than the baseline. Both routes cross similar numbers of roads and waterbodies; however, the alternative route would involve more difficult construction with regard to crossing existing utilities.

As noted above, the alternative route is adjacent to an existing electric transmission line for approximately 6.1 miles. The towers for the power line are anchored by guy wires, which could require shifting the pipeline further away from the electric transmission line. This would reduce the benefits of collocation such as use of previously cleared areas for workspace or spoil storage during construction. Balancing the various considerations presented, and the uncertainty of the location of the proposed industrial park, Atlantic retained the baseline route in this area.

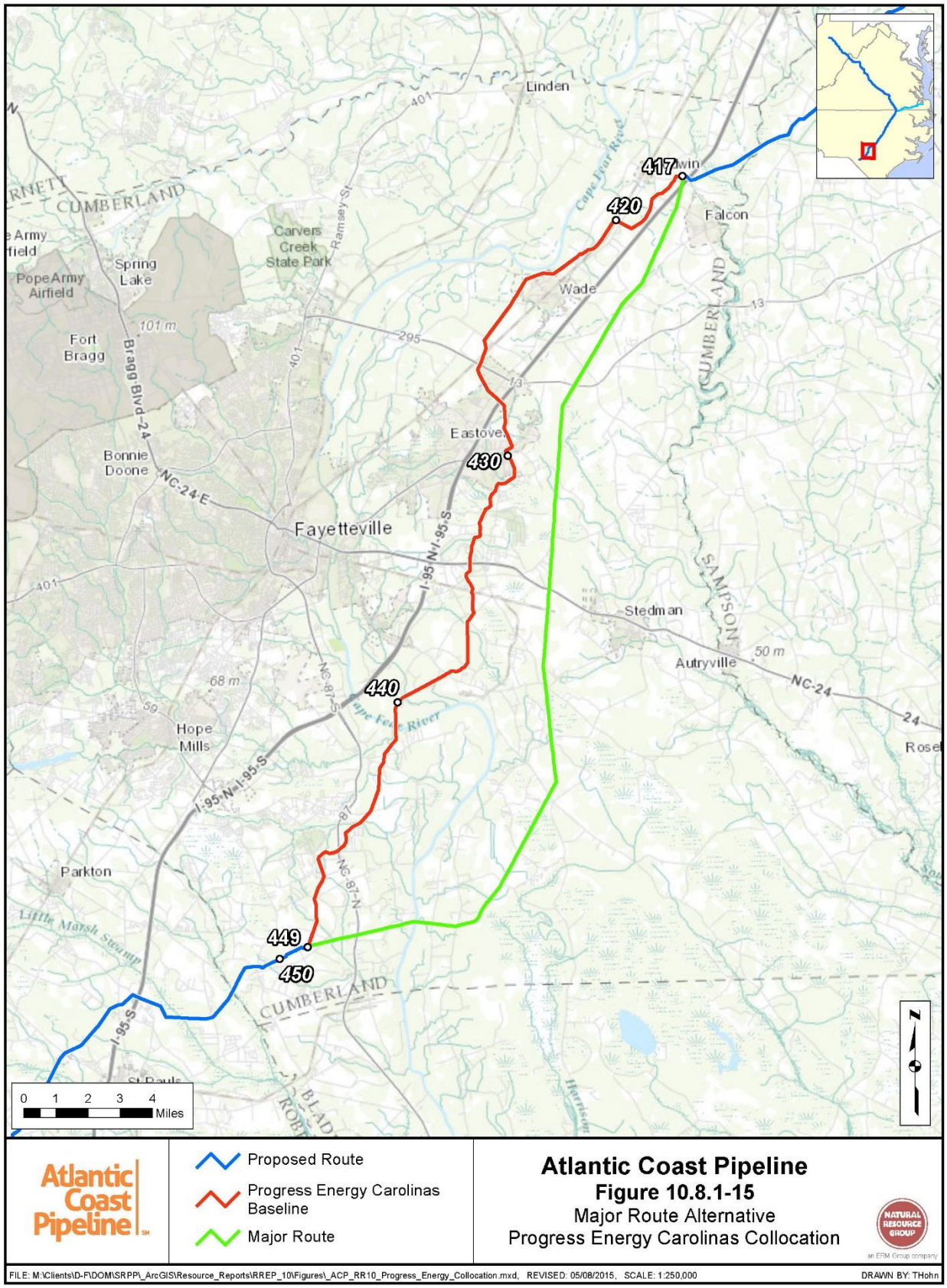
10.8.1.11 Progress Energy Carolinas Collocation Major Route Alternative

Atlantic evaluated an alternative for the AP-2 mainline route adjacent to an existing PEC 500 kV electric transmission line in Cumberland County, North Carolina. The baseline route in this area extends to the south/southeast generally parallel to the I-95 corridor on the east side of Fayetteville. Starting approximately at MP 416.9 near an intersection with I-95, the alternative route adjacent to PEC initially heads south for approximately 8.1 miles to a point south of U.S. Highway 13. It then heads south for approximately 17.3 miles, crossing Clinton Road, Cedar Creek Road, and Tabor Church Road. The route then turns to the west for approximately 5.2 miles, crossing the Cape Fear River and North Carolina State Highway 87, reconnecting with the baseline route at MP 448.9. The baseline route and the PEC Major Route Alternative are depicted on Figure 10.8.1-15, and comparative information on each route is provided in Table 10.8.1-12.

TABLE 10.8.1-12

Progress Energy Carolinas Collocation Major Route Alternative for the Atlantic Coast Pipeline

Features	Unit	Baseline Route	Progress Energy Carolinas Collocation Route Alternative
Length	miles	32.0	30.3
Primary U.S. or State/Commonwealth highway crossed	number	12	9
Other State/Commonwealth or local roads crossed	number	37	23
Adjacent to existing linear corridor facilities	miles	1.5	30.3
Federal lands crossed	miles	0.0	0.0
State/Commonwealth lands crossed	miles	0.0	0.0
Private lands crossed	miles	32.0	30.3
Conservation easements crossed	miles	0.0	0.0
Forested uplands crossed (not including forested wetlands)	miles	6.1	1.1
Wetlands crossed – forested/shrub	miles	3.5	7.7
Wetlands crossed – freshwater emergent	miles	<0.1	0.2
Wetlands crossed – other	miles	0.1	0.1
Intermittent waterbodies crossed	number	14	5
Perennial waterbodies crossed	number	33	27


Linden
417
420
Falcon
Wade
Carvers Creek State Park
Spring Lake
Pope Army Airfield
Fort Bragg
Bragg Blvd
Bonnie Doone
NC-24-E
Eastover
430
Fayetteville
I-95-N
I-95-S
Stedman
SAMPSON
Autryville
NC-24
440
Hope Mills
NC-87-S
NC-87-N
Parkton
449
450
CUMBERLAND
0 1 2 3 4 Miles
Proposed Route
Progress Energy Carolinas Baseline
Major Route
Atlantic Coast Pipeline
Figure 10.8.1-15
Major Route Alternative
Progress Energy Carolinas Collocation
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The baseline route is 1.7 miles longer than the alternative route. Both the baseline and alternative avoid Federal and State lands, as well as conservation easements. The baseline route crosses 15 more waterbodies than the route alternative, six of which are perennial waterbodies. However, the alternative route crosses 4.3 more miles of wetland (an additional 24.8 acres), most of which is forested wetland. Many of the wetland complexes along the alternative route are large forested wetlands greater than 100 acres in size. Collocation of the AP-2 mainline with the PEC line would cause significant additional impacts to these forested wetland areas, as additional tree clearing along the maintained PEC corridor would be required to install the pipeline adjacent to the high-voltage electric transmission line.

Even though the PEC route alternative would be collocated with an existing corridor, it would require substantially more disturbance and permanent clearing of forested wetlands than the baseline route. For this reason, Atlantic retained the baseline route in this area.

10.8.1.12 Meherrin River Major Route Alternative

In a letter dated September 8, 2014, and in a meeting on November 12, 2014, TNC asked Atlantic to consider an alternative route for the proposed AP-3 lateral to avoid or minimize crossings of the Meherrin River and Fountains Creek watersheds in southeastern Virginia. These watersheds are part of TNC's Albemarle Sound Whole System project area, which encompasses approximately 6 million acres of freshwater-dominated estuarine habitat in southeastern Virginia and northeastern North Carolina. TNC states that the Albemarle Sound System contains "areas of large intact wetland forest that support high levels of use by migratory and breeding birds and buffer some of the best migratory fish spawning and nursery habitats on the East Coast." TNC has worked with public agencies, corporations, landowners, and communities to protect and restore public and private lands in this area.

The baseline route for the AP-3 lateral crosses floodplain forest in the Meherrin River and Fountains Creek watersheds between MPs 0.0 and 12.0, including areas which TNC has recommended for avoidance. Atlantic identified and evaluated a route alternative which avoids Fountains Creek altogether and minimizes crossings of floodplain forest in areas recommended by TNC for avoidance. The baseline route and Meherrin River Route Alternative are depicted on Figure 10.8.1-16, and comparative information on each route is provided in Table 10.8.1-13.

The baseline route for the AP-3 lateral trends southwest to northeast across Greensville and Southampton Counties, Virginia, crossing Fountains Creek approximately 4.7 miles from the AP-1 mainline and the Meherrin River just north of Haley's Bridge approximately 8.4 miles from the AP-1 mainline. Starting at Compressor Station 3, the Meherrin River Route Alternative initially extends to the east-southeast for approximately 5.8 miles across Southampton County, North Carolina, passing south of the Fountains Creek watershed. It then heads to the northeast for approximately 7.6 miles, mostly adjacent to existing power lines, roads, or railroads. It crosses the Meherrin River along the Virginia Commonwealth/North Carolina State line adjacent to an existing railroad. The alternative route then heads north-northeast for approximately 3.4 miles, where it intersects the baseline route in Southampton County, Virginia.

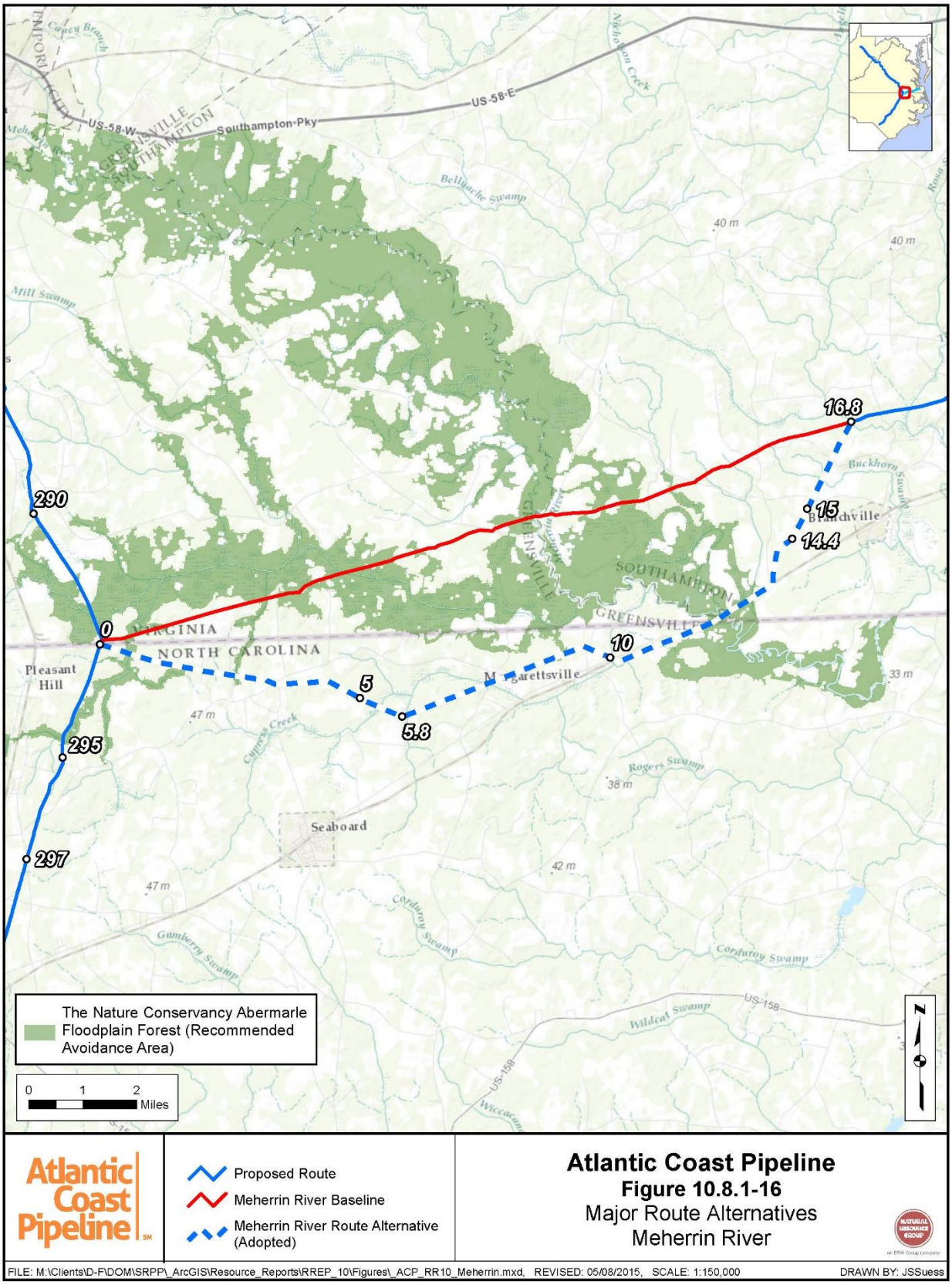
US-58-W
Southampton-Pky
US-58-E
GREENSVILLE
SOUTHAMPTON
Bellgarde Swamp
Mill Swamp
40 m
Buckhorn Swamp
Branchville
16.8
15
14.4
290
0
VIRGINIA
NORTH CAROLINA
Pleasant Hill
10
5
5.8
Margarettsville
33 m
47 m
Cypress Creek
295
Rogers Swamp
38 m
Seaboard
297
42 m
47 m
Corduroy Swamp
Gumberry Swamp
Wildcat Swamp
US-158
Wiccacon
The Nature Conservancy Abermarle Floodplain Forest (Recommended Avoidance Area)
0 1 2 Miles
N
Atlantic Coast Pipeline
Proposed Route
Meherrin River Baseline
Meherrin River Route Alternative (Adopted)
Atlantic Coast Pipeline
Figure 10.8.1-16
Major Route Alternatives
Meherrin River
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TABLE 10.8.1-13

Meherrin River Major Route Alternative for the Atlantic Coast Pipeline

Features	Unit	Baseline Route	Meherrin River Route Alternative
Length	miles	14.7	16.8
Primary U.S. or State/Commonwealth highway crossed	number	1	2
Other State/Commonwealth or local roads crossed	number	20	19
Adjacent to existing linear corridor facilities	miles	0.0	6.8
Federal lands crossed	miles	0.0	0.0
State/Commonwealth lands crossed	miles	0.0	<0.1
Private lands crossed	miles	14.7	16.8
Conservation easements crossed	miles	0.0	<0.1
Forested lands crossed	miles	3.6	3.5
Wetlands crossed – freshwater emergent	miles	0.0	0.3
Wetlands crossed – freshwater forested/shrub	miles	6.5	6.2
Wetlands crossed – other	miles	0.0	0.1
Intermittent waterbodies crossed	number	9	7
Perennial waterbodies crossed	number	13	14
TNC floodplain forest recommended for avoidance	miles	4.1	1.4

The Meherrin River Route Alternative is 2.1 miles longer than the baseline, but avoids Fountains Creek and crosses 2.7 miles less of floodplain forest areas recommended for avoidance by TNC. About 70 percent (1.0 mile) of the floodplain forest along the alternative route occurs at the Meherrin River crossing, which is adjacent to an existing railroad. This will minimize impacts in the watershed due to forest fragmentation. The alternative route additionally is adjacent to existing linear corridor facilities (power lines and roads) for approximately 6.8 miles (40 percent) compared to 0.0 miles for the baseline. The baseline avoids conservation easements, while the alternative route crosses less than 0.1 mile of a North Carolina Department of Environment and Natural Resources conservation easement. [30] Crossings of forested lands, wetlands, and waterbodies are similar for both routes.

Based on the feasibility of collocation with other utility corridors in this area, and the relative similarity of the impact on other major resource considerations, Atlantic incorporated the Meherrin River Route Alternative into the proposed route.

10.8.1.13 Northampton Major Route Alternative

Atlantic identified and evaluated a major route alternative for the AP-3 lateral (the Northampton Major Route Alternative) adjacent to an existing DVP 115 kV electric transmission line at the beginning of the AP-3 lateral in Northampton County, North Carolina. If adopted, the route alternative would require moving Compressor Station 2 from the current preferred site at MP 292.8 of the AP-1 mainline to a new location near MP 297.0 of the AP-2 mainline, or alternatively, constructing a portion of the AP-3 lateral adjacent to the existing AP-2 mainline for about 4.2 miles. Because moving the compressor station could affect system dynamics, and

[30] Atlantic and DTI are current evaluating route variations to avoid this easement.

potentially require changes in the location or configuration or other aboveground facilities, Atlantic assumed that a portion of the AP-3 lateral would be built adjacent to the AP-2 mainline as part of the route alternative. The baseline and Northampton Major Route Alternative are depicted on Figure 10.8.1-17, and comparative information on each route is provided in Table 10.8.1-14.

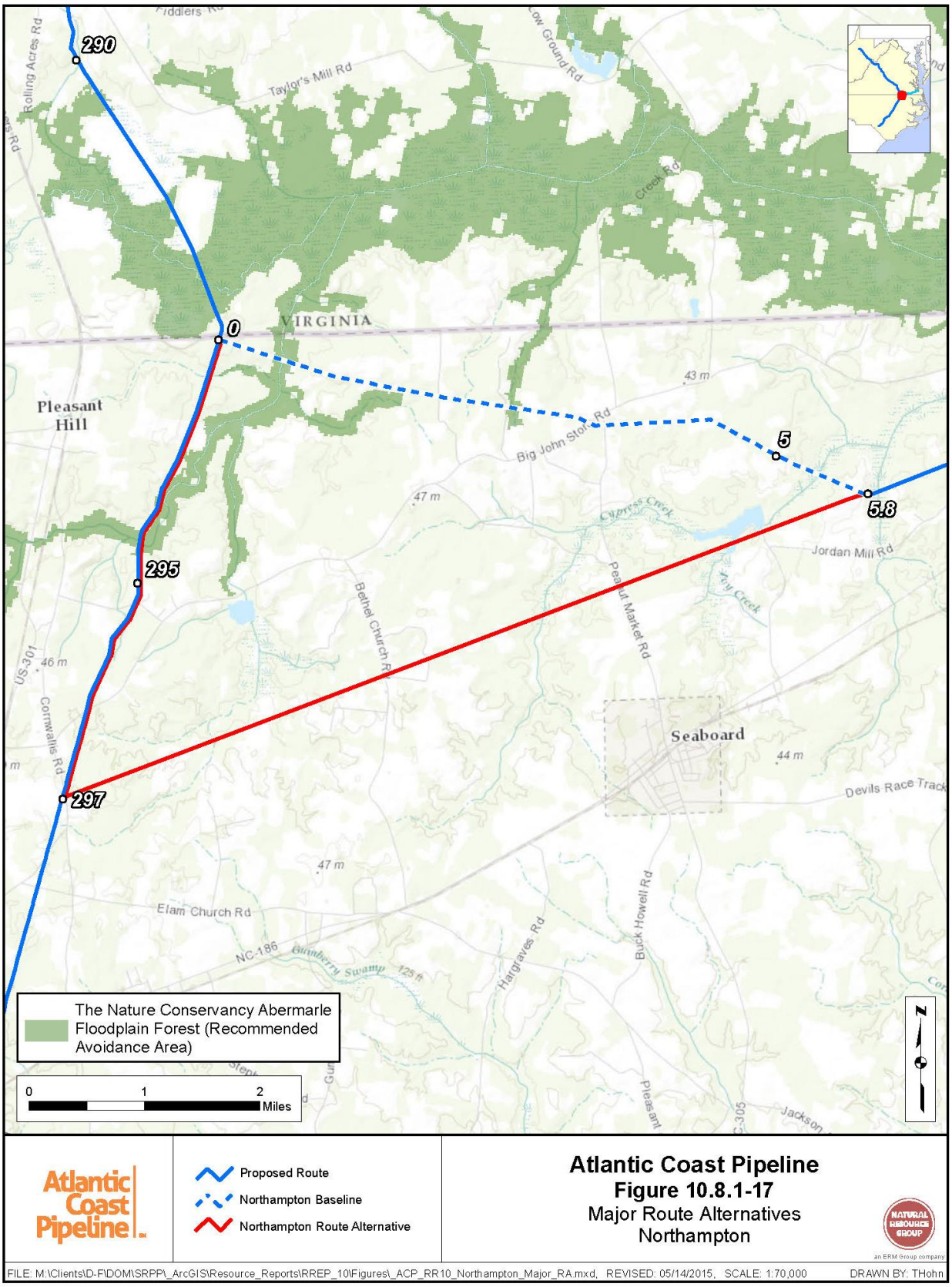
TABLE 10.8.1-14

Northampton Major Route Alternative for the Atlantic Coast Pipeline

Features	Unit	Baseline Route	Northampton Route Alternative
Length	miles	5.9	11.7
Primary U.S. or State/Commonwealth highway crossed	number	0	0
Other State/Commonwealth or local roads crossed	number	7	14
Adjacent to existing linear corridor facilities	miles	0.0	7.5
Adjacent to proposed linear corridor facilities	miles	0.0	4.2
Federal lands crossed	miles	0.0	0.0
State/Commonwealth lands crossed	miles	0.0	0.0
Conservation easements crossed	miles	0.0	0.0
Forested lands crossed	miles	2.6	5.5
Wetlands crossed – freshwater emergent	miles	0.0	0.1
Wetlands crossed – freshwater forested/shrub	miles	0.9	1.2
Intermittent waterbodies crossed	number	2	5
Perennial waterbodies crossed	number	2	3
TNC floodplain forest recommended for avoidance	miles	0.3	0.5

The baseline route extends to the east/southeast for about 5.9 miles approximately between MPs 0.0 and 5.9 of the AP-3 lateral. Relative to the baseline, the Northampton Major Route Alternative initially heads south/southwest adjacent to the AP-2 mainline for about 4.2 miles to a point where it intersects the existing DVP electric transmission line. The alternative route then heads east/northeast for about 7.5 miles to its terminus approximately at MP 5.9 of the AP-3 lateral.

The baseline route measures 5.9 miles in length, none of which is adjacent to existing linear corridor facilities. It crosses four waterbodies, including two perennial waterbodies, 0.9 mile of wetlands, and 2.6 miles of forested land. The baseline additionally crosses 0.3 mile of floodplain forest areas identified by TNC, mostly along Jacks Swamp. It avoids crossings of State lands and conservation easements.


290
0
295
297
5
5.8
VIRGINIA
Pleasant Hill
Seaboard
Taylor's Mill Rd
Big John Stor Rd
Jordan Mill Rd
Bethel Church Rd
Peanut Market Rd
Cypress Creek
Cornwallis Rd
US-301
Elam Church Rd
NC-186
Hargraves Rd
Buck Howell Rd
Devils Race Track
Jackson
43 m
47 m
46 m
44 m
The Nature Conservancy Abermarle Floodplain Forest (Recommended Avoidance Area)
0 1 2 Miles
N
Proposed Route
Northampton Baseline
Northampton Route Alternative
Atlantic Coast Pipeline
Figure 10.8.1-17
Major Route Alternatives
Northampton
FILE: M:\Clients\D-F\DOM\SRPP_ArcGIS\Resource_Reports\RREP_10\Figures_ACP_RR10_Northampton_Major_RA.mxd, REVISED: 05/14/2015, SCALE: 1:70,000 DRAWN BY: THohn

At 11.7 miles in length, the Northampton Major Route Alternative is 5.8 miles longer than the baseline. About 4.2 miles of the route is adjacent to the proposed AP-2 mainline route and 7.5 miles is adjacent to the existing DVP electric transmission line. The route crosses five waterbodies, including three perennial waterbodies, 1.3 miles of wetlands, and 5.5 miles of forested land. Of these, three intermittent and one perennial waterbodies, 0.4 mile of wetlands, and 4.1 miles of forested land are along the segment of the alternative route adjacent to the AP-2 mainline and the remainder are along the existing electric transmission line. The route alternative additionally crosses 0.5 mile of floodplain forest areas identified by TNC along Jacks Swamp (all along the segment of the route alternative adjacent to the AP-2 mainline). Like the baseline, the alternative route avoids State lands and conservation easements.

In a letter filed with the Commission, the North Carolina Wildlife Resources Commission suggested avoiding crossings of Cypress Creek by shifting the route for the AP-3 lateral further to the north. The current route for the AP-3 lateral crosses Cypress Creek at four locations. These crossings resulted from the Meherrin River Major Route Alternative (see above), which was designed to avoid sensitive floodplain forest areas along the Meherrin River and Fountains Creek. Relative to the baseline, the Northampton Major Route Alternative would result in one additional crossing of Cypress Creek in addition to a crossing of a tributary (Ivy Creek) approximately at its confluence with Cypress Creek at Jordan's Mill Pond. The baseline route avoids both Ivy Creek and Jordan's Mill Pond.

The Northampton Major Route Alternative is longer and crosses more waterbodies and more miles of wetlands, forested land, and floodplain forest areas than the baseline (though some of the crossings occur along the segment of the route alternative adjacent to the AP-2 mainline). The alternative route additionally adds a crossing of Cypress Creek and a tributary relative to the baseline. The length of the alternative route and some of its crossings of environmental features could be reduced by moving the site for Compressor Station 2 about 4.2 miles to the south, but this could affect the locations and configurations of other aboveground facilities. For all these reasons, Atlantic retained the baseline route in this area.

10.8.1.14 Boykins Major Route Alternative

Atlantic identified and evaluated a major route alternative for the AP-3 lateral (the Boykins Major Route Alternative) adjacent to an existing DVP 115 kV electric transmission line in Southampton County, Virginia. The baseline route and Boykins Major Route Alternative are depicted on Figure 10.8.1-18, and comparative information on each route is provided in Table 10.8.1-15.

The baseline route extends to the northeast for about 13.6 miles approximately between MPs 14.4 and 28.0. The Boykins Major Route Alternative is south of and generally parallel to the baseline. Starting at MP 14.4, it follows the existing electric transmission line on the north side of Hugo Road to a point north of Boykins. From here, it continues along the existing electric transmission line north of General Thomas Highway passing north of Newsoms and terminating at MP 28.0.

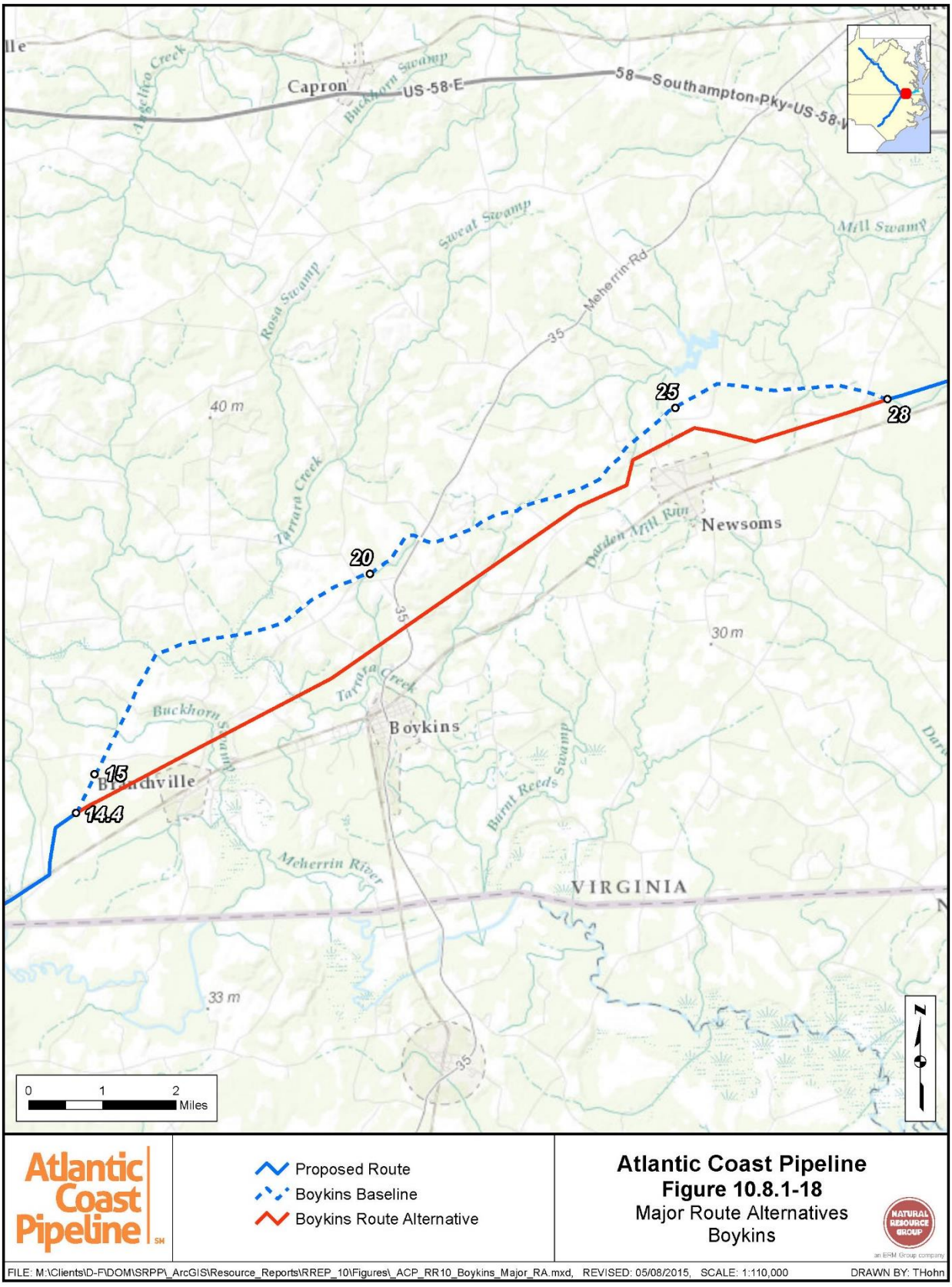

Capron
US-58-E
58-Southampton-Pky-US-58-W
Buckhorn Swamp
Sweat Swamp
Rosa Swamp
Meherrin Rd
Mill Swamp
40 m
Tarrara Creek
Darden Mill Run
Newsoms
30 m
Boykins
Buckhorn Swamp
Burnt Reeds Swamp
Meherrin River
VIRGINIA
33 m
25
28
20
15
14.4
0 1 2 Miles
Proposed Route
Boykins Baseline
Boykins Route Alternative
Atlantic Coast Pipeline
Figure 10.8.1-18
Major Route Alternatives
Boykins
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TABLE 10.8.1-15

Boykins Major Route Alternative for the Atlantic Coast Pipeline

Features	Unit	Baseline Route	Boykins Route Alternative
Length	miles	13.6	12.8
Primary U.S. or State/Commonwealth highway crossed	number	1	1
Other State/Commonwealth or local roads crossed	number	18	16
Adjacent to existing linear corridor facilities	miles	0.0	10.6
Federal lands crossed	miles	0.0	0.0
State/Commonwealth lands crossed	miles	0.0	0.0
Private lands crossed	miles	13.6	12.8
Conservation easements crossed	miles	0.0	0.0
Forested lands crossed	miles	7.1	6.2
Wetlands crossed – freshwater emergent	miles	<0.0	0.7
Wetlands crossed – freshwater forested/shrub	miles	2.6	1.2
Intermittent waterbodies crossed	number	12	11
Perennial waterbodies crossed	number	10	11

The baseline route measures approximately 13.6 miles in length, none of which is adjacent to existing linear corridor facilities. It crosses 22 waterbodies, including 10 perennial waterbodies, 2.6 miles of wetlands, and 7.1 miles of forested lands. The baseline avoids crossings of both public lands and conservation easements.

At 12.8 miles in length, the Boykins Major Route Alternative is 0.8 mile shorter than the baseline. Approximately 10.6 miles of the route (83 percent) is adjacent to the existing electric transmission line. The alternative route crosses 22 waterbodies, including 11 perennial waterbodies, which is similar to the baseline. The alternative route crosses 2.9 miles of wetlands, which is 0.3 more mile than the baseline, but it crosses 1.4 fewer miles of forested wetland. It additionally crosses 6.2 miles of forested land, which is 0.9 mile less than the baseline. Similar to the baseline, the alternative route avoids public lands and conservation easements.

The Boykins Major Route Alternative is shorter, mostly adjacent to existing linear corridor facilities, and reduces crossings of forested wetlands and forested land relative to the baseline. The alternative route passes nearer to some homes and farm buildings than the baseline, but these areas most likely could be avoided with slight adjustments to the centerline of the route. For these reasons, Atlantic continues to evaluate the Boykins Major Route Alternative.

10.8.1.15 Franklin Major Route Alternative

Atlantic identified and evaluated a major route alternative along the AP-3 lateral (the Franklin Major Route Alternative) adjacent to an existing DVP 115 kV electric transmission line in Southampton and Isle of Wight Counties and Cities of Franklin and Suffolk, Virginia. The baseline route and Franklin Major Route Alternative are depicted on Figure 10.8.1-19, and comparative information on each route is provided in Table 10.8.1-16.

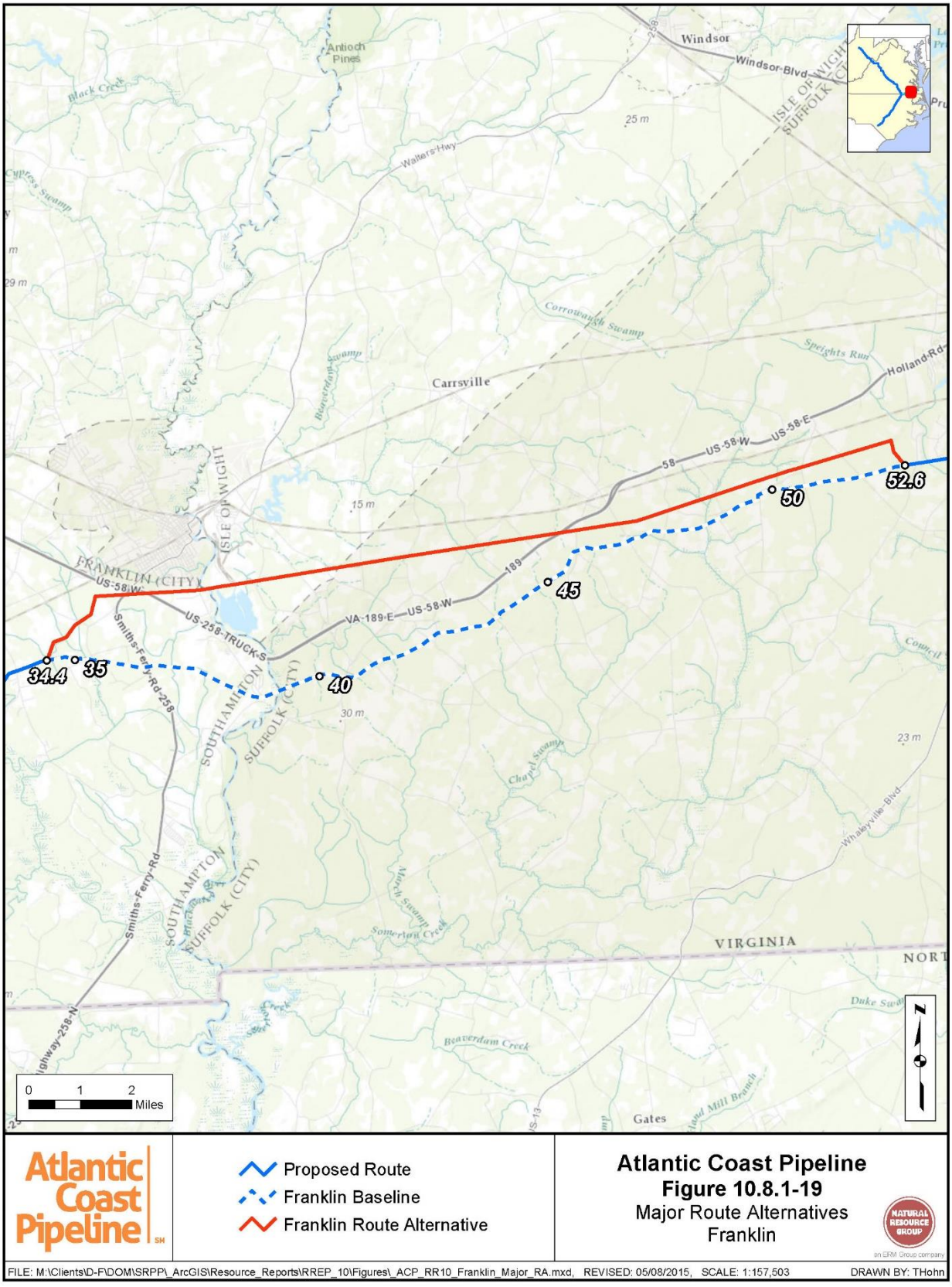

Windsor
Windsor Blvd
Antioch Pines
Black Creek
Walters Hwy
Cypress Swamp
Corrowaugh Swamp
Speights Run
Holland Rd
Carrsville
Beaverdam Swamp
ISLE OF WIGHT
SUFFOLK (CITY)
FRANKLIN (CITY)
US-58-W
US-58-E
58
189
VA-189-E
US-258-TRUCK-S
Smiths Ferry Rd 258
SOUTHAMPTON
Chapel Swamp
Whaleyville Blvd
Smiths Ferry Rd
Somerton Creek
Beaverdam Creek
Duke Swamp
VIRGINIA
Gates
25 m
15 m
30 m
23 m
29 m
34.4
35
40
45
50
52.6
0 1 2 Miles
N
Proposed Route
Franklin Baseline
Franklin Route Alternative
Atlantic Coast Pipeline
Figure 10.8.1-19
Major Route Alternatives
Franklin
NATURAL RESOURCE GROUP
an ERM Group company
FILE: M:\Clients\D-F\DOM\SRPP_ArcGIS\Resource_Reports\RREP_10\Figures_ACP_RR10_Franklin_Major_RA.mxd, REVISED: 05/08/2015, SCALE: 1:157,503 DRAWN BY: THohn

TABLE 10.8.1-16

Franklin Major Route Alternative for the Atlantic Coast Pipeline

Features	Unit	Baseline Route	Franklin Route Alternative
Length	miles	18.2	18.1
Primary U.S. or State/Commonwealth highway crossed	number	2	9
Other State/Commonwealth or local roads crossed	number	22	24
Adjacent to existing linear corridor facilities	miles	0.0	16.5
Federal lands crossed	miles	0.0	0.0
State/Commonwealth lands crossed	miles	0.0	0.0
Private lands crossed	miles	18.2	18.1
Conservation easements crossed	miles	0.0	0.6
Forested lands crossed	miles	11.0	8.8
Total wetlands crossed	miles	3.1	2.1
Wetlands crossed – freshwater emergent	miles	0.0	1.3
Wetlands crossed – freshwater forested/shrub	miles	3.0	0.2
Wetlands crossed – other	miles	0.1	0.6
Intermittent waterbodies crossed	number	10	19
Perennial waterbodies crossed	number	29	23

The baseline route extends to the east for about 18.2 miles approximately between MP 34.4 in Southampton County and MP 52.6 in the City of Suffolk. The Franklin Major Route Alternative is north of and generally parallel to the baseline, passing south of developed areas in the City of Franklin and crossing U.S. Highway 58 near the intersection with O'Kelly Drive. Starting at MP 34.4, the alternative route initially heads northeast along a greenfield for about 1.7 miles. It then follows the existing electric transmission line east for about 15.8 miles. The route then heads south for about 0.5 mile along a greenfield to the terminus approximately at MP 52.6.

The baseline route measures approximately 18.2 miles in length, none of which is adjacent to existing linear corridor facilities. It crosses 39 waterbodies, of which 29 are perennial; about 3.1 miles of wetlands; and about 11.0 miles of forested land. The baseline avoids crossings of public lands and conservation easements.

At 18.1 miles in length, the Franklin Major Route Alternative is 0.1 mile shorter than the baseline. Approximately 16.5 miles of the route (91 percent) is adjacent to the existing electric transmission line. The alternative route crosses 42 waterbodies, which is more than the baseline, but it crosses 6 fewer perennial waterbodies. It additionally crosses 2.1 miles of wetlands and 8.8 miles of forested land, which is 1.0 mile and 2.2 miles less than the baseline, respectively. Like the baseline, the alternative route avoids public lands and conservation easements.

The Franklin Major Route Alternative is shorter, mostly adjacent to existing linear corridor facilities, and reduces crossings of perennial waterbodies, wetlands, and forested land relative to the baseline. The alternative route appears to pass nearer to some homes and farm buildings than the baseline, but these areas most likely could be avoided with slight adjustments to the centerline of the route. For these reasons, Atlantic continues to evaluate the Franklin Major Route Alternative.

10.8.1.16 Great Dismal Swamp Major Route Alternatives

The GDS-NWR is an approximately 112,000-acre preserve in southeastern Virginia and northeastern North Carolina managed by the FWS. The refuge encompasses a remnant of a larger swamp forest ecosystem that used to cover much of the surrounding area (FWS, 2014).

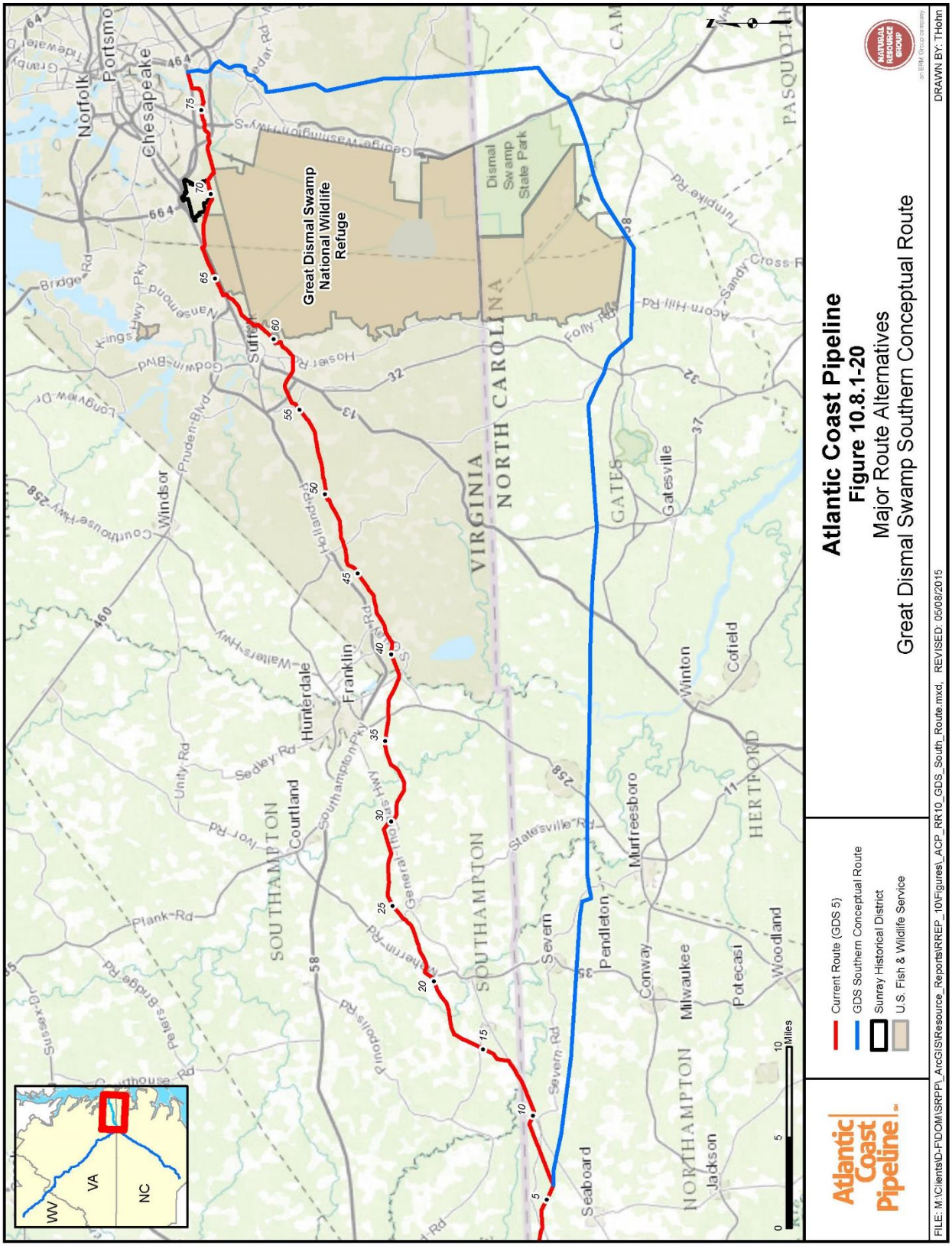
To meet its commitments to customers as specified in precedent agreements for the ACP, Atlantic is proposing to provide transportation service to various shippers at a new delivery point in the City of Chesapeake, Virginia via the proposed AP-3 lateral. Options for routing a new pipeline into this area are limited due to urbanization in and around the Cities of Suffolk and Chesapeake, which have built out to the northern boundary of the GDS-NWR. Atlantic identified an initial baseline route that avoids developed areas in the cities and minimizes impacts on the GDS-NWR by routing along the northern interior boundary of the refuge in an area containing existing electric transmission and pipeline facilities on the south side of U.S. Highway 13 (Portsmouth Boulevard). Portions of the route in this area parallel existing electric transmission or pipeline facilities within the refuge.

Atlantic met with staff from the GDS-NWR on June 30 and August 21, 2014 to review the proposed baseline route across the refuge. The meeting on June 30, 2014 included a field visit to various points along the baseline route both within the refuge and in the City of Suffolk, Virginia. Based on information from GDS-NWR staff, specifically that the route should minimize crossings of Federal lands and be adjacent to existing utilities, Atlantic identified and evaluated an alternative route (GDS 1) across the refuge. The route alternative incorporated specific recommendations from GDS-NWR staff regarding the configuration of the route along White Marsh Road in the City of Suffolk, Virginia.

In subsequent communications, GDS-NWR staff asked Atlantic to identify and evaluate an alternative route which avoids the refuge altogether. In response to this request, Atlantic identified two alternative routes (GDS 2 and GDS 6) which avoid the refuge by passing north of the City of Suffolk. Atlantic additionally identified three alternative routes (GDS 3, GDS 4, and GDS 5) which reduce the crossing length of the refuge by passing north of U.S. Highway 13 between the communities of Magnolia and Bowers Hill. Atlantic also identified and assessed a conceptual route alternative going south of the refuge.

Southern Conceptual Route Alternative

The southern conceptual alternative route originates approximately at MP 6.0 of the currently proposed AP-3 lateral route in Northampton County, North Carolina (see Figure 10.8.1-20). From this point, the conceptual route heads due east for approximately 64 miles crossing Northampton, Hertford, Gates, Pasquotank, and Camden Counties, North Carolina, passing south of the GDS-NWR and Dismal Swamp State Park. The conceptual route then heads north for approximately 20 miles, crossing Camden County, North Carolina and the City of Chesapeake, Virginia, passing east of the GDS-NWR. The route terminates approximately at MP 77.2 of the GDS 1 route on the east side of the Southern Branch Elizabeth River. The conceptual route is approximately 13 miles longer than the corresponding segment of the GDS 1 route.


Great Dismal Swamp National Wildlife Refuge
Dismal Swamp State Park
VIRGINIA
NORTH CAROLINA
SOUTHAMPTON
GATES
HERTFORD
NORTHAMPTON
Norfolk
Portsmouth
Chesapeake
Suffolk
Windsor
Franklin
Hunterdale
Courtland
Gatesville
Winton
Cofield
Murfreesboro
Pendleton
Conway
Milwaukee
Potecasi
Woodland
Severn
Seaboard
Jackson
Atlantic Coast Pipeline
Figure 10.8.1-20
Major Route Alternatives
Great Dismal Swamp Southern Conceptual Route
Current Route (GDS 5)
GDS Southern Conceptual Route
Sunray Historical District
U.S. Fish & Wildlife Service
Miles
WV
VA
NC
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Although the southern conceptual route alternative avoids the GDS-NWR, construction along this route would result in an additional 13 miles of impacts, including crossings of many miles of wetlands along the Chowen River, in the area south of the Dismal Swamp State Park, and along the Pasquatank River. Based on National Wetlands Inventory data, the southern conceptual route crosses approximately 30.6 miles of wetlands, while the corresponding segment of the currently proposed route crosses approximately 20.1 miles of wetlands. The southern conceptual route additionally crosses large blocks of land identified by TNC as sensitive floodplain forest in areas south and east of the GDS-NWR. Also, the southern conceptual route alternative is almost entirely a greenfield corridor, as there are no existing pipelines, electric transmission lines, railroads, or major roads to follow in the vicinity of the route. By contrast, the corresponding segment of the proposed route is collocated with existing linear corridor facilities for approximately 13 miles (including areas within the GDS-NWR).

Because the southern conceptual route is longer and would result in greater impacts than the currently proposed route, particularly to wetlands, the route is not considered a viable alternative.

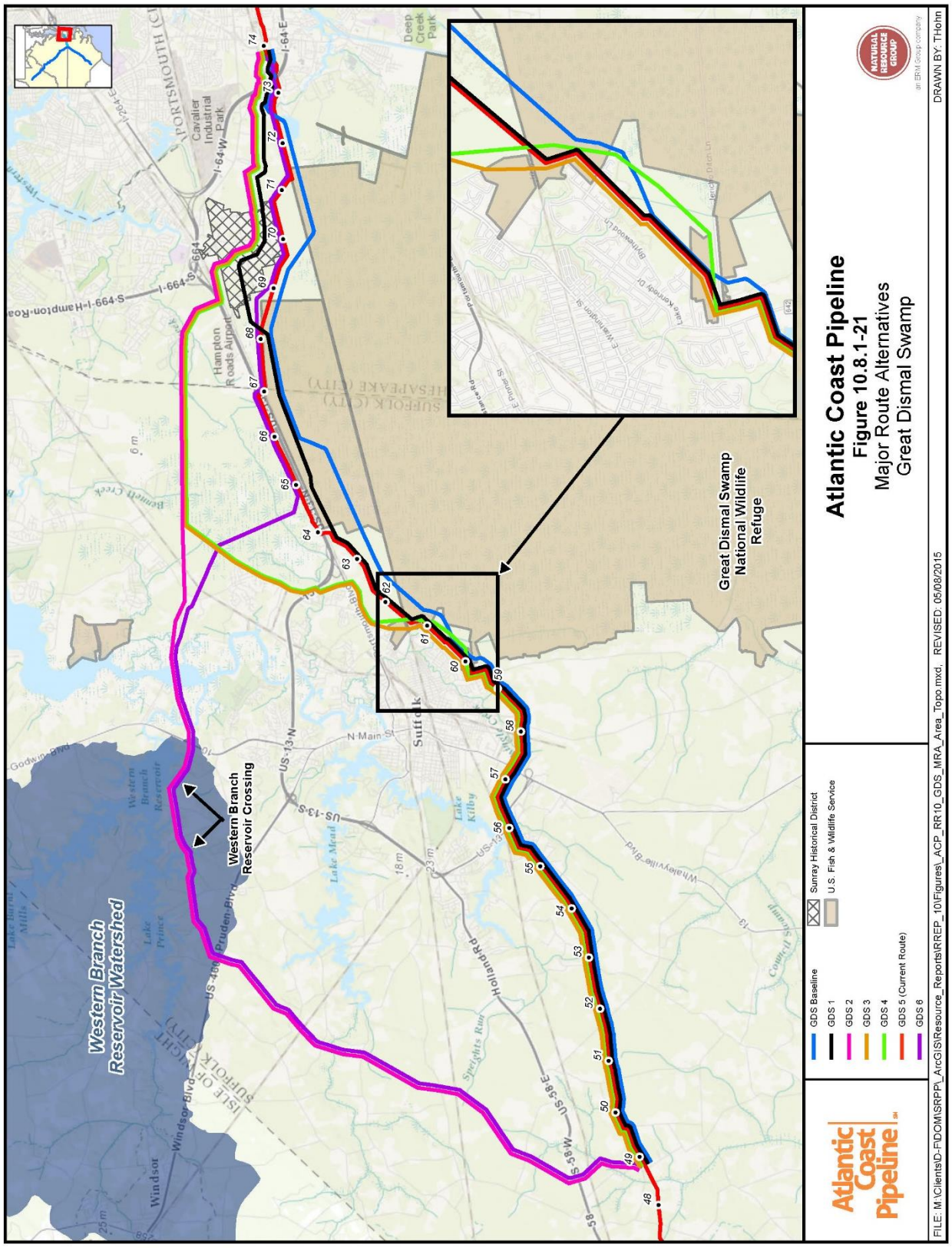
Great Dismal Swamp Route Alternatives

In addition to the baseline, six alternative routes were identified by Atlantic in the vicinity of the GDS-NWR. Each of these routes originates approximately at MP 48.8 of the currently proposed AP-3 lateral route in the City of Suffolk and terminates approximately at MP 73.9 in the City of Chesapeake. Atlantic's initial baseline route and the six alternative routes are depicted on Figure 10.8.1-21, and comparative data on each route is provided in Table 10.8.1-17.

Baseline Route

At 24.7 miles, the baseline is the shortest of the seven alternative routes. Starting at MP 48.8, the route extends to the east-northeast for approximately 7.8 miles to a point east of Lake Kilby. It then continues to the east-northeast for another 4.5 miles, passing south and east of Suffolk and entering the GDS-NWR east of White Marsh Road. The route then extends east for 6.3 miles crossing the refuge on the south side of U.S. Highway 13 and exiting the refuge at a point just east of the Suffolk/Chesapeake City line. The route then continues east for approximately 6.1 miles, where it reaches approximate MP 73.9, about 0.5 mile east of I-64.

The baseline route crosses approximately 7.2 miles of Federal lands in the GDS-NWR, including 4.3 miles which are adjacent to existing electric transmission or pipeline facilities. In total, approximately 11.5 miles (47 percent) of the baseline is collocated with existing linear corridor facilities, which is the second highest percentage of the routes considered. The baseline crosses the most miles of wetlands (by 0.6 mile) and fifth most miles of forested land, but the second fewest number of waterbodies and the fewest roads. It crosses approximately 7.1 miles of the Suffolk II battlefield study area, but avoids the Sunray Historic District, which is listed in the National Register of Historic Places. The route also avoids crossings of conservation easements and navigable waters.


Atlantic Coast Pipeline
Figure 10.8.1-21
Major Route Alternatives
Great Dismal Swamp
Great Dismal Swamp National Wildlife Refuge
Western Branch Reservoir Watershed
Western Branch Reservoir Crossing
GDS Baseline
GDS 1
GDS 2
GDS 3
GDS 4
GDS 5 (Current Route)
GDS 6
Sunray Historical District
U.S. Fish & Wildlife Service
Atlantic Coast Pipeline
NATURAL RESOURCE GROUP
an ERM Group company
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DRAWN BY: THohn

TABLE 10.8.1-17

Great Dismal Swamp Route Alternatives for the Atlantic Coast Pipeline

Features	Unit	Baseline	GDS 1	GDS 2	GDS 3	GDS 4	GDS 5 (Proposed)	GDS 6
Length	miles	24.7	25.0	28.4	27.7	27.9	25.1	29.2
Primary U.S. or Commonwealth highway crossed	number	5	5	11	12	12	9	11
Other Commonwealth or local roads crossed	number	14	22	22	25	24	18	14
Adjacent to existing linear corridor facilities	miles	11.5	11.9	1.6	8.0	8.5	14.1	9.5
Federal lands crossed (GDS-NWR)	miles	7.2	4.8	0.0	1.1	0.6	1.7	0.3
Commonwealth lands crossed	miles	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Private lands crossed	miles	17.5	20.2	28.4	26.6	27.3	23.4	28.9
Sunray Historic District lands crossed	miles	0.0	2.1	1.6	1.6	1.6	0.0	0.0
Battlefield study area crossed – Suffolk II	miles	7.1	7.5	3.4	8.7	8.8	7.5	3.4
Conservation easements crossed	miles	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Forested lands crossed	miles	17.1	15.8	15.4	19.0	19.0	18.0	17.7
Wetlands crossed – total	miles	12.9	9.1	7.7	9.8	11.1	11.2	12.3
Wetlands crossed – freshwater emergent/open water	miles	0.7	0.2	0.5	0.3	0.2	2.1	2.2
Wetlands crossed – freshwater forested/shrub	miles	12.2	9.0	6.2	9.5	10.9	9.2	9.1
Wetlands crossed – Estuarine and Marine	miles	0.0	0.0	1.0	0.0	0.0	0.0	1.0
Waterbodies crossed – total	number	50	48	66	59	60	58	62
Intermittent waterbodies crossed	number	3	3	11	6	6	1	8
Perennial waterbodies crossed	number	6	7	11	15	14	7	6
Canal/Ditch/Artificial Path crossed	number	41	38	44	38	40	50	48
Source Water Watershed – Western Branch Reservoir	miles	0.0	0.0	4.5	0.0	0.0	0.0	4.5
Navigable Waters	number	0	0	2	0	0	0	2

GDS 1 Route Alternative

GDS 1 measures 25.0 miles in length, which is the second shortest of the seven alternative routes. Starting at MP 48.8, the route extends to the east-northeast for approximately 7.8 miles to a point east of Lake Kilby. It then continues to the east-northeast for another 4.5 miles, passing south and east of Suffolk. After crossing White Marsh Road, it turns north for approximately 0.3 mile, then heads east for 0.2 mile, where it crosses Jericho Ditch Lane and enters the refuge east of White Marsh Road. The route then extends east for 6.3 miles crossing the refuge on the south side of U.S. Highway 13 and exiting the refuge at a point just east of the Suffolk/Chesapeake City line. The route then continues east for about 6.0 miles, where it reaches approximate MP 73.9, about 0.5 mile east of I-64.

GDS 1 crosses approximately 4.8 miles of Federal land in the GDS-NWR, of which 3.8 miles is adjacent to existing utilities. In total, approximately 11.9 miles (48 percent) of the route is adjacent to existing electric transmission or pipeline facilities, which is the highest percentage for the routes considered. GDS 1 crosses the second fewest miles of wetlands and forested lands, the fewest number of waterbodies, and third fewest roads. It avoids conservation easements and navigable waters. The route crosses approximately 7.5 miles of the Suffolk II battlefield study area as well as 2.1 miles of the Sunray Historic District, which is more than the other routes.

GDS 2 Route Alternative

GDS 2 measures approximately 28.4 miles in length, which is 3.7 miles longer than the baseline. Starting at MP 48.8, the route heads north-northeast for approximately 9.9 miles to a point just north of Pruden Boulevard in Suffolk. It then heads east for approximately 12.0 miles, passing north of Suffolk and crossing two short segments of the Western Branch Reservoir, which is a water supply for the City of Norfolk. After passing north of the Hampton Roads Airport, GDS 2 turns south-southeast for approximately 2.0 miles, crossing U.S. Highway 13. It then follows the same alignment as GDS 1 for 4.4 miles east to approximate MP 73.9.

GDS 2 avoids the refuge, but is the second longest of the seven alternative routes by between 0.5 and 3.7 miles. It is adjacent to existing electric transmission or pipeline facilities for 1.6 miles (6 percent), which is less than the other routes. GDS 2 crosses the fewest miles of forested land and the fourth fewest roads. It crosses the fewest miles of wetlands, but is one of only two routes, along with GDS 6, which crosses wetlands characterized as estuarine/marine. The route crosses the most waterbodies, including two which are classified as navigable waters (Nansemond River and Western Branch), and two which are finger lakes to the Western Branch Reservoir. The route additionally is within the watershed of the reservoir for 4.5 miles. It crosses the fewest miles of the Suffolk II battlefield study area but the second most miles of land in the Sunray Historic District. Like the other routes, it avoids conservation easements.

Based on competing constraints in the vicinity of GDS 2, primarily houses, it is not possible to avoid the reservoir or its watershed. If technically feasible, the crossings of the reservoir would be accomplished by HDD, which would involve pulling a prefabricated section of pipe through a hole drilled beneath the crossings. Atlantic is planning to complete geotechnical studies at the crossings to assess the feasibility of a successful HDD.

GDS 3 Route Alternative

GDS 3 measures approximately 27.7 miles in length, which is 3.0 miles longer than the baseline. It combines portions of GDS 1 and GDS 2 to reduce the crossing length of the refuge relative to GDS 1. It follows the same alignment as GDS 1 for approximately 12.7 miles to a point in the refuge just south of the Norfolk Southern Railroad. It then heads north for approximately 5.1 miles, crossing U.S. Highway 13 east of Magnolia and intersecting GDS 2 south of Robin Hood Trail. It then follows the same alignment as GDS 2 to the terminus of the route alternative at MP 73.9.

GDS 3 crosses approximately 1.1 miles of the GDS-NWR, which is 3.7 miles less than GDS 1. It is adjacent to existing electric transmission or pipeline facilities for approximately 8.0 miles (29 percent), including 0.5 mile within the refuge. GDS 3 crosses the fifth most miles of wetlands, and the fourth most number of waterbodies. It also crosses the most miles of forested land and most number of roads, including primary highways. Like the baseline and GDS 1, it avoids conservation easements and navigable waters. GDS 3 crosses 1.2 more miles of the Suffolk II battlefield study area but 0.5 mile less of the Sunray Historic District than GDS 1.

GDS 4 Route Alternative

At 27.9 miles in length, GDS 4 is 3.2 miles longer than the baseline. It is similar to GDS 3 but reduces the crossing length of the refuge by paralleling a short segment of Jericho Ditch Lane and crossing a parcel of Commonwealth owned land within the boundaries of the refuge. GDS 4 initially follows the same alignment as GDS 3 for approximately 10.9 miles to an intersection with Jericho Ditch Lane. It then parallels the north side of the lane for 0.5 mile, before heading north for 2.5 miles to a point south of East Washington Street in Suffolk. It then follows the same alignment as GDS 3 for 14.0 miles to the terminus of the route alternative at MP 73.9.

GDS 4 crosses approximately 0.6 mile of the GDS-NWR, which is 0.5 mile less than GDS 3. It is adjacent to existing linear corridor facilities for approximately 8.5 miles (30 percent), none of which is in the refuge. It crosses the fourth most miles of wetland, the most forested land (with GDS 3), and the third most waterbodies, though none of the waterbodies are classified as navigable. The route crosses the second most number of roads, including 12 primary highways. GDS 4 crosses the most miles within the Suffolk II battlefield study area and second most miles in the Sunray Historic District. Like the other routes, it avoids conservation easements.

GDS 5 – Proposed Route

GDS 5, the currently proposed route, is 25.1 miles in length, which is 0.4 mile longer that the baseline. It follows the same alignment as GDS 1 for the first 14.9 miles. Approximately at MP 63.7, GDS 5 heads north and crosses U.S. Highway 13. The route then turns to the east and parallels the north side of the highway for 2.9 miles. At a point about 0.5 mile west of the Hampton Roads Airport, the route crosses to the south side of U.S. Highway 13, and follows an existing utility corridor to the east and southeast along the south side of the Sunray Historic District. This area is a forested wetland owned by the Chesapeake Wetland Mitigation Bank, LLC. GDS 5 then follows the Norfolk Southern Railroad for approximately 1.4 miles, before heading south and then east to the terminus of the route alternative at MP 73.9.

GDS 5 crosses approximately 1.7 miles of the GDS-NWR, which is 5.5 miles shorter than the baseline. It is adjacent to existing electric transmission, pipeline, or railroad facilities for approximately 14.1 miles (56 percent), which is the most of any alternative. This includes approximately 1.1 miles within the refuge. GDS 5 crosses the third most miles of wetland and the third most miles of forested land. The route crosses the third fewest number of waterbodies,

the fourth fewest miles of the Suffolk II battlefield study area, and avoids the Sunray Historic District. Like the other alternatives, the route avoids conservation easements.

GDS 6 Route Alternative

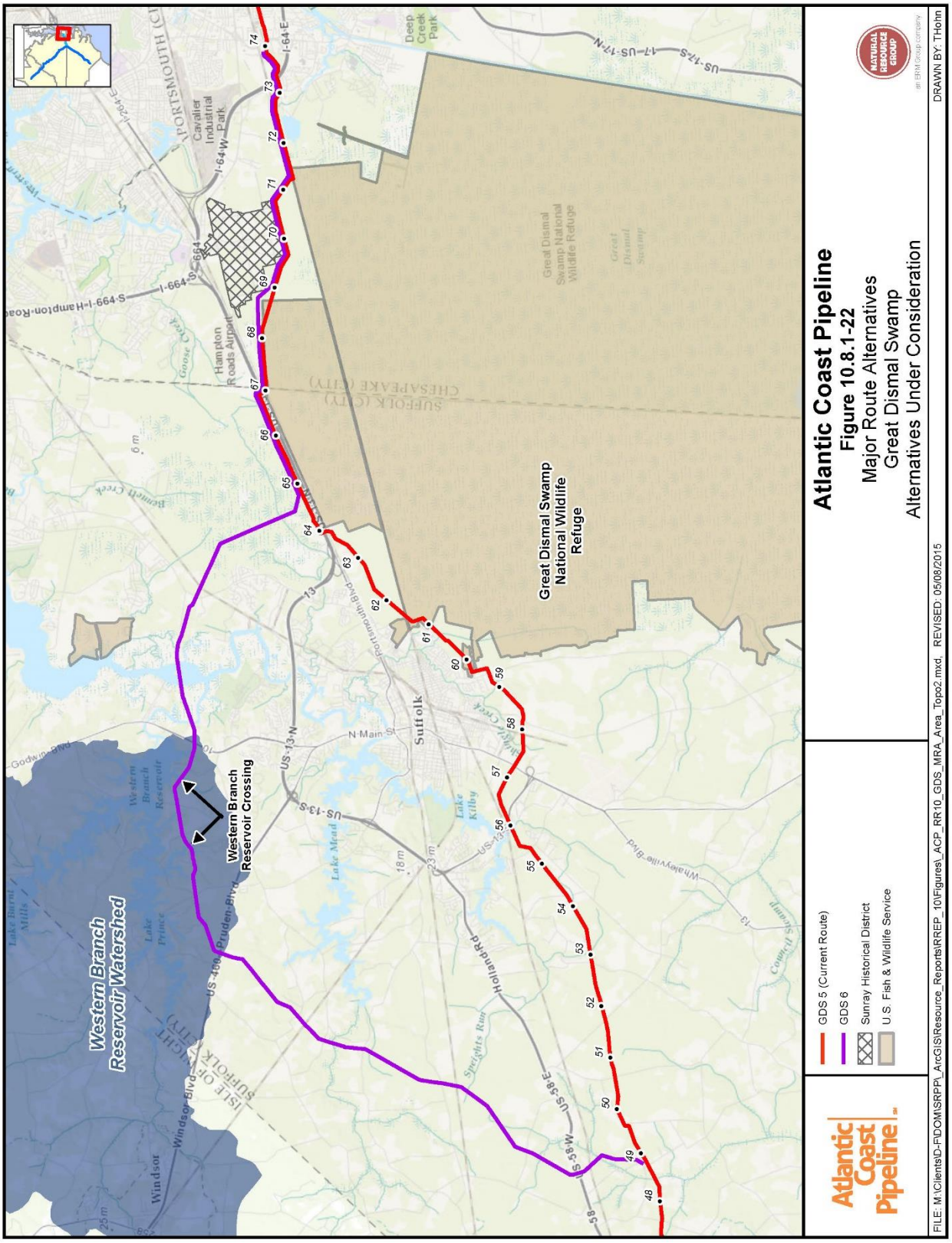
GDS 6 measures approximately 29.2 miles in length, which is 4.5 miles longer than the baseline, and is the longest route alternative. It follows the same alignment as GDS 2 for the first 15.9 miles. Just east of the Nansemond River, GDS 6 heads to the southeast along an existing electric transmission line corridor for approximately 2.0 miles before it turns south for approximately 1.6 miles. It then joins with GDS 5 from MP 64.7 to MP 68.1, where it continues to the east on the north side of the GDS-NWR boundary. Approximately 0.2 mile west of the Sunray Historic District boundary, the route heads to the south and follows GDS 5 to the terminus at MP 73.9.

GDS 6 crosses approximately 0.3 mile of the GDS-NWR, which is the second shortest crossing of any alternative. It is adjacent to existing electric transmission, pipeline, or railroad facilities for approximately 9.5 miles (33 percent), which is the fourth most of any alternative. It crosses the second most miles of wetland, the fourth most forested land, and the second most waterbodies. Similar to GDS 2, the route crosses approximately 4.5 miles of the Western Branch Reservoir watershed, and it crosses two navigable waterways. The route crosses the fewest miles of the Suffolk II battlefield study area, avoids the Sunray Historic District, and avoids conservation easements. Like GDS 5, the route crosses the forested wetland owned by Chesapeake Wetland Mitigation Bank, LLC.

All seven GDS alternatives cross the City of Suffolk, Virginia. The City of Suffolk requested that the pipeline avoid areas designated as central urban/suburban growth areas under the City of Suffolk 2026 Comprehensive Plan. These designated central urban/suburban growth areas are located within the Highway 13 loop around the City of Suffolk, bordered by the GDS to the southeast. GDS 2 and GDS 6 are the only alternatives that avoid these areas. However, the baseline route, GDS 1, GDS 3, GDS 4, and GDS 5 are all located near the southern boundary of the central growth area.

GDS Route Selection

Based on the discussion above, Atlantic identified GDS 5 as the preferred route, but continues to evaluate GDS 6 as a potential alternative. Figure 10.8.1-22 shows GDS 5 and GDS 6.


Atlantic Coast Pipeline
Figure 10.8.1-22
Major Route Alternatives
Great Dismal Swamp
Alternatives Under Consideration
GDS 5 (Current Route)
GDS 6
Sunray Historical District
U.S. Fish & Wildlife Service
Great Dismal Swamp National Wildlife Refuge
Western Branch Reservoir Crossing
Western Branch Reservoir Watershed
Suffolk
Portsmouth
Chesapeake
Hampton Roads Airport
Cavalier Industrial Park
Deep Creek Park
Lake Kilby
Lake Meade
Holland Rd
N Main St
Pruden Blvd
Windsor Blvd
Whaleyville Blvd
Portsmouth Blvd
Godwin Blvd
US-13-N
US-13-S
US-58-E
US-58-W
US-17-S
US-17-N
I-64-E
I-64-W
I-664-S
S-999-I-Hampton-Roads
FILE: M:\Clients\D-FDOM\SRPP_ArcGIS\Resource_Reports\RREP_10\Figures_ACP_RR10_GDS_MRA_Area_Topo2.mxd, REVISED: 05/06/2015
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10.8.2 Supply Header Project

10.8.2.1 JB Tonkin Major Route Alternatives

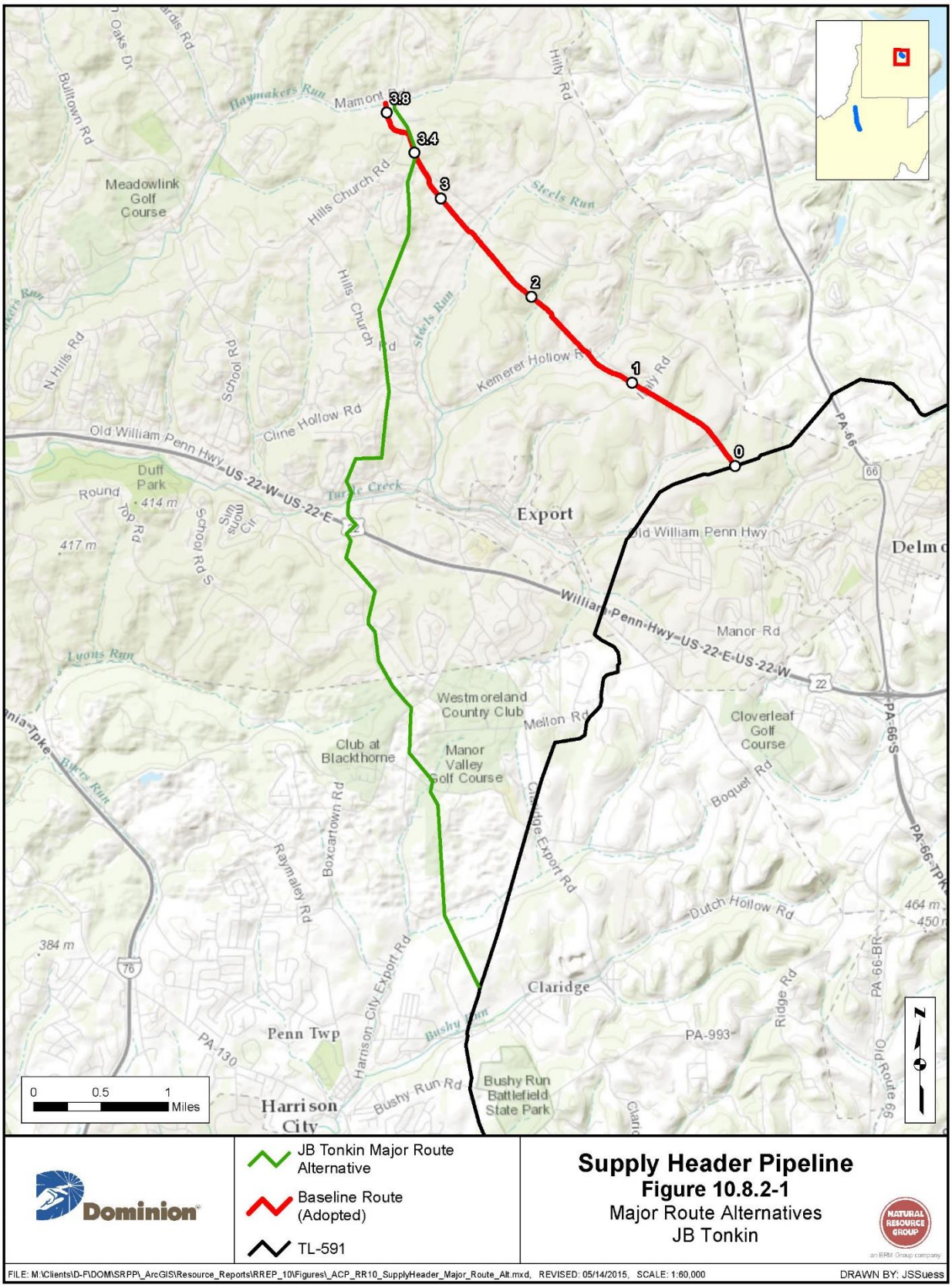
The proposed SHP facilities in Pennsylvania include a pipeline loop (TL-636) along DTI's existing LN-25 transmission pipeline. The baseline route for the loop extends southeast from DTI's existing JB Tonkin Compressor Station for approximately 3.9 miles, adjacent to the existing LN-25 right-of-way. The route then connects with DTI's existing TL-591 pipeline northwest of Delmont, Pennsylvania. In addition to this route, DTI evaluated a potential alternative that extends south from the existing JB Tonkin Compressor Station, adjacent to its existing TL-342 pipeline right-of-way, for approximately 7.3 miles where it connects with DTI's existing TL-591 pipeline northeast of Harrison City, Pennsylvania.

The baseline and alternative JB Tonkin routes are depicted on Figure 10.8.2-1, and comparative information on each route is provided in Table 10.8.2-1. Although it crosses 9 fewer waterbodies than the baseline route, the alternative is 3.5 miles longer, includes approximately 2.0 miles of greenfield routing, and crosses 2.1 more miles of forested land. Additionally, the alternative route passes within 100 feet of developed residential areas in several locations, while the baseline route does not. For these reasons, the baseline route was retained as the proposed route for the SHP TL-636 loop in Pennsylvania.

TABLE 10.8.2-1

JB Tonkin Major Route Alternative for the Supply Header Project

Features	Unit	Baseline Route (Proposed)	JB Tonkin Route Alternative
Length	miles	3.8	7.3
Primary U.S. or State highway crossed	number	0	1
Other State or local roads crossed	number	8	18
Adjacent to existing linear corridor facilities	miles	3.8	5.3
Federal lands crossed (Fort Pickett)	miles	0.0	0.0
State lands crossed	miles	0.0	0.0
Private lands crossed	miles	3.8	7.3
Conservation easements crossed	miles	0.0	0.0
Forested lands crossed	miles	1.7	3.8
Wetlands crossed – freshwater emergent	miles	0.0	0.0
Wetlands crossed – freshwater forested/shrub	miles	0.0	0.0
Intermittent waterbodies crossed	number	8	4
Perennial waterbodies crossed	number	7	2


3.8
3.4
3
2
1
0
Meadowlink Golf Course
Hills Church Rd
Steels Run
Haymakers Run
Mamont
Hilty Rd
Builtown Rd
Oaks Dr
N Hills Rd
School Rd
Kemerer Hollow Rd
Cline Hollow Rd
Old William Penn Hwy-US-22-W-US-22-E
Duff Park
Round Top Rd
414 m
417 m
Turtle Creek
Export
Old William Penn Hwy
William Penn Hwy-US-22-E-US-22-W
Manor Rd
Lyons Run
Westmoreland Country Club
Mellon Rd
Club at Blackthorne
Manor Valley Golf Course
Cloverleaf Golf Course
Boquet Rd
Boxcartown Rd
Raymaley Rd
Claridge-Export Rd
Dutch Hollow Rd
464 m
450 m
384 m
Claridge
Penn Twp
PA-130
Harrison City-Export Rd
Bushy Run
Bushy Run Rd
Bushy Run Battlefield State Park
Harrison City
PA-993
Ridge Rd
PA 66-BR
Old Route 66
PA-66
PA-66-S
PA-66-TPK
66
22
76
0 0.5 1 Miles
JB Tonkin Major Route Alternative
Baseline Route (Adopted)
TL-591
Dominion
Supply Header Pipeline
Figure 10.8.2-1
Major Route Alternatives
JB Tonkin
NATURAL RESOURCE GROUP
an ERM Group company
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10.8.2.2 Mockingbird Hill Major Route Alternatives

The proposed SHP facilities in West Virginia include a pipeline loop (TL-635) along DTI's existing TL-360 transmission pipeline. The baseline route for the loop extends south from DTI's existing Mockingbird Hill Compressor Station for approximately 12.4 miles, of which approximately 10.5 miles are collocated with the existing TL-360 right-of-way. DTI identified and evaluated the Mockingbird Hill Major Route Alternative, to provide an alternative approach to the Mockingbird Hill Compressor Station and reduce engineering and safety issues associated with construction occurring along steep side slope in areas of collocation.

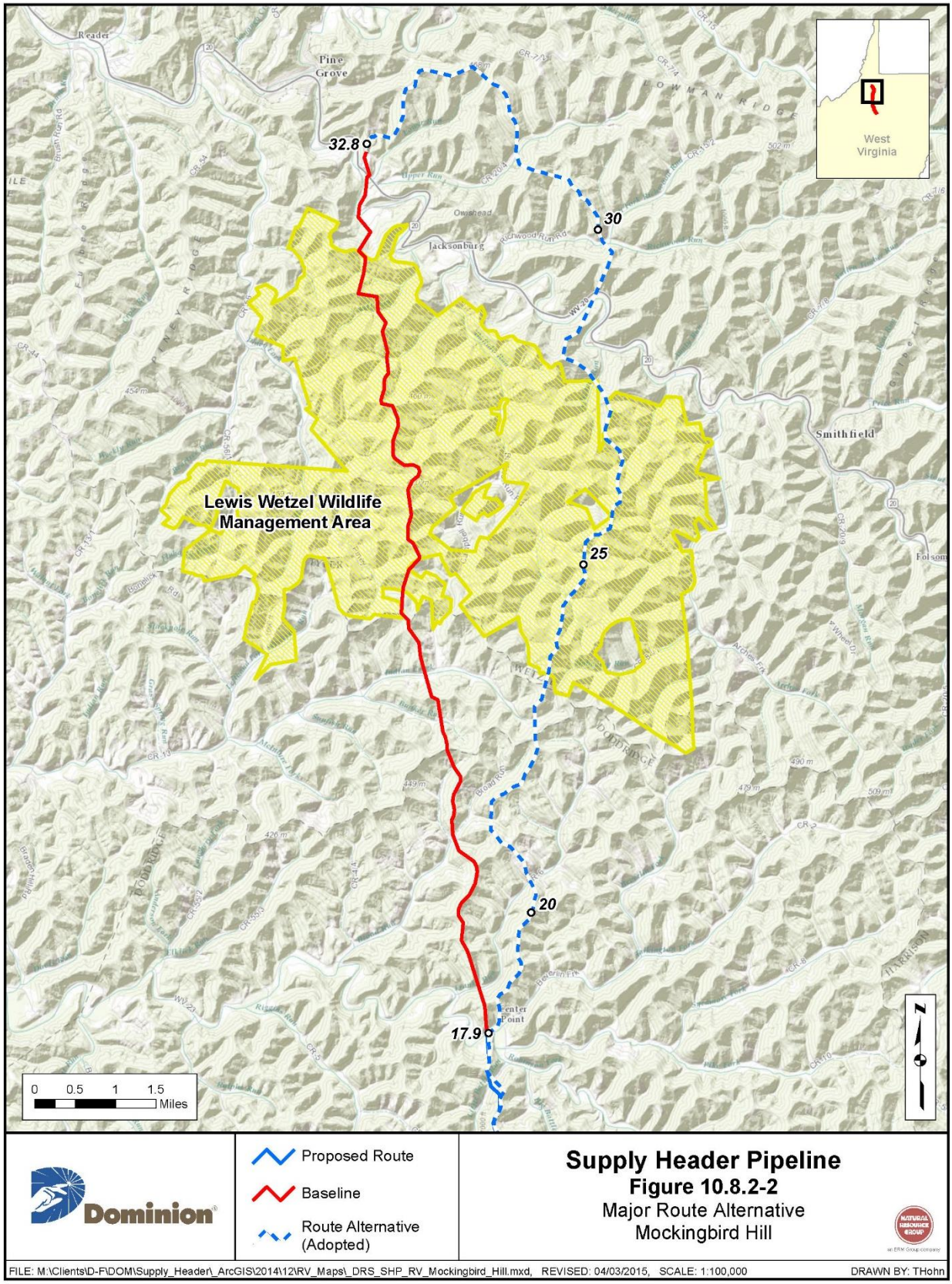
The Mockingbird Hill alternative heads northeast from the existing Mockingbird Hill Compressor Station, following a ridgeline that turns to the south. The alternative then heads south, running along several ridgelines, until it reconnects with the baseline route at MP 18.2. The baseline route and the Mockingbird Hill alternative are depicted on Figure 10.8.2-2, and comparative information is provided in Table 10.8.2-2.

TABLE 10.8.2-2

Mockingbird Hill Major Route Alternative for the Supply Header Project

Features	Unit	Baseline Route	Mockingbird Hill Route Alternative (Proposed)
Length	miles	12.4	16.6
Primary U.S. or State highway crossed	number	2	2
Other State or local roads crossed	number	15	11
Adjacent to existing linear corridor facilities	miles	10.5	1.0
Federal lands crossed	miles	0.0	0.0
State lands crossed	miles	5.1	3.7
Private lands crossed	miles	7.3	13.0
Conservation easements crossed	miles	0.0	0.0
Forested lands crossed	miles	10.4	15.8
Wetlands crossed – freshwater emergent	miles	0.02	0.0
Wetlands crossed – freshwater forested/shrub	miles	0.0	0.0
Wetland crossed – other	miles	0.02	0.01
Intermittent waterbodies crossed	number	8	8
Perennial waterbodies crossed	number	6	6

The alternative route is 4.2 miles longer than the baseline route and crosses 5.4 additional miles of forested land. Due to topography in the area, however, collocation of the baseline route with the existing TL-360 pipeline on top of a ridgeline is not possible in most areas and/or would require the pipeline and construction workspace to be on steep side slopes in some areas. Additionally, although the baseline is longer, it crosses 1.4 miles less of the Lewis Wetzel Wildlife Management Area. For these reasons, the Mockingbird Hill Major Route Alternative was adopted as the proposed route.


Reader
Pine Grove
32.8
30
Jacksonburg
Owshead
Smithfield
Folsom
Lewis Wetzel Wildlife Management Area
25
20
17.9
Center Point
West Virginia
0 0.5 1 1.5 Miles
Proposed Route
Baseline
Route Alternative (Adopted)
Dominion
Supply Header Pipeline
Figure 10.8.2-2
Major Route Alternative
Mockingbird Hill
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10.9 ROUTE VARIATIONS

Atlantic and DTI identified and continues to identify and evaluate a number of route variations designed to avoid or minimize impacts on geographically distinct and localized resources, such as conservation easements, cultural resource sites, or wetlands. Route variations were also considered to resolve engineering or constructability issues or address stakeholder concerns, where feasible. The route variations measured between approximately 1 and 5 miles in length and passed within a couple miles of the baseline route. The primary criterion for comparing route variations to the baseline route was cumulative impact avoidance relative to the objective of the route variation. Similar to the major route alternatives described above, if a route variation was adopted, it became part of the proposed route and the corresponding segment of the baseline route was rejected. Descriptions of each route variation to date are provided in the subsections below.

10.9.1 Atlantic Coast Pipeline

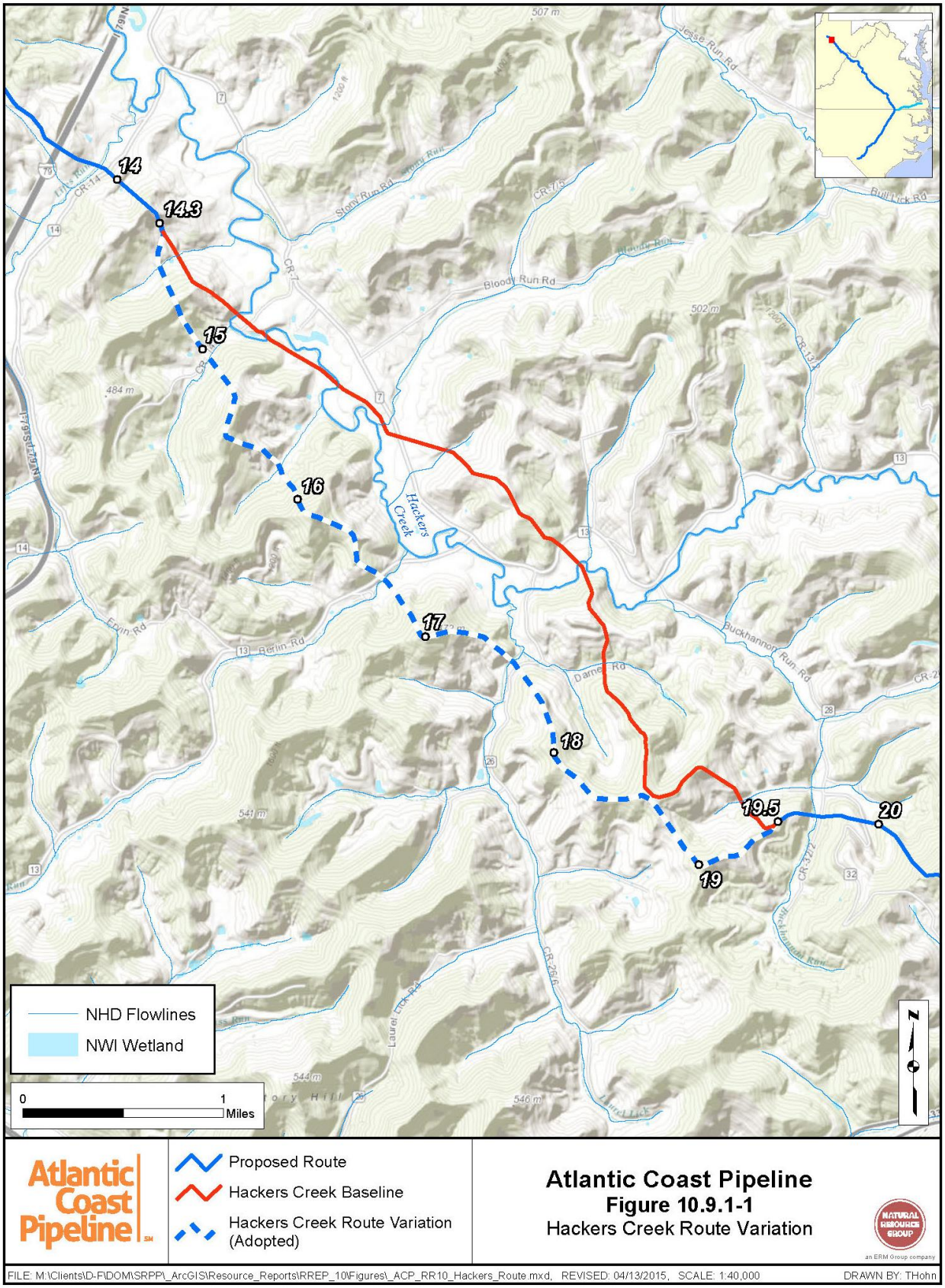
10.9.1.1 Hackers Creek Route Variation

In a letter dated December 9, 2014, the West Virginia FWS asked Atlantic to evaluate route alternatives or construction methods that avoid crossings of Hackers Creek in Lewis County, West Virginia. This creek is known to contain suitable habitat for federally listed mussel species, including the clubshell and snuffbox mussels (see Appendix 1H of Resource Report 1). Atlantic subsequently identified and evaluated a minor route variation between MPs 14.3 and 19.4 of the AP-1 mainline to avoid crossings of the creek. The baseline and alternative route (Hackers Creek Route Variation) are depicted on Figure 10.9.1-1, and comparative information on each route is provided in Table 10.9.1-1).

TABLE 10.9.1-1

Hackers Creek Route Variation for the Atlantic Coast Pipeline

Features	Unit	Baseline Route	Hackers Creek Route Variation
Length	miles	4.9	5.2
Roads crossed	number	7	5
Adjacent to existing linear corridor facilities	miles	0.0	1.3
Federal lands crossed	miles	0.0	0.0
State lands crossed	miles	0.0	0.0
Private lands crossed	miles	4.9	5.2
Conservation easements crossed	miles	0.0	0.0
Forested land crossed	miles	2.8	4.5
Wetlands crossed	miles	0.0	0.0
Intermittent waterbodies crossed	number	4	3
Perennial waterbodies crossed	number	5	2


14
14.3
15
16
17
18
19
19.5
20
Hackers Creek
Bloody Run Rd
Berlin Rd
Buckhannon Run Rd
Jesse Run Rd
Bull Lick Rd
Erwin Rd
Laurel Creek Rd
NHD Flowlines
NWI Wetland
0
1
Miles
Proposed Route
Hackers Creek Baseline
Hackers Creek Route Variation (Adopted)
Atlantic Coast Pipeline
Figure 10.9.1-1
Hackers Creek Route Variation
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Relative to the baseline route, the Hackers Creek Route Variation extends to the southwest and crosses a number of hilltops rather than following the valley along Hackers Creek. The route variation is approximately 0.3 mile longer than the baseline and it crosses 1.7 more miles of forested land. In addition to avoiding crossings of Hackers Creek, however, it also reduces the total number of waterbody crossings from 9 to 5. In a meeting on January 12, 2015, the West Virginia FWS and West Virginia Department of Natural Resources concurred that the route variation would avoid impacts on the federally listed mussel species. As shown in Table 10.9.1-1, crossings of other resources along the two routes are similar. For all these reasons, Atlantic incorporated the Hackers Creek Route Variation into the proposed route.

10.9.1.2 Huttonsville Route Variation

Atlantic identified and evaluated a minor route variation between MPs 49.8 and 55.9 in Randolph County, West Virginia to reduce the crossing of State-owned lands and to address a landowner request avoid sensitive features such as trout ponds, caves, and springs. The landowner is planning to establish a nature preserve on the property.

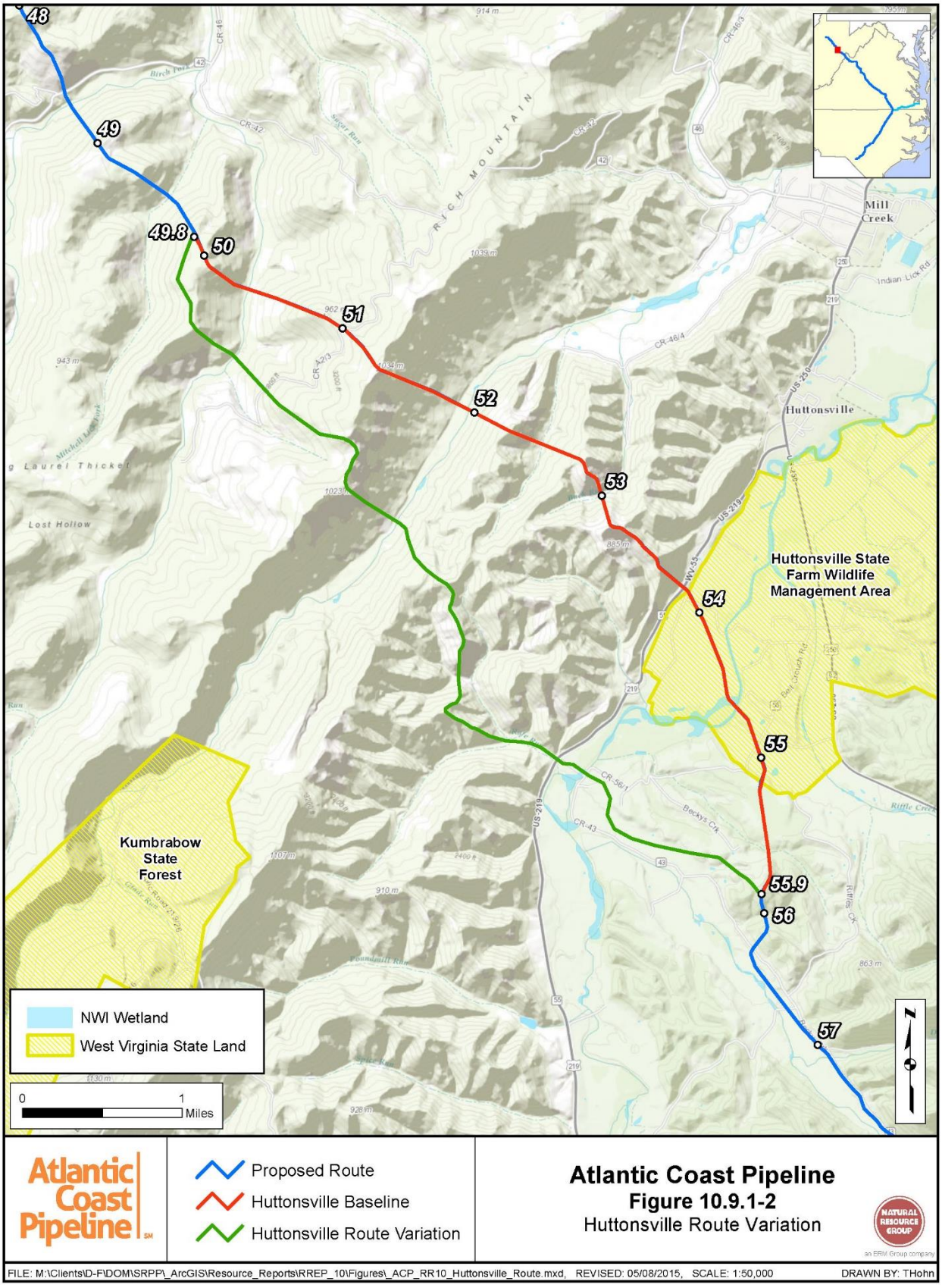
The Huttonsville Route Variation initially heads south of the baseline route at MP 49.8, providing an alternate crossing of Rich Mountain and Mill Ridge. The route variation follows various ridges south of the baseline route, then crosses the Tygart Valley River, following Becky Creek until it rejoins the baseline at MP 55.9. The two routes are depicted on Figure 10.9.1-2, and comparative information on the routes is provided in Table 10.9.1-2.

TABLE 10.9.1-2

Huttonsville Route Variation for the Atlantic Coast Pipeline

Features	Unit	Baseline Route	Huttonsville Route Variation
Length	miles	6.0	6.4
Roads crossed	number	5	4
Adjacent to existing linear corridor facilities	miles	0.0	0.0
Federal lands crossed	miles	0.0	0.0
State lands crossed (Huttonsville State Farm Wildlife Management Area)	miles	1.3	0.0
Private lands crossed	miles	4.7	6.4
Conservation easements crossed	miles	0.0	0.0
Forested land crossed	miles	4.9	5.1
Wetlands crossed	miles	0.1	<0.1
Intermittent waterbodies crossed	number	4	2
Perennial waterbodies crossed	number	5	5

Relative to the baseline, the route variation avoids crossing the trout ponds and some of the sensitive landscape features identified by the landowner. It also avoids the Huttonsville State Farm Wildlife Management Area, the Huttonsville Correctional Center, and two intermittent waterbody crossings. However, the route variation crosses areas which could potentially support threatened and endangered species and habitat, possibly including bat hibernacula. Additionally, the route variation is 0.4 mile longer and crosses 0.2 more mile of forested land than the baseline. As shown in Table 10.9.1-2, crossing of other resources along the two routes is similar.


48
49
49.8
50
51
52
53
54
55
55.9
56
57
Huttonsville State Farm Wildlife Management Area
Kumbrabow State Forest
Huttonsville
Mill Creek
NWI Wetland
West Virginia State Land
0
1
Miles
Proposed Route
Huttonsville Baseline
Huttonsville Route Variation
Atlantic Coast Pipeline
Figure 10.9.1-2
Huttonsville Route Variation
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While the route variation addresses some of the issues identified by the landowner and avoids crossings of State lands, it still crosses sensitive landscape and habitat features within the tract. Moreover, on February 17, 2015 the landowner provided Atlantic with a map of the property depicting locations of sensitive biological resources on the tract. Atlantic currently is evaluating this information, and will continue to review potential route alternatives in this area.

10.9.1.3 Dividing Waters Farm Route Variations

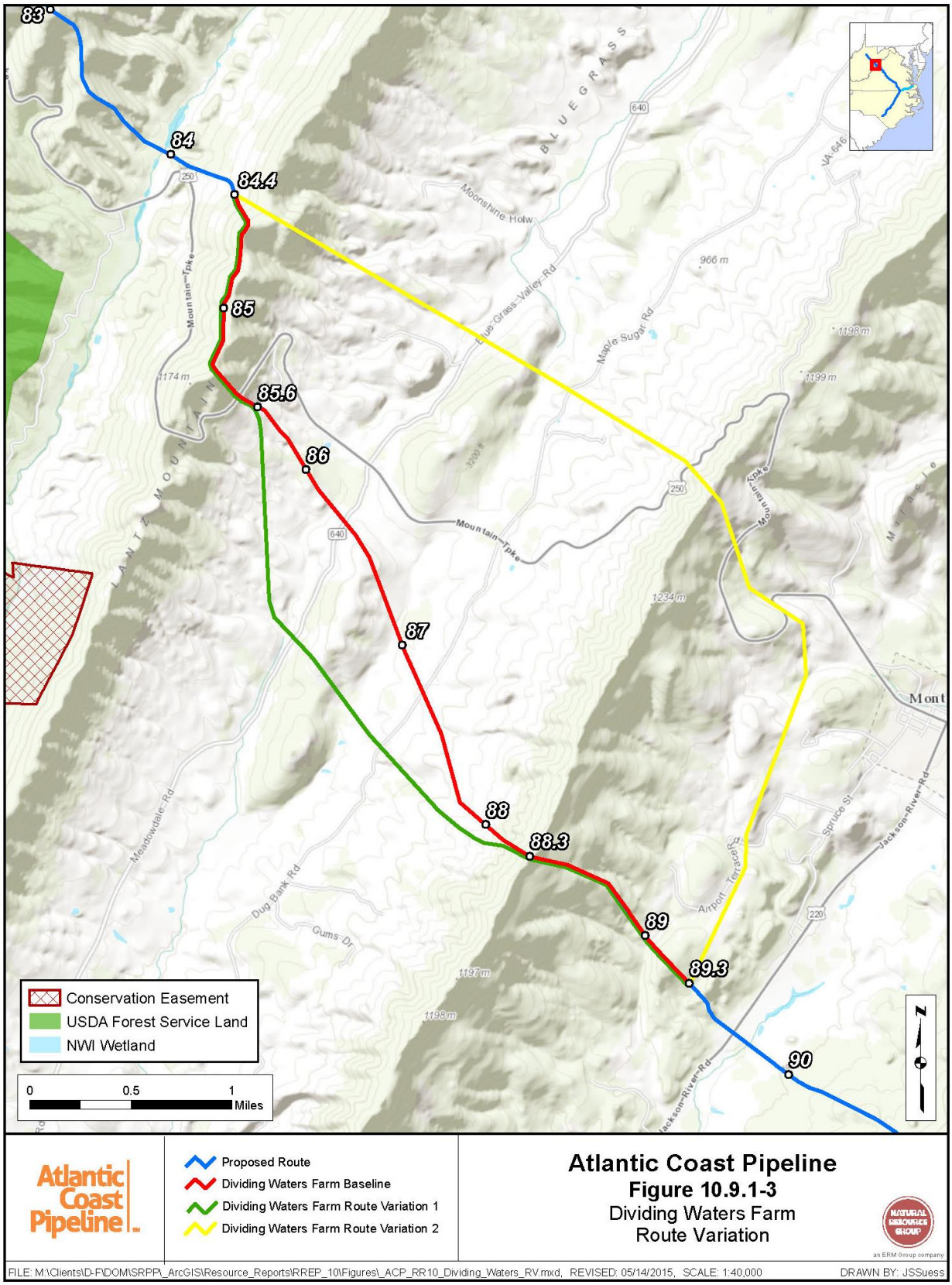
Atlantic identified and evaluated two route variations between MPs 85.6 and 88.3 in Highland County, Virginia in an effort to avoid the Dividing Waters Farm (see Figure 10.9.1-3 and Table 10.9.1-3). Various interested parties have advocated that this farm be purchased by the Commonwealth and turned into a new State park, and these parties requested that Atlantic avoid crossing this property. Additionally, the proposed route in the vicinity of Dividing Waters Farm crosses a sugar maple mixed forest landscape along U.S. Highway 250 which several individuals have said provides a unique viewshed. For purposes of the alternatives analysis, a segment of the MNF 2 alternative route described above was used as the baseline.

TABLE 10.9.1-3

Dividing Waters Farm Route Variations for the Atlantic Coast Pipeline

Features	Unit	Baseline Route	Dividing Waters Farm Route Variation 1	Dividing Waters Farm Route Variation 2
Length	miles	4.9	5.1	5.5
Roads crossed	number	3	3	7
Adjacent to existing linear corridor facilities	miles	0.0	0.0	3.3
Federal lands crossed	miles	0.0	0.0	0.0
Commonwealth lands crossed	miles	0.0	0.0	0.0
Private lands crossed	miles	4.9	5.1	5.5
Conservation easements crossed	miles	0.0	0.0	0.0
Forested land crossed	miles	3.6	3.0	2.5
Wetlands crossed	miles	0.0	0.0	0.0
Intermittent waterbodies crossed	number	7	9	6
Perennial waterbodies crossed	number	0	0	0
Potential future State park crossed	miles	1.3	0.3	0.0

Starting approximately at MP 84.4 on Lantz Mountain, the Dividing Waters Farm Route Variation 1 initially follows the same alignment as the baseline route for about 1.2 miles to the south. It then extends south for approximately 1.2 miles to an intersection with Meadowdale Road. From this point, the route heads to the southeast for 1.6 miles, crossing Dug Bank Road and rejoining the baseline route on Monterey Mountain approximately at MP 88.3. It then follows the same alignment as the baseline for about 1.1 miles to the terminus approximately at MP 89.3.


83
84
84.4
85
85.6
86
87
88
88.3
89
89.3
90
Conservation Easement
USDA Forest Service Land
NWI Wetland
0
0.5
1
Miles
Proposed Route
Dividing Waters Farm Baseline
Dividing Waters Farm Route Variation 1
Dividing Waters Farm Route Variation 2
Atlantic Coast Pipeline
Figure 10.9.1-3
Dividing Waters Farm
Route Variation
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While Dividing Waters Farms 1 reduces the crossing length of the Dividing Waters Farm by approximately 1.0 mile, it is 0.2 mile longer, crosses more difficult terrain (including side slope), and crosses 2 more intermittent waterbodies than the baseline. The route variation additionally passes near and potentially crosses a cemetery on the east slope of Lantz Mountain, and would require a more difficult crossing of Meadowdale Road than the baseline in an area immediately adjacent to a waterbody. In contrast, the baseline route crosses the road on flatter land. The route variation also does not address the comments regarding potential impacts on the viewshed in this area. For these reasons, Dividing Waters Farm 1 provides no environmental advantage over the baseline.

Based on information provided by FERC staff, Atlantic evaluated a second route variation (Dividing Waters Farm 2) which avoids Dividing Waters Farm altogether and potentially addresses comments regarding the viewshed. Starting approximately at MP 84.4, the route variation initially follows an existing electric transmission line (voltage and operator unknown) for approximately 3.3 miles to the southeast. It then heads south along a greenfield for about 2.8 miles on the east side of Monterey Mountain, terminating approximately at MP 88.3 along the baseline.

At 5.5 miles in length, Dividing Waters Farm 2 is 0.6 mile longer than the baseline, but is adjacent to an existing electric transmission line for a majority (60 percent) of the route. The route variation additionally avoids Dividing Waters Farm and crosses the fewest miles of forested lands and the fewest waterbodies of the three routes. Dividing Waters Farm 2 crosses both Meadowdale Road and Dug Bank Road adjacent to the existing electric transmission line, which would minimize visual impacts in the valley between Lantz and Monterey Mountains. As currently configured the route variation crosses side slope on the east side of Monterey Mountain, crosses U.S. Highway 250 in three locations, and is adjacent to the Hannah Airfield, a private use airport. Additional review of these areas is necessary to confirm constructability of the route.

Based on desktop data, Dividing Waters Farm 2 appears to provide several environmental advantages over the baseline and Dividing Waters Farm 2, but additional review of the route is necessary to confirm that the route is buildable. Therefore, Atlantic is continuing to evaluate the baseline and the Dividing Waters Farm 2 route variation.

10.9.1.4 Augusta Industrial Route Variation

Atlantic identified and evaluated a minor route variation between MPs 140.3 and 143.4 in Augusta County, Virginia, to avoid a proposed industrial development near the town of Stuarts Draft as requested by the Augusta County Planning Commission (see Figure 10.9.1-4). Relative to the baseline route, the Augusta Industrial Route Variation heads southeast near Highway 340 until it reaches Wayne Avenue. It then follows Wayne Avenue for approximately 0.2 mile, heads to the northeast, and joins the baseline east of Lipscomb Road. The route variation is 0.3 mile longer, crosses 0.3 mile more of forested land, and crosses two additional intermittent waterbodies, but it meets the request of the Augusta County Planning Commission by heading south of an existing Target Distribution Center and avoiding the proposed industrial area. As shown in Table 10.9.1-4, crossings of other resources along the two routes are similar. Because the route variation meets the request of the Augusta County Planning Board and environmental impacts would be similar, Atlantic incorporated the Augusta Industrial Route Variation into the proposed route.

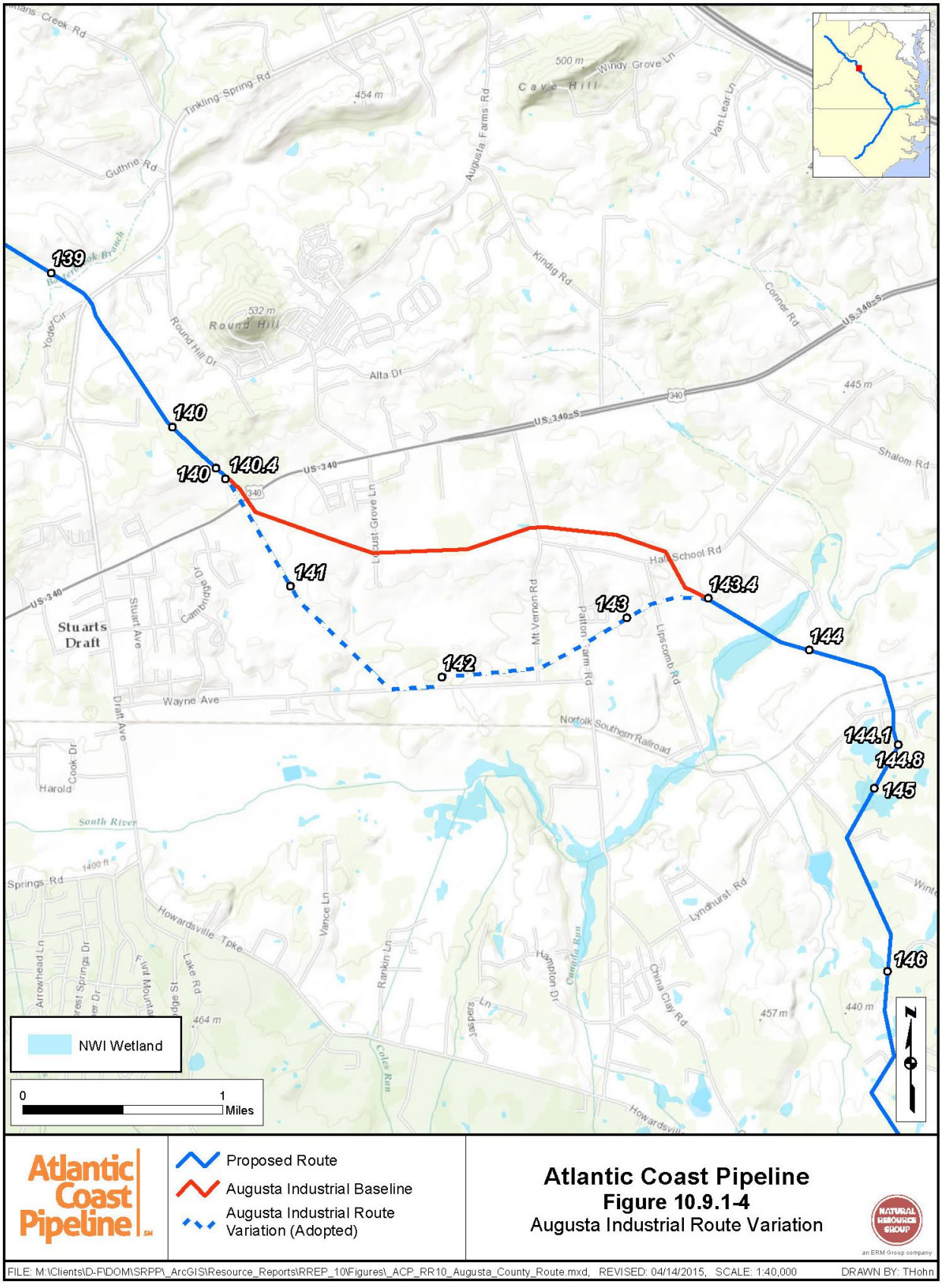
139
140
140
140.4
141
142
143
143.4
144
144.1
144.8
145
146
Stuarts Draft
Harold
Cave Hill
Round Hill
Windy Grove Ln
Tinkling Spring Rd
Guthrie Rd
Augusta Farms Rd
Kindig Rd
Van Lear Ln
Corner Rd
US-340=S
Alta Dr
Round Hill Dr
Yoder Cir
Shalom Rd
US-340
Lipscomb Rd
Hall School Rd
Mt Vernon Rd
Fairfax Farm Rd
Lipscomb Rd
Stuart Ave
Cambridge Dr
Draft Ave
Wayne Ave
Norfolk Southern Railroad
Cook Dr
South River
Springs Rd
Howardsville Tpke
Arrowhead Ln
Forest Springs Dr
Lake Rd
Vance Ln
Rankin Ln
Hampton Dr
Camelia Run
China Clay Rd
Lyndhurst Rd
Jaspers Ln
Cedar Run
500 m
454 m
532 m
445 m
464 m
457 m
440 m
1400 ft
NWI Wetland
0
1
Miles
Proposed Route
Augusta Industrial Baseline
Augusta Industrial Route Variation (Adopted)
Atlantic Coast Pipeline
Figure 10.9.1-4
Augusta Industrial Route Variation
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TABLE 10.9.1-4

Augusta Industrial Route Variation for the Atlantic Coast Pipeline

Features	Unit	Baseline Route	Augusta Industrial Route Variation (adopted)
Length	miles	2.7	3.0
Roads crossed	number	6	8
Adjacent to existing linear corridor facilities	miles	0.0	0.3
Federal lands crossed	miles	0.0	0.0
Commonwealth lands crossed	miles	0.0	0.0
Private lands crossed	miles	2.7	3.0
Conservation easements crossed	miles	0.0	0.0
Forested land crossed	miles	0.2	0.5
Wetlands crossed	miles	0.0	0.0
Intermittent waterbodies crossed	number	3	5
Perennial waterbodies crossed	number	0	0

10.9.1.5 Naked Mountain Route Variation

In the preliminary draft of Resource Report 10, Atlantic identified and evaluated a route variation along the AP-1 mainline route in Nelson County, Virginia to avoid Commonwealth land in the Naked Mountain Natural Preserve Area. This route variation subsequently was eclipsed by the East of Lovingston Major Route Alternative described above. Although the proposed route has changed in this area, it still avoids the Naked Mountain Natural Preserve Area. As shown on Figure 10.8.1-10, the preserve is located approximately 1.6 miles to the east of the proposed route near MP 170.

10.9.1.6 Norwood Route Variation

Atlantic identified and evaluated a route variation (Norwood Route Variation 1) between MPs 174.2 and 179.6 of the AP-1 mainline in Nelson County, Virginia to avoid crossing a conservation easement held by the VOF (see Figure 10.9.1-5 and Table 10.9.1-5). Starting just north of Red Apple Orchard, north of James River Road, the route variation initially extends approximately 1.5 miles east-southeast of the baseline route to Horse Mountain. It then turns south-southeast and continues for another 3.1 miles, rejoining the baseline route approximately 0.5 mile north of the James River crossing. Although it is 0.2 mile longer than the baseline, the route variation avoids the conservation easement and crosses 0.8 mile less of forested land and two fewer intermittent waterbodies. For these reasons, Atlantic initially incorporated Norwood Route Variation 1 into the proposed route.

Subsequent to adopting Norwood Route Variation 1, Atlantic evaluated a second alternative, Norwood Route Variation 2, at the request of a landowner. Starting at MP 174.2, Norwood Route Variation 2 initially heads east around Red Apple Orchard, then heads southeast passing east of James River Road. It rejoins Norwood Route Variation 1 approximately at MP 176.3 (see Figure 10.9.1-5).

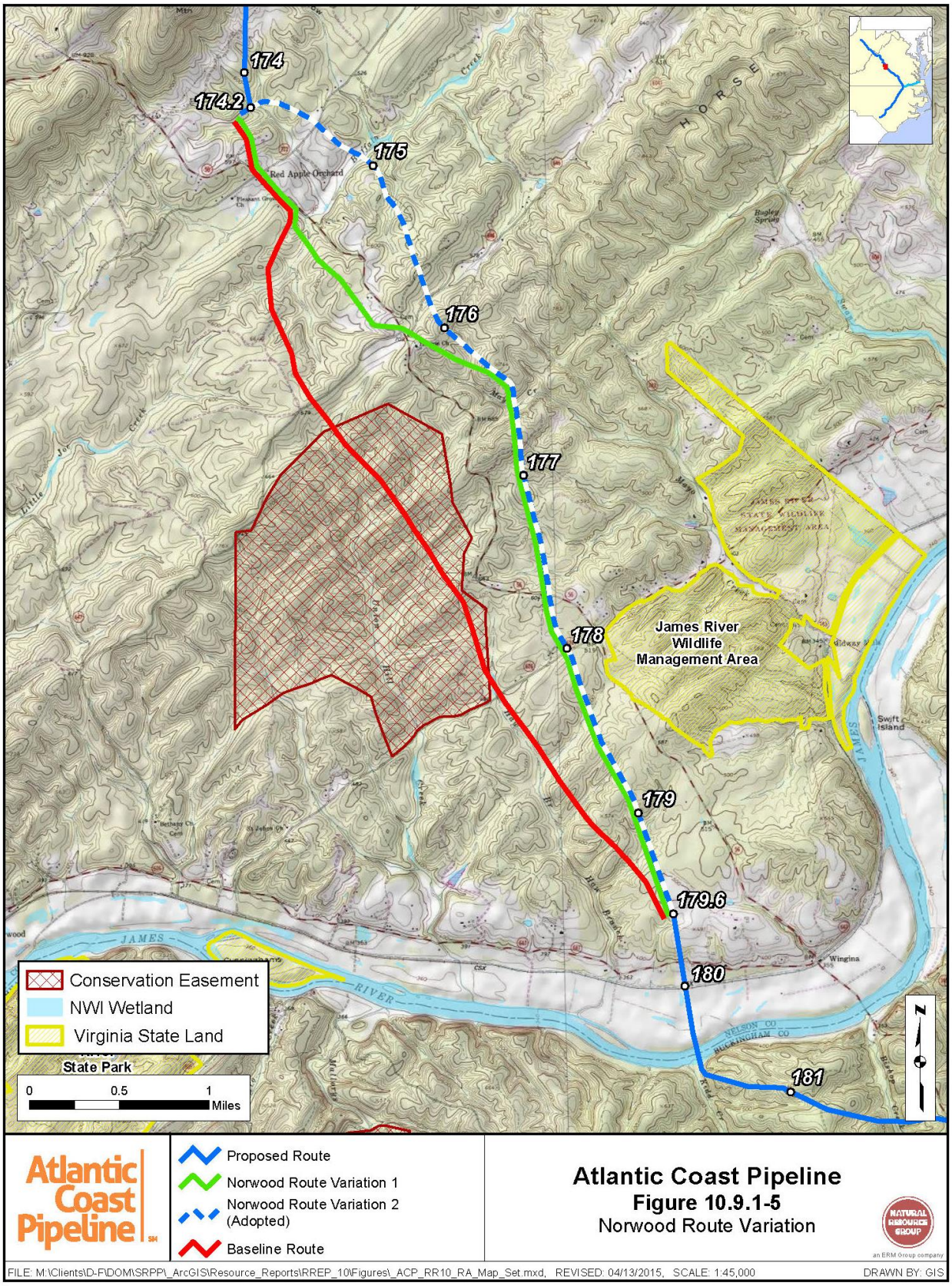
174
174.2
175
176
177
178
179
179.6
180
181
James River
Wildlife
Management Area
Red Apple Orchard
Swift
Island
Wingina
Conservation Easement
NWI Wetland
Virginia State Land
State Park
0
0.5
1
Miles
N
Atlantic
Coast
Pipeline
Proposed Route
Norwood Route Variation 1
Norwood Route Variation 2
(Adopted)
Baseline Route
Atlantic Coast Pipeline
Figure 10.9.1-5
Norwood Route Variation
NATURAL RESOURCE GROUP
an ERM Group company
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TABLE 10.9.1-5

Norwood Route Variation for the Atlantic Coast Pipeline

Features	Unit	Baseline Route	Norwood Route Variation 1	Norwood Route Variation 2 (Proposed)
Length	miles	5.3	5.4	5.5
Roads crossed	number	5	8	6
Adjacent to existing linear corridor facilities	miles	0.0	0.0	0.0
Federal lands crossed	miles	0.0	0.0	0.0
Commonwealth lands crossed	miles	0.2	0.0	0.0
Private lands crossed	miles	5.1	5.5	5.5
Conservation easements crossed	miles	1.3	0.0	0.0
Forested lands crossed	miles	4.1	4.3	4.4
Wetlands crossed	miles	<0.1	0.0	<0.1
Intermittent waterbodies crossed	number	9	7	8
Perennial waterbodies crossed	number	1	1	2

Relative to the initial alternative route, Norwood Route Variation 2 avoids residential lands along James River Road and reduces the number of affected landowners by nine. As shown in Table 10.9.1-5, crossings of other environmental features would be similar for the two alternative routes. Because the Norwood Route Variation 2 addresses a landowner issue, reduces the number of affected landowners, and is similar to Norwood Route Variation 1 in terms of environmental impacts, this variation was incorporated into the proposed route.

10.9.1.7 Wingina District Route Variation

The proposed AP-1 mainline route crosses a historic site on the north side of the James River near Wingina in Nelson County, Virginia, approximately at MP 180. The Wingina Historic District, which contains historic sites and buildings and may contain prehistoric sites, has been nominated for listing on the National Register of Historic Places. Atlantic identified a route variation (the Wingina District Route Variation) at the crossing of the James River in Nelson and Buckingham Counties, Virginia, in an effort to avoid the district (see Figure 10.9.1-6 and Table 10.9.1-6).

Relative to the baseline route (which is part of Norwood Route Variation 2), the Wingina District Route Variation initially extends to the southeast from MP 177.0 for approximately 2.7 miles, crossing Cabell Road, the James River Wildlife Management Area, Midway Mills Lane, and the James River. The route then heads south/southeast for approximately 3.4 miles, crossing Woodland Church Road and terminating along the baseline at MP 182.3 near Warminister Church Road.

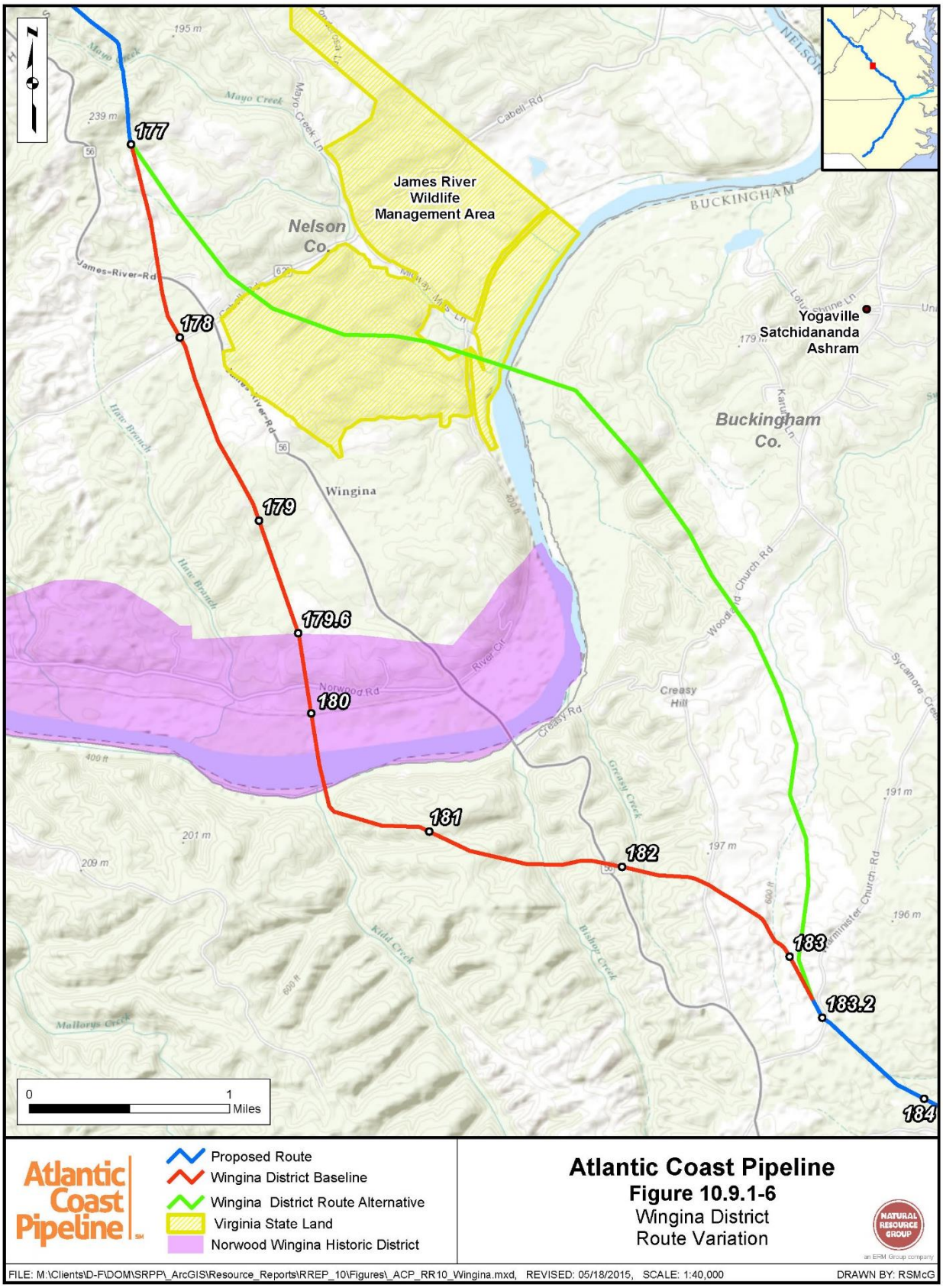
177
178
179
179.6
180
181
182
183
183.2
184
James River
Wildlife
Management Area
Nelson
Co.
Buckingham
Co.
Yogaville
Satchidananda
Ashram
Wingina
BUCKINGHAM
James-River-Rd
Cabell Rd
Creasy Rd
Norwood Rd
Creasy
Hill
0
1
Miles
Proposed Route
Wingina District Baseline
Wingina District Route Alternative
Virginia State Land
Norwood Wingina Historic District
Atlantic Coast Pipeline
Atlantic Coast Pipeline
Figure 10.9.1-6
Wingina District
Route Variation
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TABLE 10.9.1-6

Wingina District Route Variation for the Atlantic Coast Pipeline

Features	Unit	Baseline Route	Wingina District Route Variation
Length	miles	6.3	6.1
Roads crossed	number	7	5
Adjacent to existing linear corridor facilities	miles	0.0	0.0
Federal lands crossed	miles	0.0	0.0
Commonwealth lands crossed (James River Wildlife Management Area)	miles	0.0	1.1
Private lands crossed	miles	6.3	5.0
Conservation easements crossed	miles	0.6	0.0
Forested land crossed	miles	4.3	4.4
Wetlands crossed	miles	0.1	0.1
Intermittent waterbodies crossed	number	7	10
Perennial waterbodies crossed	number	3	3
Wingina Historic District	miles	0.8	0.0

There are advantages and disadvantages to both the baseline and alternative route in this area. The baseline route crosses approximately 0.8 mile of the Wingina Historic District, which may include one or more Native American cultural sites, as well as 0.6 mile of conservation easements held by the Virginia Department of Game and Inland Fisheries. The route variation avoids these areas, but crosses 1.1 miles of the James River Wildlife Management Area and passes nearer to (within about 1 mile of) the Yogaville Satchidananda Ashram in Buckingham County. Both routes cross the James River, which is a Section 10 navigable waterway, but the crossing along either route most likely would be by HDD. The route variation crosses three more intermittent waterbodies than the proposed route, but crossings of other features, such as forested lands, wetlands, and perennial waterbodies, are similar for both routes. For these reasons, Atlantic continues to evaluate both the baseline and Wingina District Route Variation.

10.9.1.8 Perry Hill Route Variation

Atlantic identified a route variation between MPs 186.8 and 189.4 of the AP-1 mainline in Buckingham County, Virginia to avoid a VOF conservation easement (see Figure 10.9.1-7 and Table 10.9.1-7). Beginning just north of the James River Highway, the route variation heads south for approximately 1.8 miles to a point near Matthews Creek. It then continues south-southeast for 0.6 mile where it intersects the baseline route near Willow Lake Road. The baseline route is approximately 0.1 mile shorter than the route variation, although both routes cross approximately 0.1 mile of wetland. The route variation crosses 0.6 mile more forested land and one additional perennial waterbody, but it avoids the conservation easement and crosses three fewer intermittent waterbodies. Atlantic incorporated the route variation into the proposed route because it avoids the conservation easement.

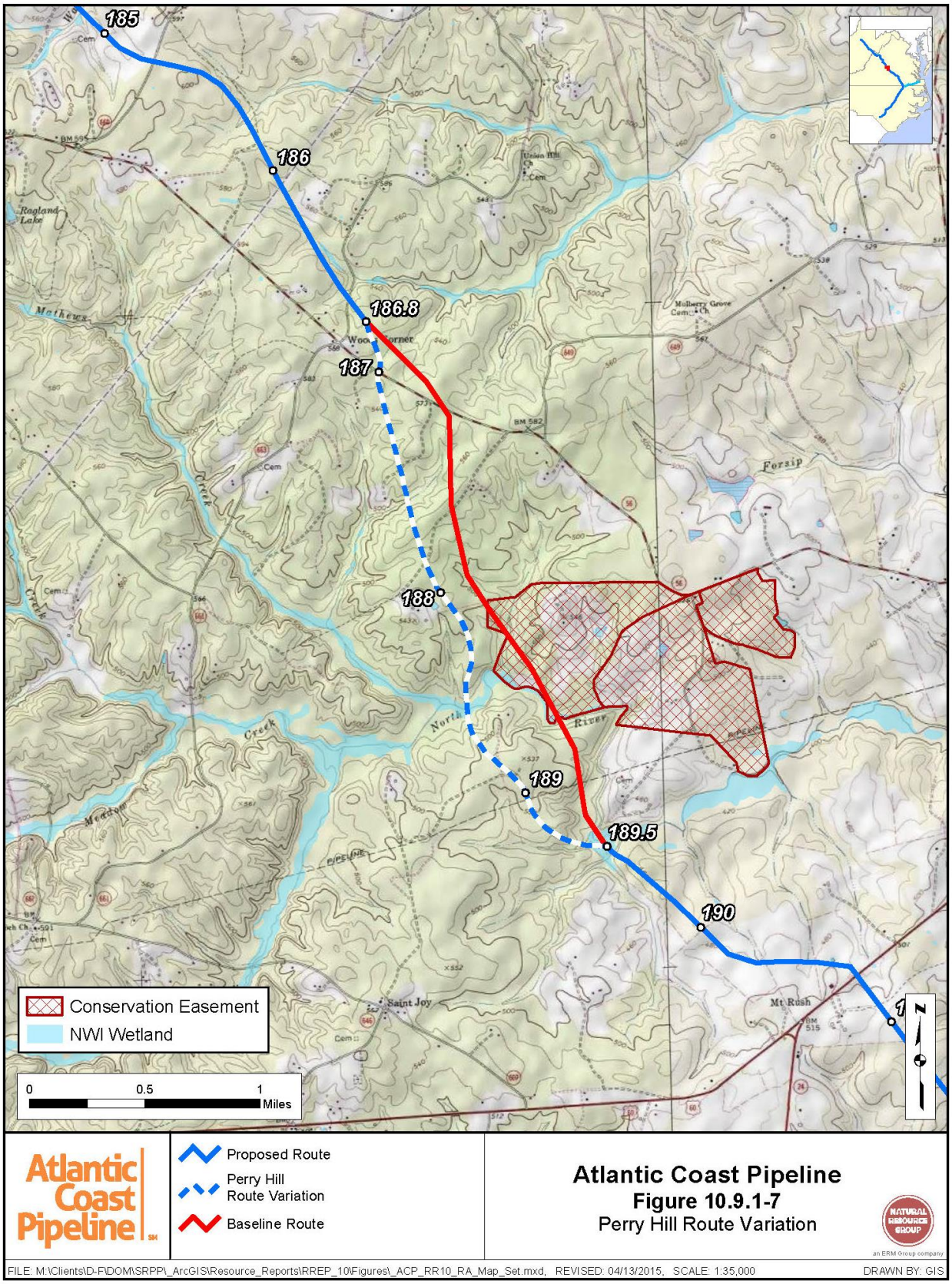
185
186
186.8
187
188
189
189.5
190
Conservation Easement
NWI Wetland
0
0.5
1
Miles
Proposed Route
Perry Hill
Route Variation
Baseline Route
Atlantic Coast Pipeline
Figure 10.9.1-7
Perry Hill Route Variation
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TABLE 10.9.1-7

Perry Hill Route Variation for the Atlantic Coast Pipeline

Features	Unit	Baseline Route	Perry Hill Route Variation (Proposed)
Length	miles	2.6	2.7
Roads crossed	number	1	1
Adjacent to existing linear corridor facilities	miles	0.0	0.0
Federal lands crossed	miles	0.0	0.0
Commonwealth lands crossed	miles	0.0	0.0
Private lands crossed	miles	2.4	2.4
Conservation easements crossed	miles	0.6	0.0
Forested land crossed	miles	1.7	2.3
Wetlands crossed – freshwater forested/shrub	miles	0.1	0.1
Intermittent waterbodies crossed	number	0	2
Perennial waterbodies crossed	number	4	1

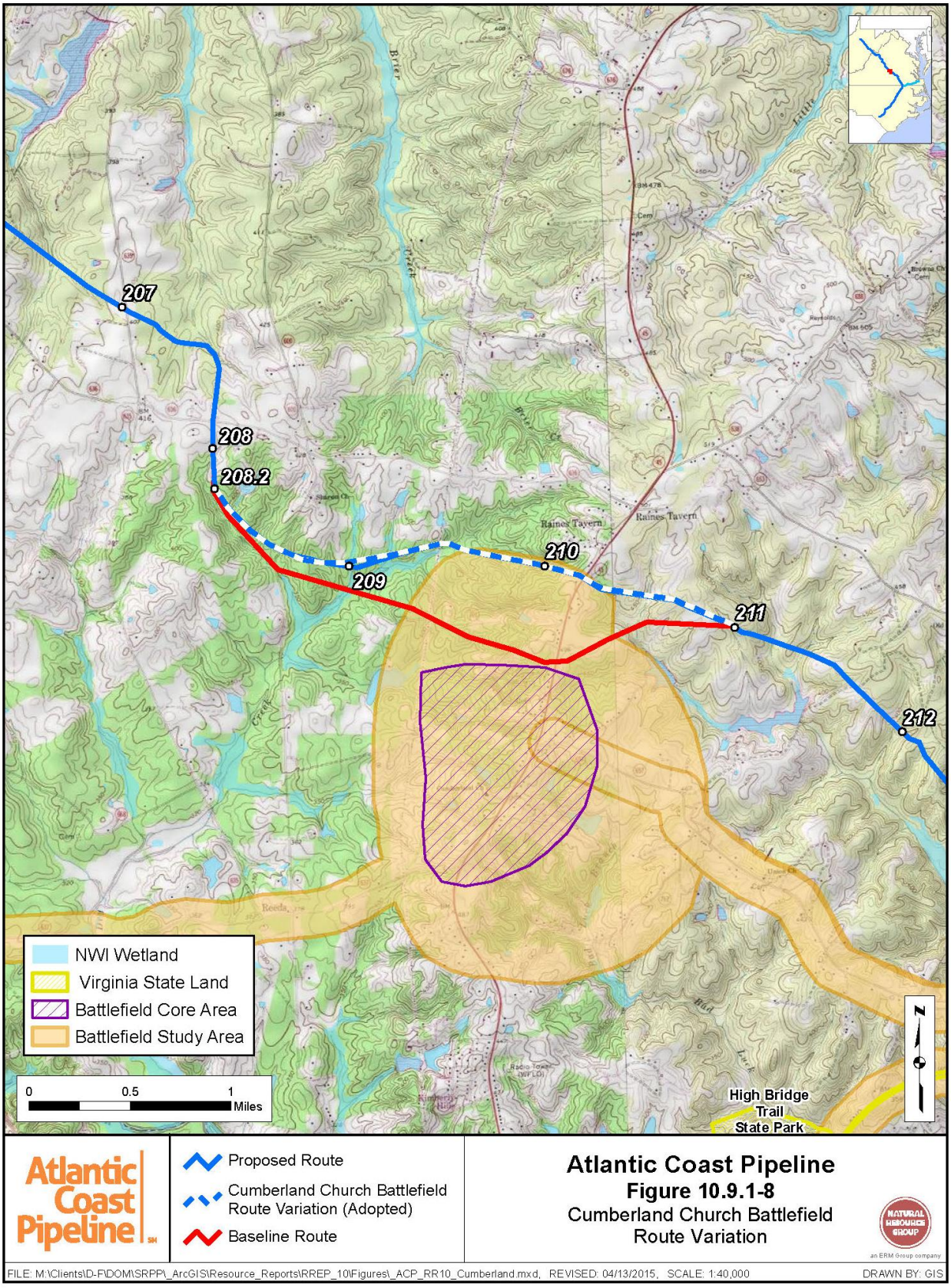
10.9.1.9 Cumberland Church Battlefield Route Variation

Atlantic identified and evaluated a route variation between MPs 208.1 and 211.0 of the AP-1 mainline in Cumberland County, Virginia to reduce the crossing length of the Cumberland Church Battlefield (see Figure 10.9.1-8 and Table 10.9.1-8). Starting south of Raines Tavern Road, the route variation extends east for approximately 2.9 miles, crossing Dry Creek and Atkins and Cumberland Roads. It rejoins the baseline route just west of Green Creek.

TABLE 10.9.1-8

Cumberland Church Battlefield Route Variation for the Atlantic Coast Pipeline

Features	Unit	Baseline Route	Cumberland Church Battlefield Route Variation (Proposed)
Length	miles	3.0	2.9
Roads crossed	number	3	2
Adjacent to existing linear corridor facilities	miles	0.0	0.0
Federal lands crossed	miles	0.0	0.0
Commonwealth lands crossed	miles	0.0	0.0
Private lands crossed	miles	3.0	2.9
Conservation easements crossed	miles	0.0	0.0
Forested land crossed	miles	2.3	2.3
Wetlands crossed – freshwater forested/shrub	miles	<0.1	<0.1
Intermittent waterbodies crossed	number	7	5
Perennial waterbodies crossed	number	2	2
Cumberland Church Battlefield study area	miles	1.1	0.7


207
208
208.2
209
210
211
212
Raines Tavern
NWI Wetland
Virginia State Land
Battlefield Core Area
Battlefield Study Area
0
0.5
1
Miles
N
High Bridge Trail State Park
Atlantic Coast Pipeline
Proposed Route
Cumberland Church Battlefield Route Variation (Adopted)
Baseline Route
Atlantic Coast Pipeline
Figure 10.9.1-8
Cumberland Church Battlefield Route Variation
NATURAL RESOURCE GROUP
an ERM Group company
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The route variation is 0.1 mile shorter than the baseline route and reduces the crossing length of the battlefield study area by 0.4 mile. Additionally, the route variation crosses the battlefield study area along the northern periphery of the site, approximately 0.5 mile north of the battlefield core area. In contrast, the baseline route crosses the north-central portion of the battlefield study area and passes within 150 feet of the core area of the site. The route variation additionally crosses two fewer intermittent waterbodies than the baseline route. Crossings of other resources are similar for the two routes. For these reasons, Atlantic incorporated the Cumberland Church Battlefield Route Variation into the proposed route.

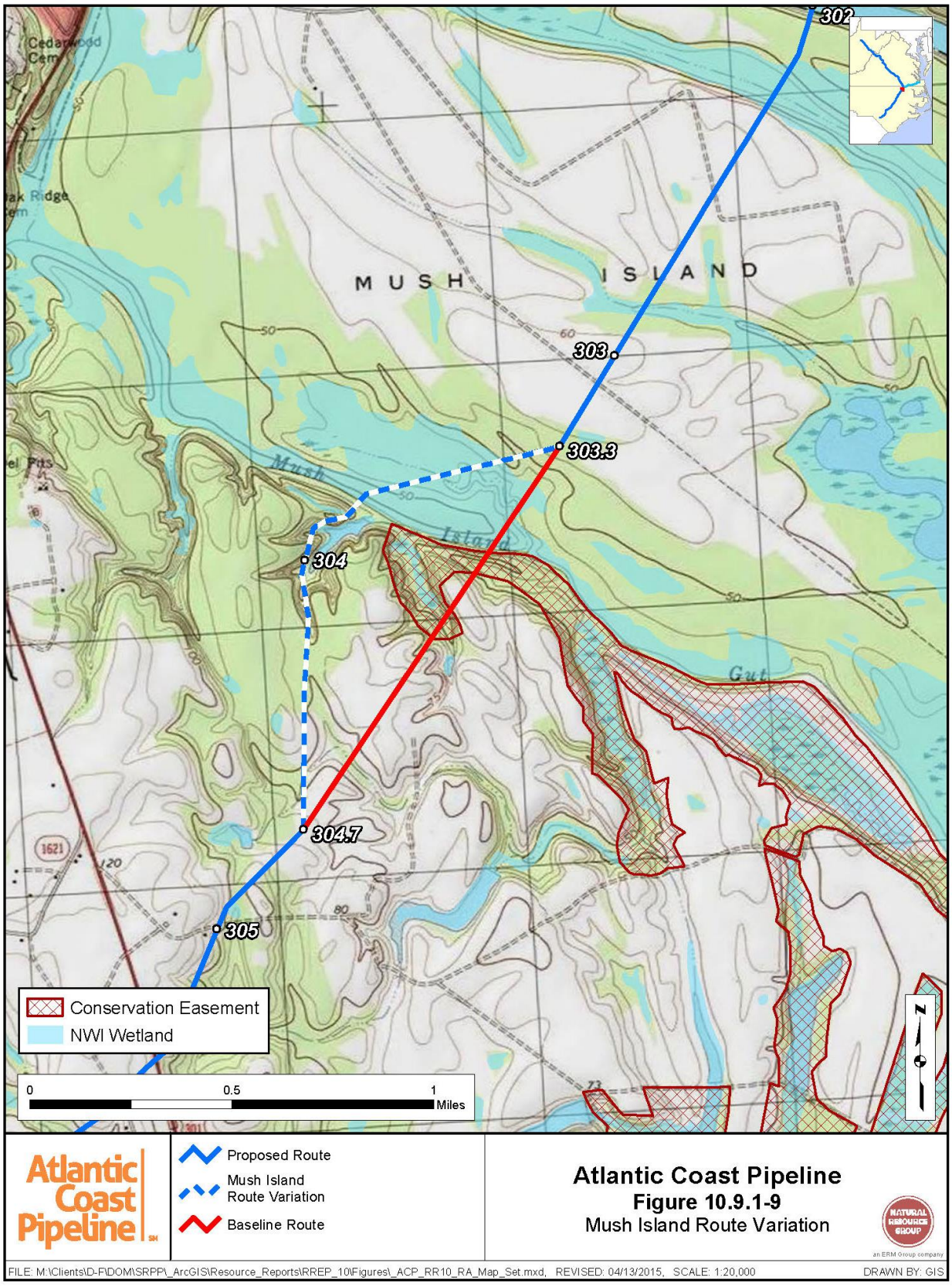
10.9.1.10 Mush Island Route Variation

Atlantic identified a route variation between MPs 303.3 and 304.7 of the AP-2 mainline route in Halifax County, North Carolina to avoid a conservation easement enrolled in the Natural Resources Conservation Service's (NRCS) Wetland Reserve Program (see Figure 10.9.1-9 and Table 10.9.1-9). Relative to the baseline route, the Mush Island Route Variation initially extends to the southwest of the baseline route for approximately 0.7 mile, and then turns due south for another 0.7 mile back to the baseline. The route variation is approximately 0.2 mile longer than the baseline route, but it avoids the conservation easement. The route variation additionally crosses approximately 0.6 mile more of forested land, 0.2 more mile of wetland, and one more intermittent waterbody. Because it avoids the conservation easement, however, Atlantic incorporated the Mush Island Route Variation into the proposed route.

TABLE 10.9.1-9

Mush Island Route Variation for the Atlantic Coast Pipeline

Features	Unit	Baseline Route	Mush Island Variation (Proposed)
Length	miles	1.2	1.4
Roads crossed	number	1	1
Adjacent to existing linear corridor facilities	miles	0.0	0.0
Federal lands crossed	miles	0.0	0.0
State lands crossed	miles	0.0	0.0
Private lands crossed	miles	1.2	1.4
Conservation easements crossed	miles	0.1	0.0
Forested land crossed	miles	0.4	1.0
Wetlands crossed – freshwater forested/shrub	miles	0.2	0.4
Intermittent waterbodies crossed	miles	0.0	<0.1
Perennial waterbodies crossed	number	1	2
Cumberland Church Battlefield study area	number	1	1


302
303
303.3
304
304.7
305
MUSH ISLAND
Conservation Easement
NWI Wetland
0
0.5
1
Miles
N
Proposed Route
Mush Island Route Variation
Baseline Route
Atlantic Coast Pipeline
Figure 10.9.1-9
Mush Island Route Variation
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10.9.1.11 Halifax Route Variation

Atlantic evaluated a route variation (the Halifax Route Variation) approximately between MPs 311.2 and 313.1 of the AP-2 mainline in Halifax County, North Carolina, in an effort to reduce crossings of forested land (see Figure 10.9.1-10 and Table 10.9.1-10). Starting about 0.3 mile east of Grapevine Road, the Halifax Route Variation initially heads south for 1.1 miles, crossing State Route 561. It then heads west for 1.2 miles, crossing Marsh Swamp, and terminating at the baseline just west of Justice Branch Road. The route variation reduces crossings of forested land by 0.2 mile and wetlands by 0.1 mile, but is 0.4 mile longer and crosses one more waterbody and one more road than the baseline. Because potential impacts for both routes are similar, the route variation provides no environmental advantage over the baseline. Therefore, Atlantic retained the baseline as the proposed route in this area.

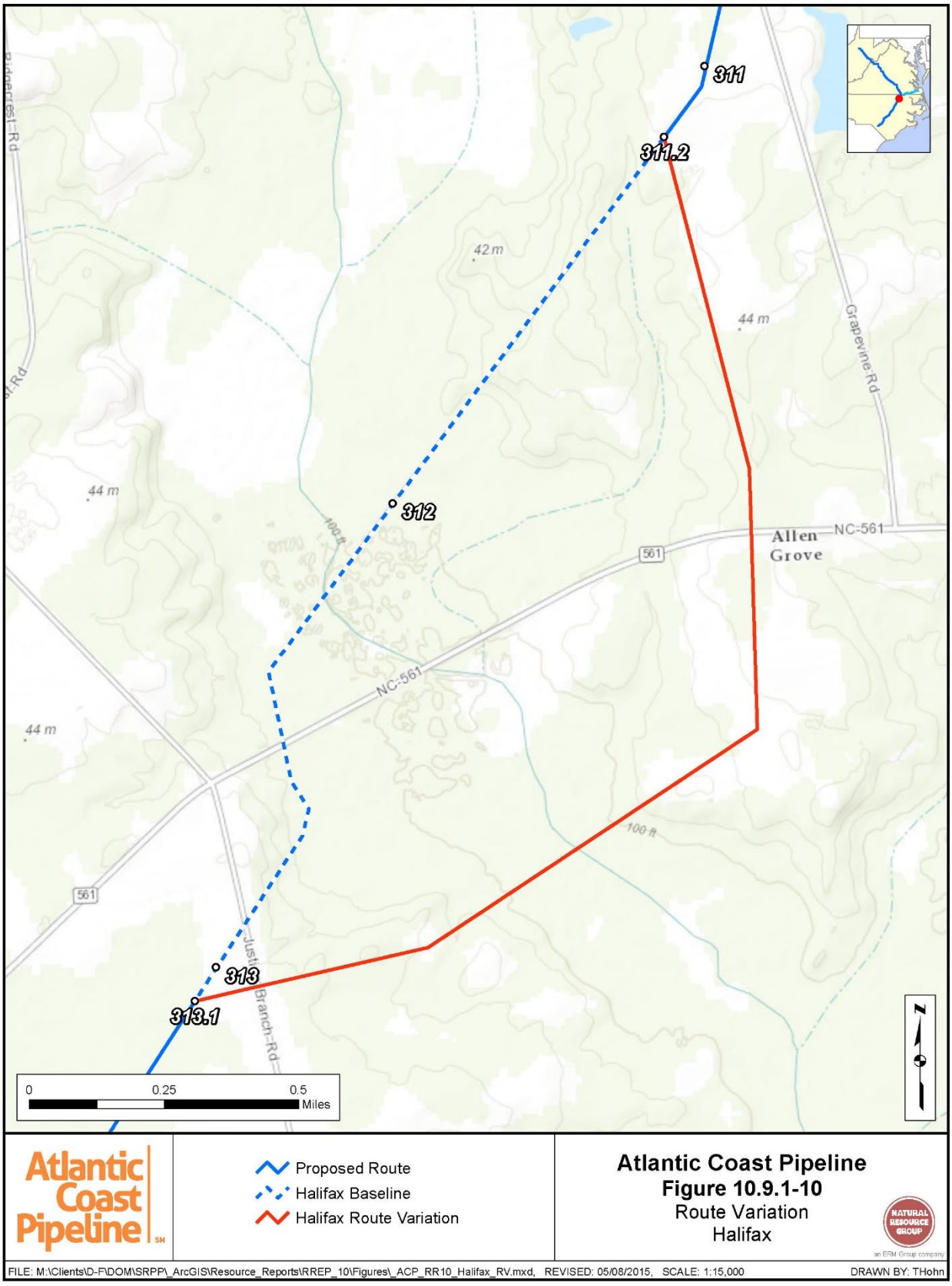
TABLE 10.9.1-10

Halifax Route Variation for the Atlantic Coast Pipeline

Features	Unit	Baseline Route	Halifax Route Variation
Length	miles	1.9	2.3
Roads crossed	number	2	3
Adjacent to existing linear corridor facilities	miles	0.0	0.0
Federal lands crossed	miles	0.0	0.0
State lands crossed	miles	0.0	0.0
Private lands crossed	miles	1.9	2.3
Conservation easements crossed	miles	0.0	0.0
Forested land crossed	miles	0.7	0.5
Wetlands crossed – freshwater forested/shrub	miles	0.3	0.2
Intermittent waterbodies crossed	number	1	2
Perennial waterbodies crossed	number	1	1
Battlefield study areas	miles	0.0	0.0

10.9.1.12 Breeches Swamp Route Variation

Atlantic identified a route variation between MPs 320.3 and 322.4 of the AP-2 mainline route in Halifax County, North Carolina to avoid two conservation easements enrolled in the NRCS's Conservation Reserve Program (see Figure 10.9.1-11 and Table 10.9.1-11). Starting at a point just south of Ringwood Road, the Breeches Swamp Route Variation extends west of the baseline route for approximately 0.7 mile, crossing I-95. It then heads due south for approximately 1.4 miles parallel to and west of I-95, rejoining the baseline route approximately 0.3 mile south of Sneed Road. The route variation is approximately 0.2 mile longer than the baseline route and crosses approximately 0.1 more mile of wetland, but it avoids the conservation easement, crosses 0.1 mile less of forested land, and crosses one less intermittent waterbody. For these reasons, Atlantic incorporated the Breeches Swamp Route Variation into the proposed route.


311
311.2
312
313
313.1
42 m
44 m
44 m
44 m
Grapevine Rd
Allen Grove
NC-561
561
NC-561
561
100 ft
100 ft
Justice Branch Rd
0
0.25
0.5
Miles
N
Atlantic Coast Pipeline
Proposed Route
Halifax Baseline
Halifax Route Variation
Atlantic Coast Pipeline
Figure 10.9.1-10
Route Variation
Halifax
NATURAL RESOURCE GROUP
an ERM Group company
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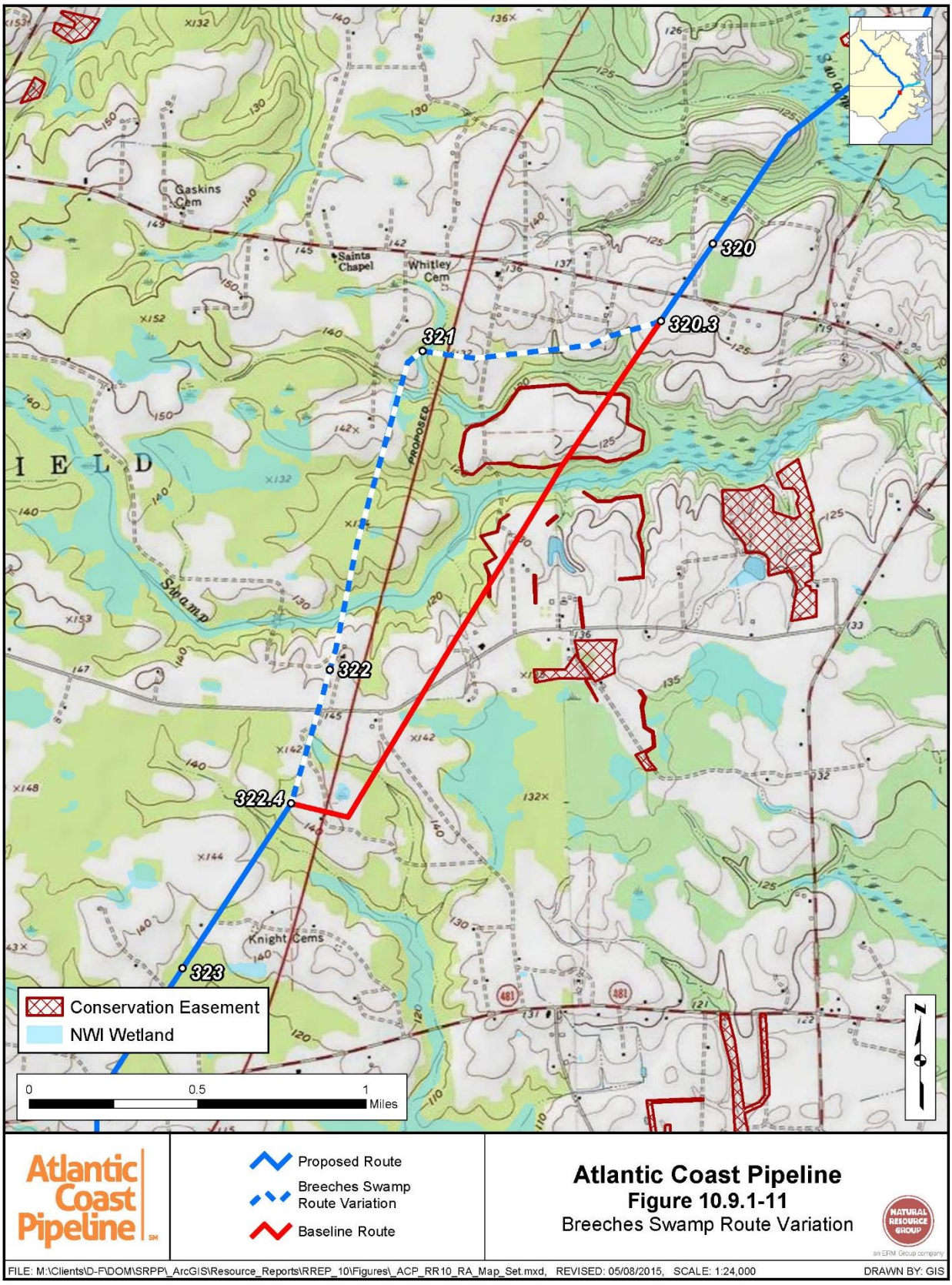
320
320.3
321
322
322.4
323
Gaskins Cem
Saints Chapel
Whitley Cem
Knight Cems
Swamp
PROPOSED
Conservation Easement
NWI Wetland
0
0.5
1
Miles
N
Proposed Route
Breeches Swamp Route Variation
Baseline Route
Atlantic Coast Pipeline
Figure 10.9.1-11
Breeches Swamp Route Variation
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TABLE 10.9.1-11

Breeches Swamp Route Variation for the Atlantic Coast Pipeline

Features	Unit	Baseline Route	Breeches Swamp Route Variation (Proposed)
Length	miles	1.9	2.1
Roads crossed	number	4	6
Adjacent to existing linear corridor facilities	miles	0.0	0.0
Federal lands crossed	miles	0.0	0.0
State lands crossed	miles	0.0	0.0
Private lands crossed	miles	1.9	2.1
Conservation easements crossed	miles	0.1	0.0
Forested land crossed	miles	0.4	0.3
Wetlands crossed – freshwater forested/shrub	miles	0.1	0.2
Intermittent waterbodies crossed	number	3	2
Perennial waterbodies crossed	number	1	1

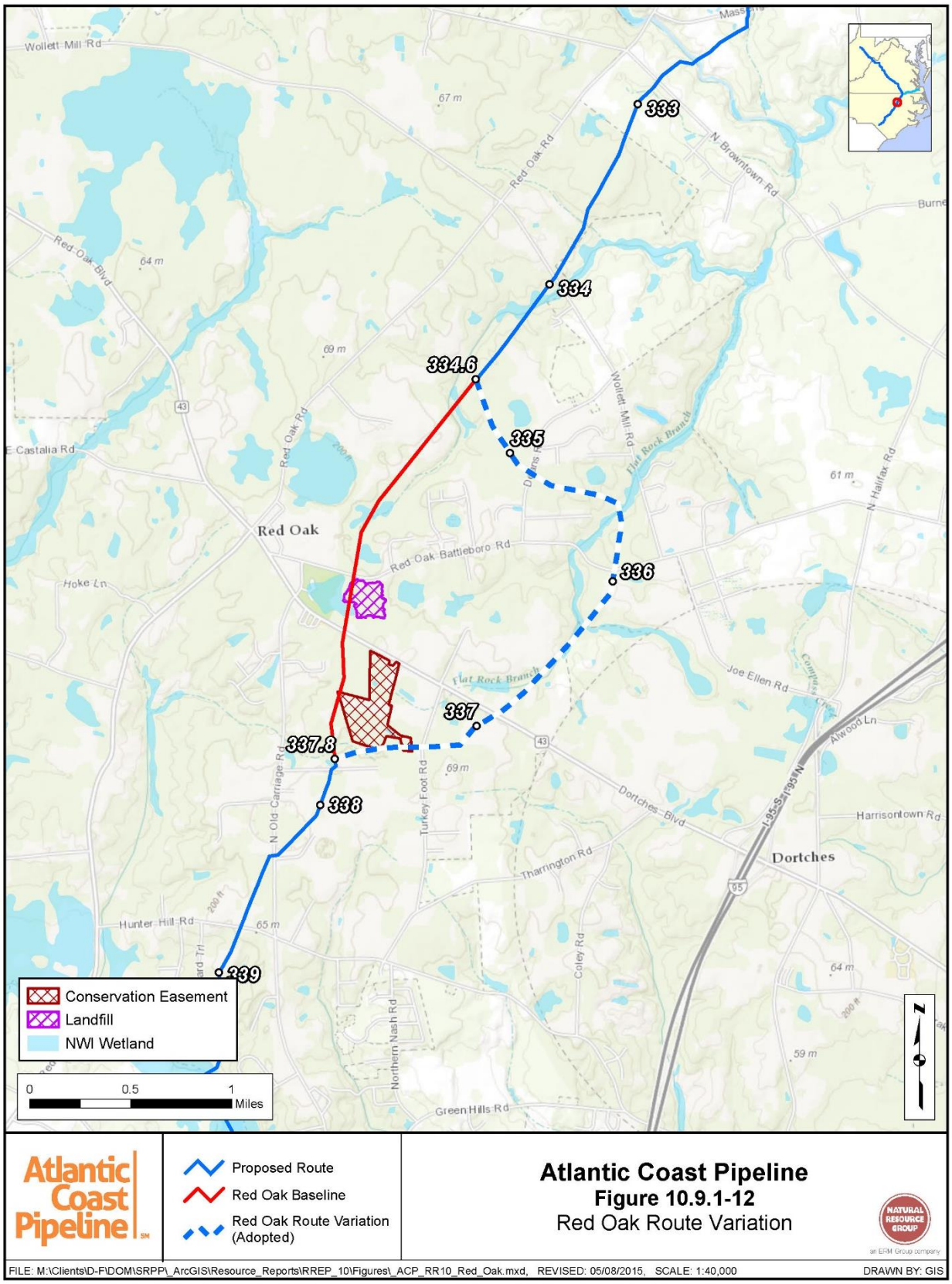
10.9.1.13 Red Oak Route Variation

Atlantic identified a route variation between MPs 334.6 and 337.7 of the AP-2 mainline route in Nash County, North Carolina, to avoid a former landfill (see Figure 10.9.1-12 and Table 10.9.1-12). Starting north of the town of Red Oak, the route variation initially heads southeast for approximately 1.0 mile, and then turns south for approximately 1.5 miles, passing east of an existing subdivision along Flat Rock Road and Red Oak Battleboro Drive. The route then heads west for approximately 0.6 mile, rejoining the baseline at a point just north of Big Jim Road.

TABLE 10.9.1-12

Red Oak Route Variation for the Atlantic Coast Pipeline

Features	Unit	Baseline Route	Red Oak Route Variation
Length	miles	2.1	3.2
Roads crossed	number	2	4
Adjacent to existing linear corridor facilities	miles	0.0	0.0
Federal lands crossed	miles	0.0	0.0
State lands crossed	miles	0.0	0.0
Private lands crossed	miles	2.1	3.2
Conservation easements crossed	miles	<0.1	<0.1
Forested land crossed	miles	1.0	1.2
Wetlands crossed – forested/shrub	miles	0.2	0.2
Intermittent waterbodies crossed	number	3	4
Perennial waterbodies crossed	number	1	3
Historic landfill area	miles	0.1	0.0


333
334
334.6
335
336
337
337.8
338
339
Red Oak
Dortches
Conservation Easement
Landfill
NWI Wetland
0 0.5 1 Miles
Proposed Route
Red Oak Baseline
Red Oak Route Variation (Adopted)
Atlantic Coast Pipeline
Figure 10.9.1-12
Red Oak Route Variation
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The route variation avoids an approximately 0.1 mile long crossing of the Red Oak Landfill, which operated from 1969 to 1977. The North Carolina Department of Environment and Natural Resources reported the one-time disposal of 135 pounds of pesticides and a three-year weekly disposal of waste rags containing the solvent methyl isobutyl ketone at the landfill. The route variation is approximately 1.1 mile longer than the baseline, but avoids the former landfill. Crossings of other features are similar or identical for the two routes. In light of the avoidance of the former landfill, and the similar impact on other major resource considerations, Atlantic incorporated the Red Oak Route Variation into the proposed route.

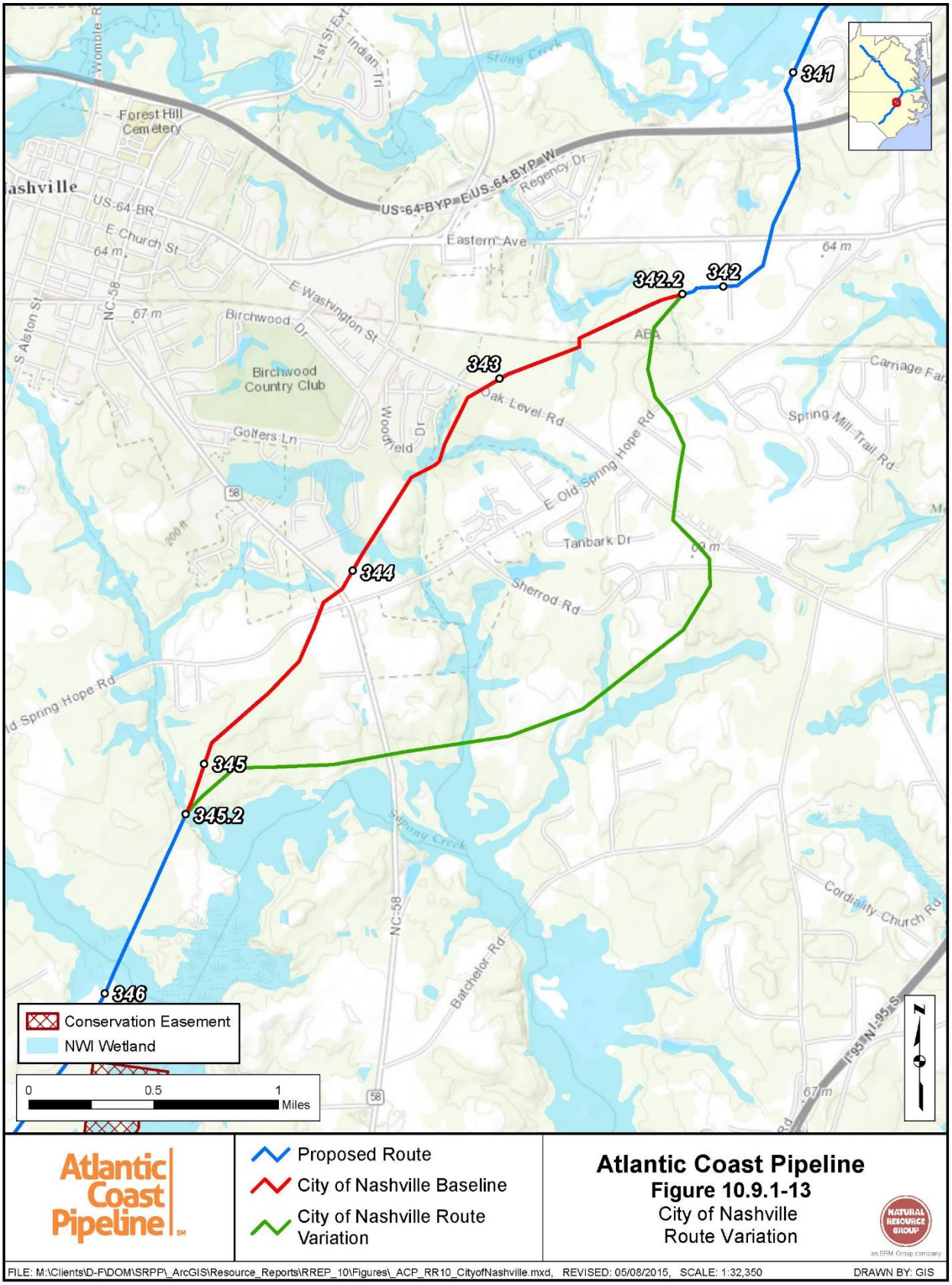
10.9.1.14 City of Nashville Route Variation

Atlantic identified and evaluated a route variation for the AP-2 mainline route at the request of the City of Nashville, in an effort to avoid the proposed route running between two existing subdivisions on the south side of Oak Level Road (see Figure 10.9.1-13 and Table 10.9.1-13). Starting at MP 342.2, the route variation initially heads south for approximately 1.5 miles, passing east of these subdivisions and crossing East Old Springs Hope and Oak Level Roads. It then heads southwest for 2.2 miles, crossing North Carolina State Road 58, and intersecting the baseline at MP 345.2. The City of Nashville Route Variation is approximately 0.7 mile longer than the baseline. It crosses 0.8 mile more of forested land, but 0.2 mile less of forested wetland. While the route variation avoids the subdivisions west of East Old Spring Hope Roads, it crosses between other subdivisions along Oak Level Road and Sherrod Road. For these reasons, Atlantic retained the baseline route in this area.

TABLE 10.9.1-13

City of Nashville Route Variation for the Atlantic Coast Pipeline

Features	Unit	Baseline Route	City of Nashville Route Variation
Length	miles	3.0	3.7
Roads crossed	number	4	5
Adjacent to existing linear corridor facilities	miles	0.0	0.0
Federal lands crossed	miles	0.0	0.0
State lands crossed	miles	0.0	0.0
Private lands crossed	miles	3.0	3.7
Conservation easements crossed	miles	0.0	0.0
Forested land crossed	miles	0.5	1.3
Wetlands crossed – freshwater forested/shrub	miles	0.3	0.1
Intermittent waterbodies crossed	number	2	1
Perennial waterbodies crossed	number	0	1


341
342
342.2
343
344
345
345.2
346
Forest Hill Cemetery
US-64-BYP-E/US-64-BYP-W
US-64-BR
E Church St
Eastern Ave
Regency Dr
E Washington St
Birchwood Dr
Birchwood Country Club
Golfers Ln
Woodfield Dr
Oak Level Rd
E Old Spring Hope Rd
Spring Mill Trail Rd
Tanbark Dr
Sherrod Rd
Cordiality Church Rd
Batchelor Rd
NC-58
Stony Creek
Conservation Easement
NWI Wetland
0 0.5 1 Miles
Proposed Route
City of Nashville Baseline
City of Nashville Route Variation
Atlantic Coast Pipeline
Figure 10.9.1-13
City of Nashville
Route Variation
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10.9.1.15 Swamp Road Route Variation

Atlantic identified a route variation between MPs 423.0 and 425.7 of the AP-2 mainline route in Cumberland County, North Carolina to minimize crossings of forested wetland (see Figure 10.9.1-14 and Table 10.9.1-14). The Swamp Road Route Variation generally parallels the initial baseline route beginning at a point just north of River Road and extending 2.7 miles south-southwest to Rick Walker Road. The route variation passes east of a forested wetland near MP 423.7 and west of a forested wetland near MP 424.7. It crosses 0.8 mile less of forested wetland, 0.6 mile less of forested land, and three fewer perennial waterbodies than the initial baseline route. As a result, Atlantic incorporated the Swamp Road Route Variation into the proposed route.

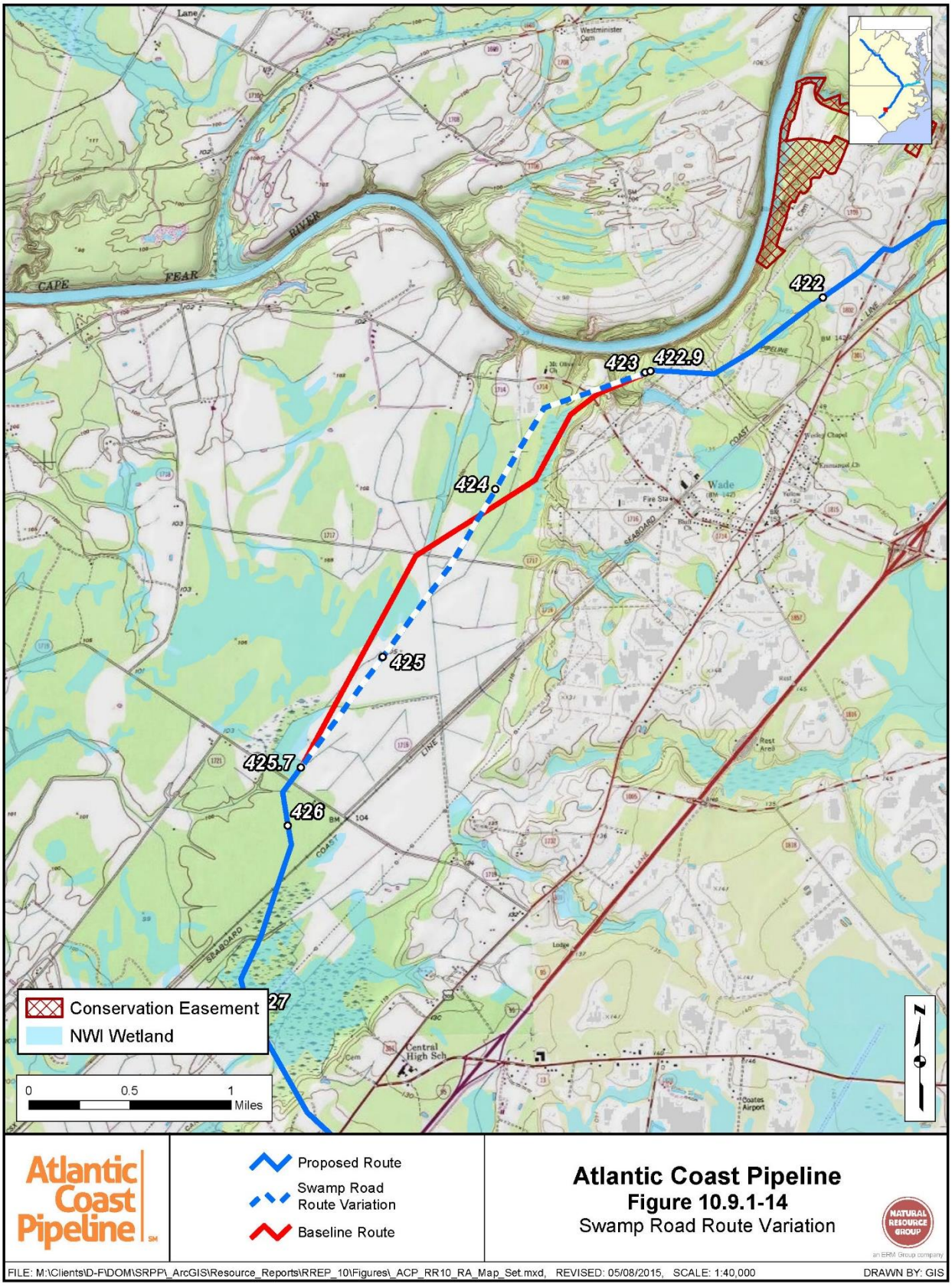
TABLE 10.9.1-14

Swamp Road Route Variation for the Atlantic Coast Pipeline

Features	Unit	Baseline Route	Swamp Road Route Variation (Proposed)
Length	miles	2.7	2.7
Roads crossed	number	3	2
Adjacent to existing linear corridor facilities	miles	0.0	0.0
Federal lands crossed	miles	0.0	0.0
State lands crossed	miles	0.0	0.0
Private lands crossed	miles	2.7	2.7
Conservation easements crossed	miles	0.0	0.0
Forested land crossed	miles	1.4	0.8
Wetlands crossed – freshwater forested/shrub	miles	0.9	0.1
Intermittent waterbodies crossed	number	2	2
Perennial waterbodies crossed	number	4	1

10.9.1.16 Cape Fear Route Variation

Atlantic identified and evaluated a route variation between MPs 438.3 and 443.6 in Cumberland County, North Carolina to avoid a conservation easement enrolled in the NRCS's Wetland Reserve Program (see Figure 10.9.1-15 and Table 10.9.1-15). From a point near Cedar Creek Road, the Cape Fear Route Variation heads approximately 1.5 miles to the southwest of the baseline route to Evans Dairy Road. It then continues to the south-southwest for approximately 3.8 miles, crossing the Cape Fear River and rejoining the baseline route near Tyson Road. The route variation is approximately 0.2 mile longer than the baseline route, crosses 0.2 mile more of forested land, and crosses two more perennial waterbodies than the baseline route. However, it avoids the conservation easement and reduces crossings of forested wetlands by 0.1 mile. For these reasons, Atlantic adopted the Cape Fear Route Variation into the proposed route.


422
422.9
423
424
425
425.7
426
427
Conservation Easement
NWI Wetland
0 0.5 1 Miles
N
Proposed Route
Swamp Road Route Variation
Baseline Route
Atlantic Coast Pipeline
Figure 10.9.1-14
Swamp Road Route Variation
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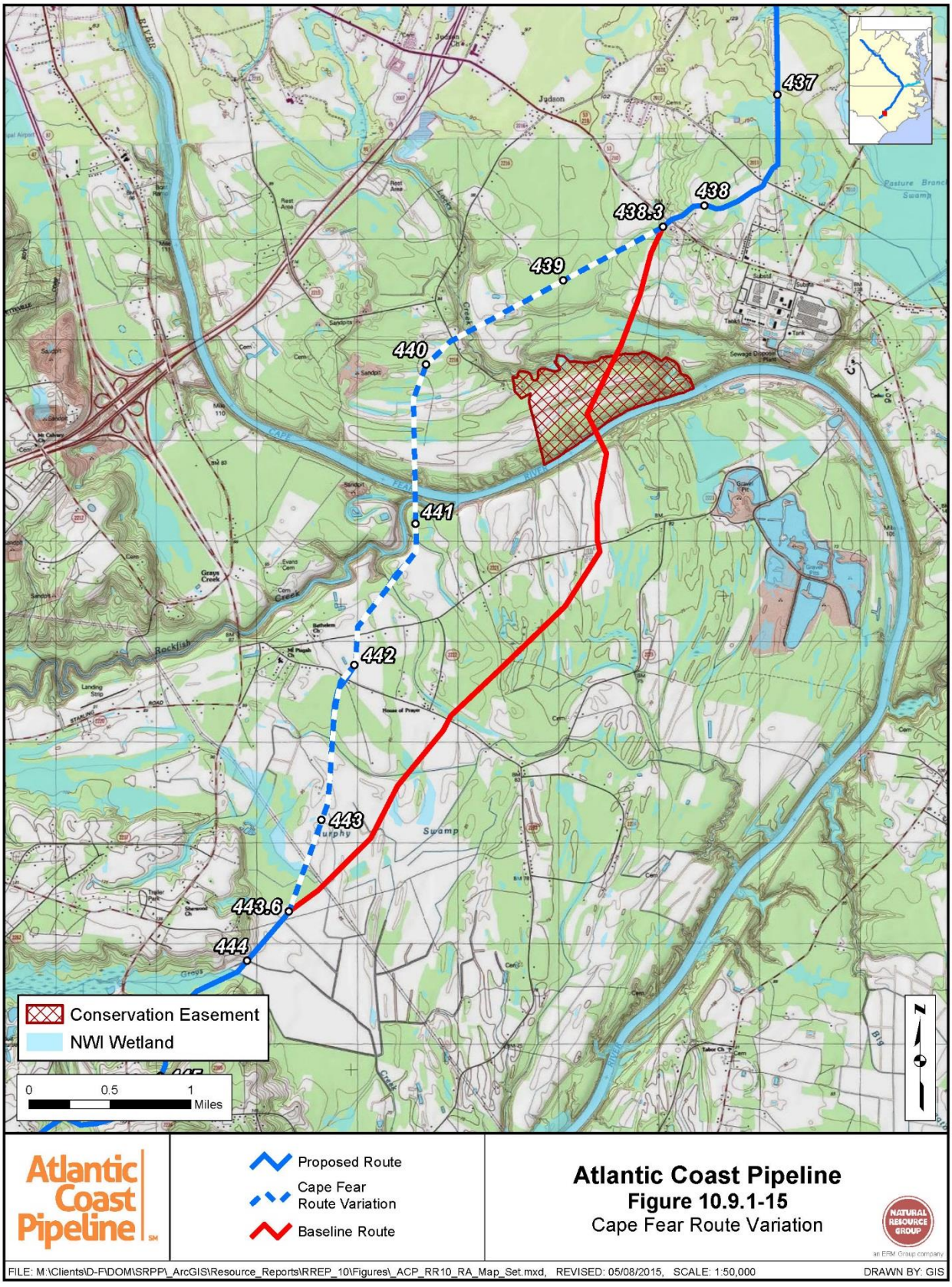
437
438
438.3
439
440
441
442
443
443.6
444
Conservation Easement
NWI Wetland
0
0.5
1
Miles
N
Atlantic Coast Pipeline
Proposed Route
Cape Fear Route Variation
Baseline Route
Atlantic Coast Pipeline
Figure 10.9.1-15
Cape Fear Route Variation
NATURAL RESOURCE GROUP
an ERM Group company
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TABLE 10.9.1-15

Cape Fear Route Variation for the Atlantic Coast Pipeline

Features	Unit	Baseline Route	Cape Fear Route Variation (Proposed)
Length	miles	5.1	5.3
Roads crossed	number	2	5
Adjacent to existing linear corridor facilities	miles	0.0	0.0
Federal lands crossed	miles	0.0	0.0
State lands crossed	miles	0.0	0.0
Private lands crossed	miles	5.1	5.3
Conservation easements crossed	miles	0.5	0.0
Forested land crossed	miles	1.7	1.9
Wetlands crossed – freshwater forested/shrub	miles	0.3	0.2
Intermittent waterbodies crossed	number	4	3
Perennial waterbodies crossed	number	2	4

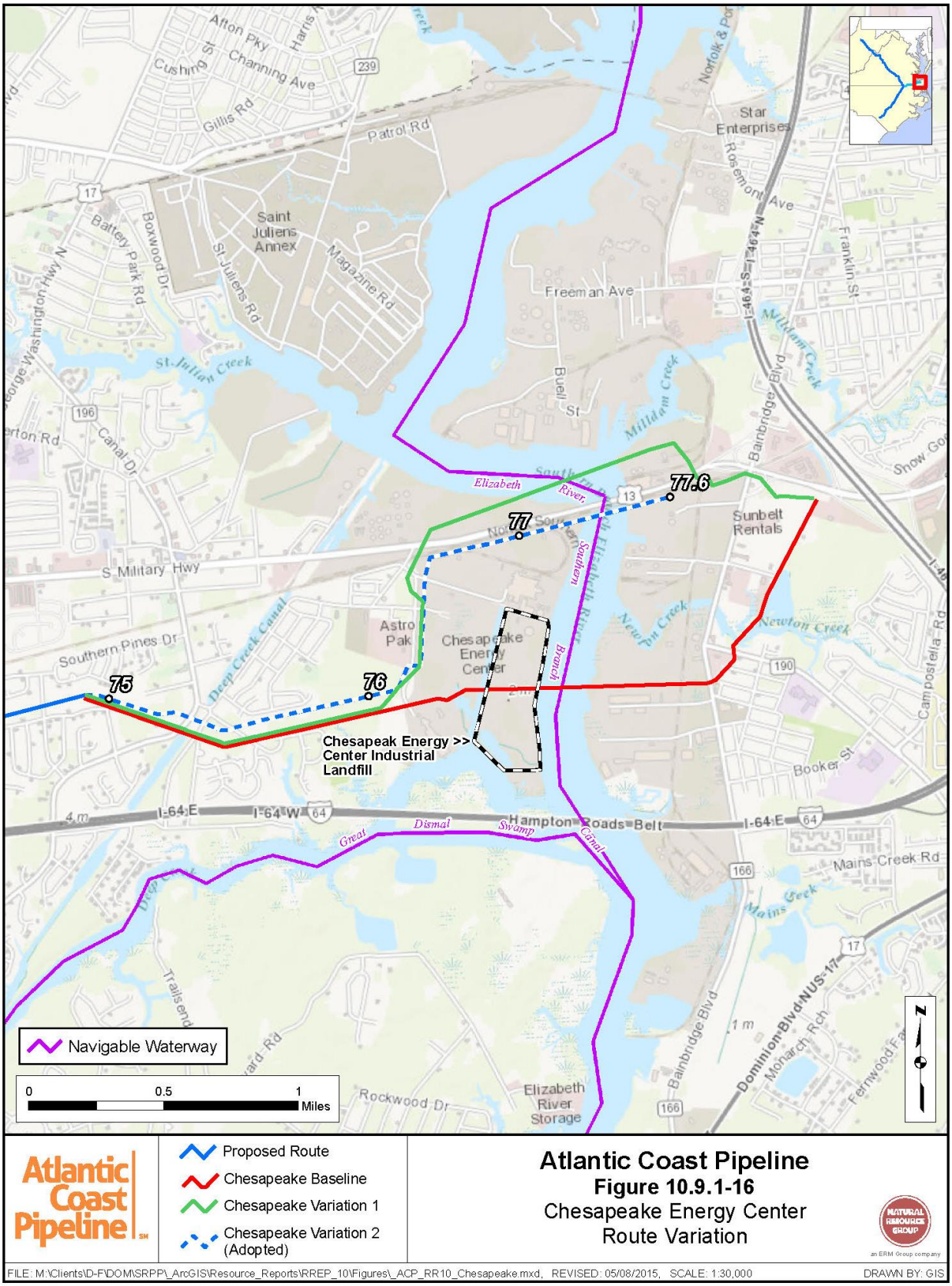
10.9.1.17 Chesapeake Energy Center Route Variation

Atlantic identified and evaluated two route variations between MP 76.0 and the end of the AP-3 lateral to avoid an industrial landfill at the Chesapeake Energy Center in the City of Chesapeake, Virginia (see Figure 10.9.1-16 and Table 10.9.1-16). The Chesapeake Energy Center Route Variation 1 initially heads north of the baseline for 0.8 mile along Steel Street; then heads east for 0.9 mile crossing the Elizabeth River and paralleling the north side of U.S. Highway 13; then heads east/southeast for 0.7 mile to the terminus of the route. This route variation is 0.3 mile longer than the baseline and crosses 0.2 mile more of forested lands. However, the Chesapeake Energy Center Route Variation 1 avoids crossing the industrial landfill as well as two other environmentally impacted sites. Crossings of other features along the two routes are similar.

TABLE 10.9.1-16

Chesapeake Energy Center Route Variation for the Atlantic Coast Pipeline

Features	Unit	Baseline Route	Chesapeake Energy Center Route Variation 1	Chesapeake Energy Center Route Variation 2
Length	miles	3.2	3.5	2.7
Roads crossed	number	9	17	7
Adjacent to existing linear corridor facilities	miles	3.1	1.5	2.7
Federal lands crossed	miles	0.0	0.0	0.0
Commonwealth lands crossed	miles	0.0	0.0	0.0
Private lands crossed	miles	3.2	3.5	2.7
Conservation easements crossed	miles	0.0	0.0	0.0
Forested land crossed	miles	0.8	1.0	0.5
Wetlands crossed – freshwater forested/shrub	miles	0.1	0.1	0.4
Wetlands crossed – freshwater emergent	miles	0.1	0.1	<0.1
Wetlands crossed – marine	miles	0.5	0.4	0.1
Intermittent waterbodies crossed	number	0	0	0
Perennial waterbodies crossed	number	7	6	3
Chesapeake Energy Center Industrial Landfill	miles	0.2	0.0	0.0


Navigable Waterway
0 0.5 1 Miles
Chesapeak Energy >> Center Industrial Landfill
75
76
77
77.6
Proposed Route
Chesapeake Baseline
Chesapeake Variation 1
Chesapeake Variation 2 (Adopted)
Atlantic Coast Pipeline
Figure 10.9.1-16
Chesapeake Energy Center Route Variation
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Subsequent to evaluating the Chesapeake Energy Center Route Variation 1, Atlantic identified and evaluated a second alternative to a new end point for the AP-3 lateral on the south side of U.S. Highway 13. Starting at MP 74.9, the Chesapeake Energy Center Route Variation 2 parallels an existing electric transmission corridor to the east/southeast for about 1.2 miles. Approximately at MP 76.1, the route variation heads north for about 0.6 mile along the east side of Steel Street. It then heads to the east for about 0.9 mile on the south side of U.S. Highway 13. This route variation is shorter than the baseline and Route Variation 1, impacts fewer wetlands, and crosses fewer waterbodies. Therefore, Atlantic adopted the Chesapeake Energy Center Route Variation 2 as the proposed route.

10.9.2 Supply Header Project

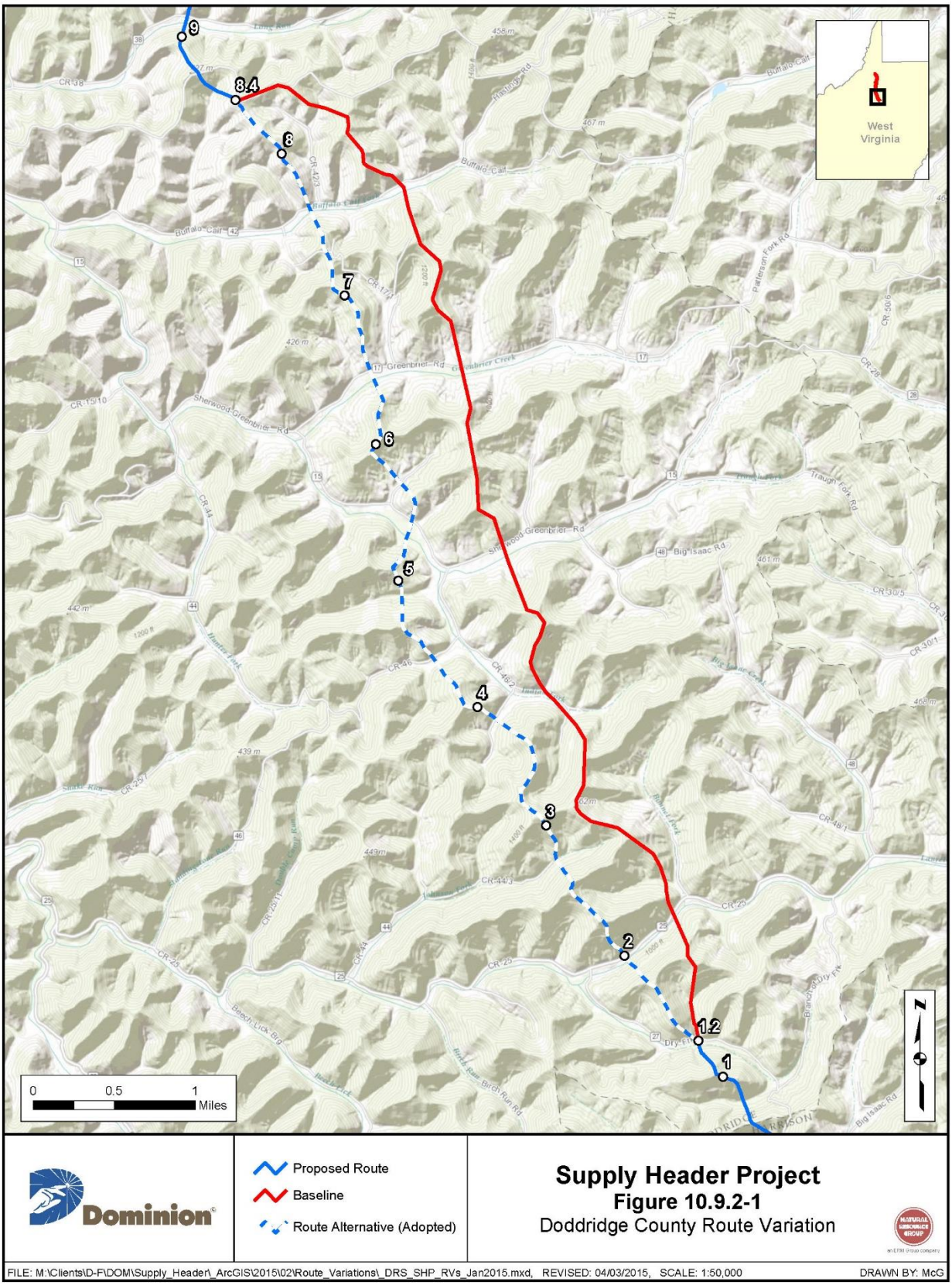
10.9.2.1 Doddridge County Route Variation

DTI identified and evaluated a route variation between MPs 1.2 and 8.4 to reduce the length of the pipeline route and avoid existing pipelines located in areas where there is insufficient space for pipeline collocation. The baseline route heads to the north from MP 1.2, and follows existing cleared areas along various ridgelines for approximately 7.5 miles. The Doddridge County Route Variation parallels the baseline route to the west but follows a different set of ridgelines where there is sufficient space available land to safely construct the new pipeline (see Figure 10.9.2-1 and Table 10.9.2-1). The environmental impacts of the Doddridge County route variation are less than the baseline due to the shorter length of the route, and the route variation is preferred for constructability purposes. For these reasons, the Doddridge County Route Variation was adopted as the proposed route.

TABLE 10.9.2-1

Doddridge County Route Variation for the Supply Header Project

Features	Unit	Baseline Route	Doddridge County Route Variation (Proposed)
Length	miles	7.5	7.1
Roads crossed	number	7	9
Adjacent to existing linear corridor facilities	miles	0.0	0.0
Federal lands crossed	miles	0.0	0.0
State lands crossed	miles	0.0	0.0
Private lands crossed	miles	7.5	7.1
Conservation easements crossed	miles	0.0	0.0
Forested land crossed	miles	6.7	6.6
Wetlands crossed – freshwater forested/shrub	miles	0.0	0.0
Wetlands crossed – freshwater emergent	miles	<0.1	0.0
Intermittent waterbodies crossed	number	4	6
Perennial waterbodies crossed	number	4	4
Recreational trails crossed	number	0	0


West Virginia
0 0.5 1 Miles
Proposed Route
Baseline
Route Alternative (Adopted)
Dominion
Supply Header Project
Figure 10.9.2-1
Doddridge County Route Variation
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10.9.2.2 Buckeye Run Route Variation

DTI identified and evaluated a route variation between MPs 8.4 and 13.9 due to engineering constraints along the baseline route (see Figure 10.9.2-2 and Table 10.9.2-2). The Buckeye Run Route Variation follows a ridgeline west of and parallel to the ridgeline crossed by the baseline. The route variation is approximately 0.6 mile longer than the baseline route, but it crosses fewer roads, wetlands, and waterbodies. The baseline route is collocated with an additional 1.9 miles of existing pipeline corridor, but collocation with the baseline in these areas would require the construction workspace to be almost entirely on steep side slopes due to limited space at the top of the ridgeline. Based on the engineering and safety issues associated with construction along the baseline, the Buckeye Run Route Variation was adopted as the proposed route.

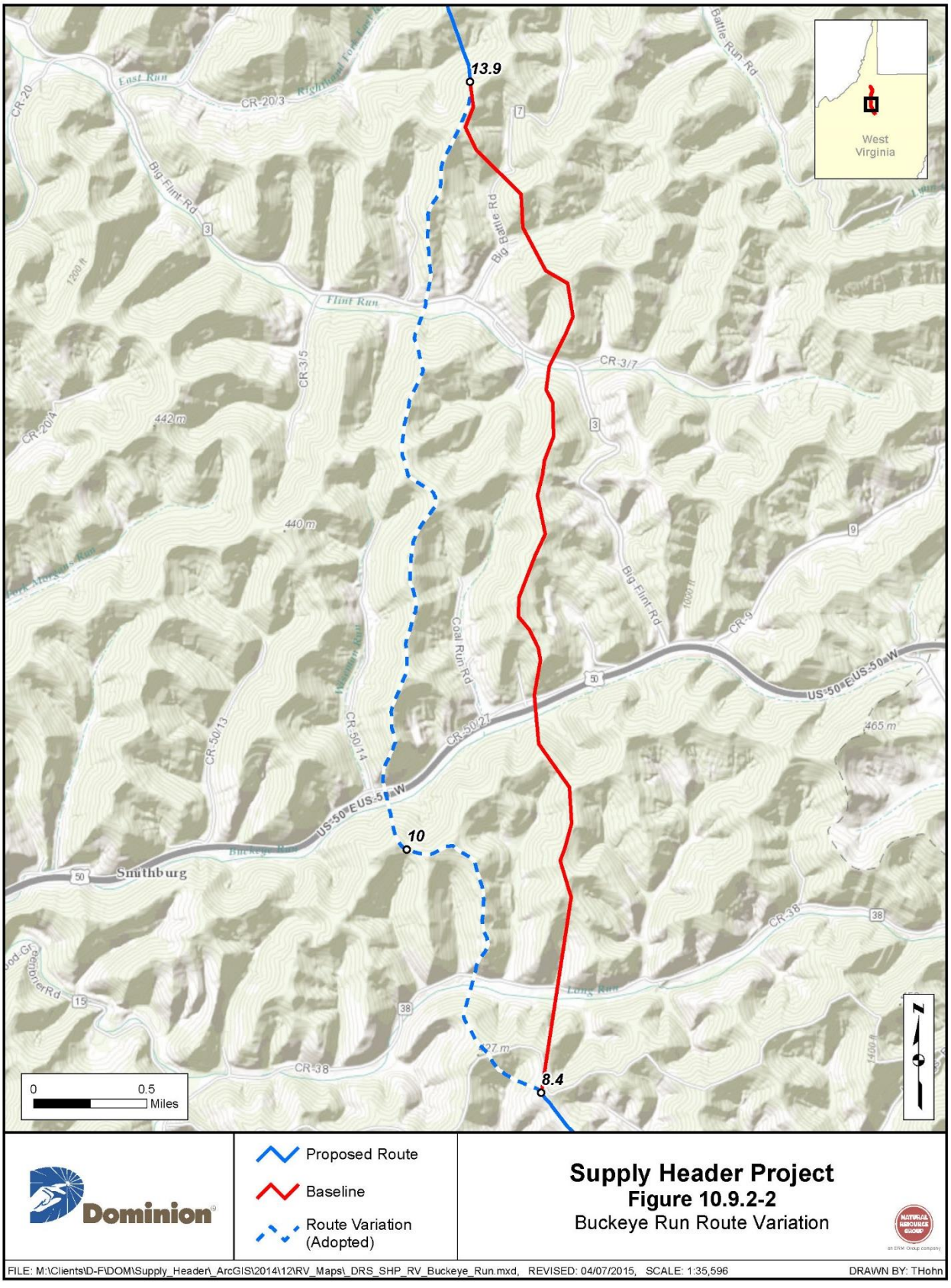
TABLE 10.9.2-2

Buckeye Run Route Variation for the Supply Header Project

Features	Unit	Baseline Route	Buckeye Run Route Variation (Proposed)
Length	miles	4.9	5.5
Roads crossed	number	6	4
Adjacent to existing linear corridor facilities	miles	2.2	0.3
Federal lands crossed	miles	0.0	0.0
State lands crossed	miles	0.0	0.0
Private lands crossed	miles	5.2	6.0
Conservation easements crossed	miles	0.0	0.0
Forested land crossed	miles	4.9	5.7
Wetlands crossed – freshwater forested/shrub	miles	0.0	0.0
Wetlands crossed – freshwater emergent	miles	<0.1	0.0
Intermittent waterbodies crossed	number	2	1
Perennial waterbodies crossed	number	3	3
Recreational trails crossed	number	3	3

10.9.2.3 Wetzel County Route Variation

DTI identified and evaluated a route variation between MPs 27.8 and 32.3 in an effort to reduce the length of the Mockingbird Hill Major Route Alternative. As described in the Section 10.9.2.2, the Mockingbird Hill Major Route Alternative reduces impacts to the Lewis Wetzel Wildlife Management Area. To optimize this route even further, the Wetzel County Route Variation parallels a ridgeline located to the southwest of the baseline (see Figure 10.9.2-3 and Table 10.9.2-3). The Wetzel County Route Variation is 1.8 miles shorter, and impacts 1.7 fewer miles of forested lands than the baseline. Based on the shorter length and reduction in impacts, DTI adopted the Wetzel County Route Variation into the proposed route.


13.9
10
8.4
West Virginia
0
0.5
Miles
Proposed Route
Baseline
Route Variation (Adopted)
Supply Header Project
Figure 10.9.2-2
Buckeye Run Route Variation
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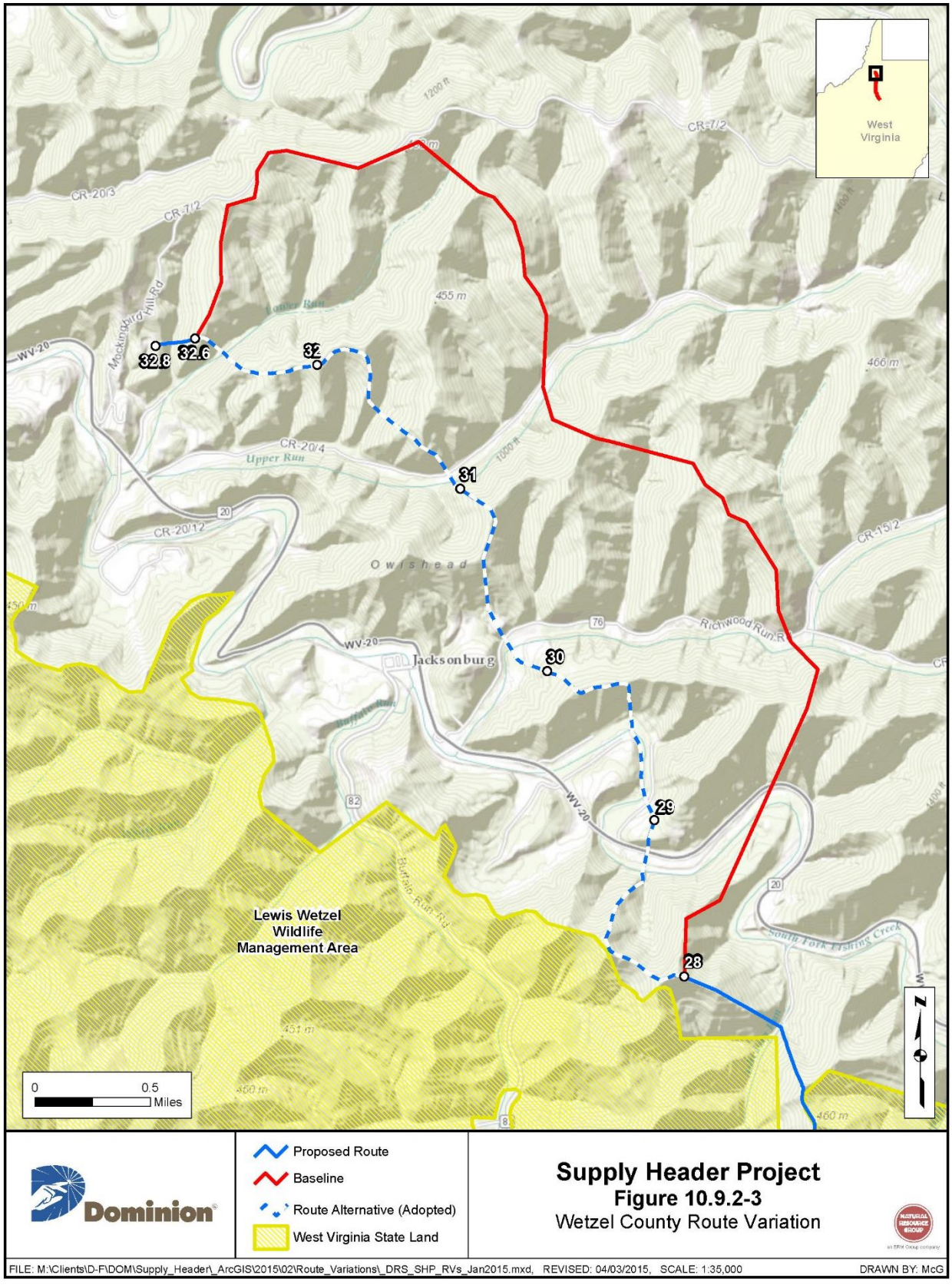
West Virginia
32.8
32.6
32
31
30
29
28
Lewis Wetzel
Wildlife
Management Area
Jacksonburg
Owishead
Upper Run
Lower Run
CR-20/3
CR-7/2
CR-20/4
CR-20/12
CR-15/2
WV-20
Richwood Run
Buffalo Run
Buffalo Run Rd
South Fork Fishing Creek
Mockingbird Hill Rd
0
0.5
Miles
Proposed Route
Baseline
Route Alternative (Adopted)
West Virginia State Land
Dominion
Supply Header Project
Figure 10.9.2-3
Wetzel County Route Variation
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TABLE 10.9.2-3

Wetzel County Route Variation for the Supply Header Project

Features	Unit	Baseline Route (Mockingbird Hill)	Wetzel County Route Variation (Proposed)
Length	miles	6.3	4.5
Roads crossed	number	7	6
Adjacent to existing linear corridor facilities	miles		
Federal lands crossed	miles	0.0	0.0
State lands crossed	miles	0.0	0.0
Private lands crossed	miles	6.3	4.5
Conservation easements crossed	miles	0.0	0.0
Forested land crossed	miles	5.8	4.1
Wetlands crossed – freshwater forested/shrub	miles	0.0	0.0
Wetlands crossed – freshwater emergent	miles	<0.1	0.1
Intermittent waterbodies crossed	number	3	1
Perennial waterbodies crossed	number	3	6
Recreational trails crossed	number	0	0
The Nature Conservancy Critical Habitat	miles	0.9	0.9

10.10 ROUTE ADJUSTMENTS

Atlantic and DTI made and continue to make a number of minor route adjustments to optimize the baseline routes as a result of ongoing routing, biological, cultural resources, and civil field surveys. The route adjustments generally measure less than 2 miles in length, pass within a quarter mile or less of the baseline routes, and do not significantly affect the total length of the routes. The route adjustments were adopted without a formal alternatives analysis, but the need for the adjustment was intuitive and practical (e.g., a slight shift in the centerline to avoid a wetland). Individually, the refinements to the routes are small, but collectively they reduce impacts on environmental resources. Table 10.10-1 lists the route adjustments to date that have been incorporated into the proposed ACP pipeline routes and the rationale for each adjustment. No adjustments to the SHP routes have been identified to date.

10.11 ABOVEGROUND FACILITY ALTERNATIVES

Atlantic is in the process of identifying, screening, and evaluating alternative sites for Compressor Stations 1, 2, and 3 for the ACP. A preliminary screen for Compressor Station 1 has identified four potential alternative sites. Two of the sites appear to be too steep to be suitable for a compressor station, and the third site appears to be too close to residences. The owner of the fourth site has declined to discuss sale of that property. A preliminary screen for Compressor Station 2 has identified one potential alternative site, but this site would add approximately 1.2 miles to the length of the AP-1 mainline. A preliminary screen for Compressor Station 3 has identified one potential alternative site, but this site would increase the length of the AP-3 mainline by approximately 1 mile. A detailed analysis of alternative sites for the proposed compressor stations will be provided in the next draft of Resource Report 10.

Because the additional compression facilities being proposed for the SHP will be constructed adjacent to existing DTI compressor stations, no alternative sites were evaluated for these facilities.

TABLE 10.10-1

Select Route Adjustments Incorporated into the Proposed Atlantic Coast Pipeline Route

Route Adjustment	Approximate Mileposts	State	Rationale
AP-1 Mainline			
Hollick Run	7.1 to 8.1	WV	Adjustment to decrease the length of the pipeline and provide better alignment for a river crossing
Life's Run	12.7 to 14.6	WV	Adjustment to reduce crossings of a known mussel stream
Buckhannon Run Road	18.6 to 19.6	WV	Adjustment to avoid a cultural resource site
Left Fork of French Creek Road	29.1 to 30.0	WV	Adjustment to reduce tree clearing
Queens Road	37.9 to 38.7	WV	Adjustment to avoid a wetland
Laurel Fork	80.5 to 82.9	VA	Adjustment to avoid a waterbody crossing
Warminister Church Road	182.7 to 184.6	VA	Adjustment to reduce tree clearing as requested by a landowner and also to avoid a cultural resource site
Licky Branch	192.3 to 193.1	VA	Adjustment to avoid a waterbody crossing
Little Willis River 1	203.3 to 203.6	VA	Adjustment to avoid two waterbody crossings
Little Willis River 2	204.2 to 204.4	VA	Adjustment to avoid two waterbody crossings
Raines Tavern Road	207.2 to 208.1	VA	Adjustment to avoid two waterbody crossings
Little Creek	224.6 to 225.3	VA	Adjustment to avoid a waterbody crossing
Deep Creek	230.2 to 231.3	VA	Adjustment to minimize a wetland crossing
Weedy Creek	233.9 to 235.8	VA	Adjustment to minimize a wetland crossing
Gills Bridge Road	254.0 to 255.8	VA	Adjustment to avoid a gem mine and house as requested by a landowner and to reduce crossings of cultural resource sites
Taylors Mill Road	289.3 to 290.1	VA	Adjustment to minimize a wetland crossing
AP-2 Mainline			
Jacks Swamp	293.6 to 295.1	NC	Adjustment to minimize a wetland crossing length
Jacket Swamp	318.8 to 319.6	NC	Adjustment to avoid a conservation easement
Contentnea Creek	360.8 to 362.4		Adjustment to optimize creek crossing angle
Hales Road	371.9 to 373.3	NC	Adjustment to avoid a waterbody crossing and minimize a wetland crossing
Buffalo Creek	374.1 to 375.4	NC	Adjustment to avoid two waterbody crossings
Guin Road	390.1 to 390.6	NC	Adjustment to avoid a waterbody crossing and minimize a wetland crossing
Odom Road	448.0 to 448.9	NC	Adjustment to avoid a wetland crossing and reduce tree clearing
Little Marsh Swamp	453.1 to 456.6	NC	Adjustment to minimize a wetland crossing and parallel an existing utility corridor
AP-3 Lateral			
Dutch Road	43.8 to 44.1	VA	Adjustment to reduce the required amount of tree clearing
O'Kelly Drive	45.3 to 46.7	VA	Adjustment to avoid an irrigation pond as requested by the landowner
Quince Road	48.4 to 48.9	VA	Adjustment to locate the pipeline closer to road as requested by a landowner

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