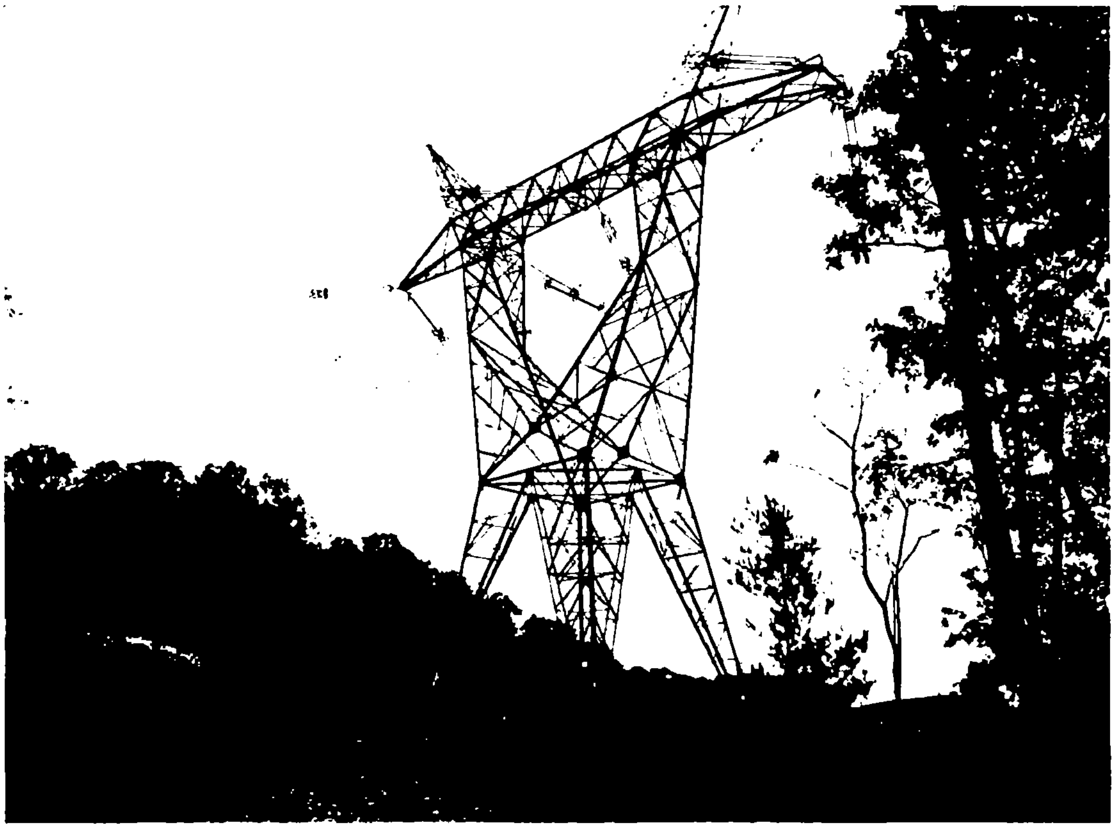
Exhibit 5A

LINE ROUTE EVALUATION REPORT
and
ENVIRONMENTAL REPORT

PATH Project

Welton Spring to Kemptown Segment



Submitted to:

PATH Allegheny Transmission Company, LLC
PATH West Virginia Transmission Company, LLC
PATH Allegheny Virginia Transmission Corporation

PATH

800 Cabin Hill Drive
Greensburg, Pennsylvania 15601-1989

April 2, 2009

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800 Cabin Hill Drive
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Prepared by:

The
Louis Berger Group
Burns & McDonnell
Commonwealth Associates, Inc.
Project Team

April 2, 2009

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ACRONYMS AND ABBREVIATIONS

(in addition to those in Glossary)

BGE	Baltimore Gas and Electric
CR	County Route
EPA	U.S. Environmental Protection Agency
ESRI	Environmental Systems Research Institute
FRPP	Farm and Ranch Land Protection Program
Maryland DNR	Maryland Division of Natural Resources
MHT	Maryland Historic Trust
msl	mean sea level
NHD	National Hydrography Dataset
NLCD 2001	National Land Cover Database 2001
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRCS	Natural Resources Conservation Service (of USDA)
NRHP	National Register of Historic Places
NWI	National Wetland Inventory
OHV	off-highway vehicle
OPGW	optical ground wire
SR	State Route
T&E	threatened and endangered (species)
USDA	U.S. Department of Agriculture
USFS	U.S. Forest Service
USGS	U.S. Geological Survey
Virginia DCR	Virginia Department of Conservation and Recreation
Virginia DHR	Virginia Department of Historic Resources
VOF	Virginia Outdoors Foundation
West Virginia DEP	West Virginia Department of Environmental Protection
West Virginia DNR	West Virginia Division of Natural Resources
West Virginia GES	West Virginia Geological and Economic Survey
WMA	Wildlife Management Area
WWNRR	West Virginia Northern Railroad

EXECUTIVE SUMMARY

The 2007 RTEP issued by PJM directed the construction of the PATH Original Configuration in the Allegheny Power Transmission Zones and the AEP Transmission Zones. Subsequently, PJM was advised by PATH-WV and PATH-Allegheny of siting constraints near Bedington Substation. PJM reviewed alternative configurations that would achieve the electric reliability purposes of the PATH Original Configuration. On October 17, 2008, PJM announced the PATH Project, comprising PATH, a new single 765 kV line from Amos Substation to the proposed Kemptown Substation, with a new substation in the vicinity of eastern Grant County, northern Hardy County, or southern Hampshire County, which has since been identified as the proposed Welton Spring Substation.

SCOPE OF REPORT

This document describes and reports on the route selection methodology, process, and results for the segment of the PATH Project beginning at the proposed Welton Spring Substation and ending at the proposed Kemptown Substation, and the Welton Spring Station and the Kemptown Station themselves. This document's companion document, *PATH Project Route Evaluation Report and Environmental Report: Amos to Welton Spring Segment*, describes and reports on the selection methodology, process and results for the portion of the PATH Project beginning at the Amos Substation extending to the proposed Welton Spring Substation.

Chapters 1 and 2 fully describe the routing development and criteria used to develop the Alternative Routes. Because this portion of the PATH Project crosses state lines five times between three states the information is provided by state jurisdiction from west to east across the study area. The sequence is shown below:

- Hardy and Hampshire Counties, West Virginia
- Frederick and Clarke Counties, Virginia
- Jefferson County, West Virginia
- Loudoun County, Virginia
- Frederick County, Maryland

Chapter 3 provides a description of the existing conditions in the study area and the potential impacts of the Alternative Routes, by segment. Chapter 4 provides a summary of the advantages and disadvantages of the alternatives and the reasons the Proposed Route for each segment of the line was chosen.

Chapter 5 provides a discussion of the mitigation measures proposed for the Project, and Chapter 6 contains the references used in compiling the report.

ROUTING CRITERIA

The route selection study was performed by a multi-disciplinary Routing Team (Appendix A) whose goal was to select the most suitable route for a 765 kV electrical transmission line between the proposed Welton Spring Substation and the proposed Kemptown Substation. The most suitable route was defined as the route minimizing the effect of PATH on all factors of the natural and cultural environment, while avoiding unreasonable and circuitous routes, extreme costs, and non-standard design requirements. The Routing Team developed specific routing criteria in identifying, evaluating, and selecting routes, attempting to minimize:

1. Route length, circuity, cost, and special design requirements
2. The removal or substantial interference with the use of existing residences
3. The removal of existing barns, garages, commercial buildings, and other nonresidential structures
4. Substantial interference with the use and operation of existing schools, existing and recognized places of worship, existing cemeteries, and existing facilities used for cultural and historical, and recreational purposes
5. Substantial interference with economic activities
6. Crossing of designated public resource lands such as national and state forests and parks, large camps and other recreation lands, designated battlefields or other designated historic resources and sites, and wildlife management areas
7. Crossing large lakes and large wetland complexes, critical habitat, and other scarce, distinct natural resources
8. Substantial visual impact on residential areas and public resources

In implementing these routing criteria, the Routing Team also was informed by (1) the technical expertise of engineers and other industry professionals responsible for the reliable and economic construction, operation, and maintenance of the PATH Project and other electric system facilities, (2) NERC reliability standards as implemented by PJM, (3) industry "best practices," and (4) the electrical need determination for the PATH Project. The Routing Team consulted throughout its efforts with internal and external electric industry professionals as necessary in the consideration of any proposed routes that may be inconsistent with the application of specific technical guidelines:

1. Avoid double-circuiting or crossing existing 765 kV lines.
2. Do not parallel existing 765 kV lines for more than 1 mile in any particular location.
3. Minimize the crossing of 345 kV and 500 kV transmission lines.
4. Minimize paralleling corridors with more than one existing 345 kV or 500 kV circuit.
5. Maintain 200 feet of centerline-to-centerline separation when paralleling existing 345 kV, 500 kV, and 765 kV transmission lines.
6. Maintain 150 feet of centerline-to-centerline separation when paralleling 138 kV or lower voltage transmission lines.
7. Minimize angles greater than 65 degrees and sloping soils more than 30 degrees (20 degrees at angle points).
8. Do not triple-circuit lines of 345 kV or greater voltage.

The Routing Team worked together during the route selection study to define the study area, identify routing constraints, collect and analyze environmental and design data, meet with the public, meet with stakeholder groups, meet with resource and permitting agencies, develop and revise siting alternatives, and analyze and report on the selection of the Potential Routes, the Alternative Routes and, ultimately, the Proposed Route.

DESCRIPTIONS OF ALTERNATIVE ROUTES

The Alternative Routes, identified by letters, range from E to P. The lettering begins with E to avoid possible confusion with Alternative Routes A through D that were developed for the Amos to Welton Spring Segment.

Hardy and Hampshire Counties, West Virginia

Alternative Route E

Alternative Route E heads north from Welton Spring Substation for roughly 12 miles aligned parallel to the Junction-Hardy 138 kV/Purgitsville 34.5 kV ROW, loosely paralleling U.S. Highway 220. At Junction, West Virginia, the route turns east and parallels or double circuits the French's Mill-Hampshire 138 kV line for approximately 24 miles on a heading that runs just south of Augusta and Capon Bridge before entering Frederick, Virginia, near where the Mt. Storm-Doubs 500 kV line crosses the state line.

Alternative Route F

Alternative Route F heads east out of the Welton Spring Substation and largely parallels the Mt. Storm-Doubs line for roughly 15 miles, crossing the South Branch Potomac WMA, a narrow portion of the Nathaniel Mountain WMA, and the southern tip of Short Mountain WMA before turning northeast. Alternative Route F continues northeast for slightly more than 17 miles passing between Rio and Delray, West Virginia, before reaching the Frederick, Virginia, border.

Frederick and Clarke Counties, Virginia

To site PATH across Frederick County, the Routing Team focused on developing Potential Routes that largely followed the joint Mt. Storm-Doubs 500 kV/ 138 kV ROW for the value of its paralleling opportunities and its near direct heading toward Kemptown Substation.

Although several alignments were considered between the Hampshire/Frederick County border and Cedar Grove Road, an alignment along the south side of the Mt. Storm-Doubs ROW was ultimately selected because it: (1) aligns immediately parallel to the existing corridor, (2) takes advantage of the use of a double circuit configuration with the Gore-Stonewall 138 kV line when necessary, (3) does not place many houses between the new 765 kV and existing 500 kV lines, and (4) only requires a small deviation near the intersection of the line and U.S. Highway 50. For this reason, Alternatives G, H, and I all follow the same alignment for the first 13 miles from the Virginia border to a point just beyond the crossing of Cedar Grove Road.

Alternative Routes G, H, and I

High levels of residential development between Cedar Grove Road and Interstate 81 required the development of several alternative alignments for the remainder of the routes through Frederick County, a distance of 7 to 8 miles. One alignment, Alternative Route G, followed a northern route that involved a combination of parallel alignments and northern diversions to avoid residential developments all the way to the Jefferson County, West Virginia, boundary. Alternative Route H followed a parallel alignment along the south side of the Mt. Storm-Doubs ROW with only limited diversions, but with several areas where double circuit configurations and shifts of the Mt. Storm-Doubs 500 kV line would be necessary. Alternative Route I followed a largely non-parallel alignment to the south of Cedar Hill Road, through farmlands and lower density residential areas before turning north and meeting up with Alternative Route H just west of Interstate 81.

Jefferson County, West Virginia

Alternative Route J

Alternative Route J traverses the county primarily along the existing transmission line corridor. The route passes north of Summit Point and through the Bullskin Run Historic District along this existing corridor, then makes a southern deviation to avoid houses and a subdivision adjacent to the existing lines. The route runs through the southern limits of Charles Town before crossing the Shenandoah River and NPS lands, again following the existing transmission corridor. Alternative Route J parallels an existing transmission line corridor with a 500 kV and a 138 kV line for approximately 12 miles, or 75 percent, of the route length.

Alternative Route K

Like Alternative Route J, Alternative Route K starts along the existing transmission corridor. This route deviates from the existing lines west of Summit Point and turns south through mixed agricultural and residential areas. The route passes near the Rippon Historic District and through the Kabletown Historic District before rejoining the existing transmission corridor. East of the Shenandoah River, Alternative Route K breaks from the existing transmission corridor and uses an alternative crossing of the Appalachian Trail to the south adjacent to where SR 9 crosses the Trail. Alternative Route K follows an existing transmission line for 8.9 miles or 48, percent of the route length; of which 7.2 miles is parallel to the 500 kV transmission line, and the remainder is reconstruction of a 138 kV line as a double circuit 765/138 kV line.

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Loudoun County, Virginia

Alternative Route L

Alternative Route L starts at the state line and follows the existing transmission corridor all the way across Loudoun County. The route crosses Appalachian Trail lands and passes through the Blue Ridge Center, then continues across Short Hill Mountain and across the rolling terrain to the Potomac River.

Alternative Route L parallels the existing transmission line corridor for 100 percent of the way to the Potomac River. This route passes north of Lovettsville. Alternative Route L does not pass through any historic districts, although the endpoints begin next to Harper's Ferry and the Appalachian Trail at the west end and the C&O Canal at the east end.

Alternative Route M

The start of Alternative Route M at the west side of the county is located in Keys Gap at the point where SR 9 crosses the Appalachian Trail. The route then runs northeast for approximately 2.8 miles before merging with the existing lines. Alternative Route M also includes a loop around some open space lands east of SR 287 which brings it closer to the town of Lovettsville. The route winds through some large-lot subdivisions and agricultural lands for approximately 3.8 miles before rejoining the existing transmission corridor. Alternative Route M only follows this existing corridor for 45 percent of the total length through the Loudoun County.

Frederick County, Maryland

Alternative Route N

Alternative Route N starts at the Potomac River, crossing over the C&O Canal and then over the south end of Catoctin Mountain. The route passes the Doubs Substation and then turns east, passing through the Carrolton Manor Historic District. The route crosses the Monocacy River and then the Lilypons water garden nursery, runs north of Sugarloaf Mountain and then south of Urbana. From there the route runs through agricultural lands to the Kemptown site. Some of these lands are under development or in the planning stages for development. Alternative Route N parallels an existing 500 kV transmission line corridor for 85 percent of the route length.

Alternative Route O

Alternative Route O starts the same as Alternative Route N, then turns northeast past the Doubs Substation along a double-circuit 230 kV line to the Lime Kiln Substation. The route borders the Grey Rock Quarry and then passes between the quarry and an industrial park as it turns southeast from the Lime Kiln Substation. The route crosses the Monocacy River and continues southeast over relatively open lands with some homes, then turns east to I-270 and parallels the highway south past Urbana. The route rejoins the existing transmission corridor on the east side of Urbana Pike and follows that line to the Kemptown Substation. The portion through Urbana is the most densely developed area along the routes in Frederick County. Alternative Route O follows an existing transmission line corridor for 15.1 miles, or 67 percent of the route length. Of this length, 6.5 miles is along 230 kV lines that run to the Lime Kiln Substation. Another 7.5 miles are along the existing 500 kV line; and 1.1 miles are reconstruction of a 230 kV line as double circuit.

Alternative Route P

Alternative Route P follows the same alignment as Alternative Route N except in the area of Lilypons and Sugarloaf Mountain. This route breaks off from the existing transmission corridor after crossing the Monocacy River and runs south of the Lilypons nursery. The route runs along the base of Sugarloaf Mountain through pasture land and woods, then rejoins the existing transmission corridor near the existing 230 kV transmission line. Alternative Route P parallels the existing 500 kV transmission line corridor for 73 percent of its length.

PROPOSED ROUTE SELECTION

The Alternative Routes were analyzed as explained in this document for their effects on humans, animals and plants, and the environment, as well as cultural, historical, and recreational resources. Following are the Proposed Routes for each segment of the Welton Spring to Kemptown portion of PATH.

Hardy and Hampshire Counties, West Virginia

Alternative Route F

Alternative Route F was selected as the Proposed Route for this segment. In comparison to Alternative Route E it was the shortest in length, had notably fewer number of houses within 250 and 500 feet of the route centerline, crossed fewer streams, wetlands, and waterbodies, and was comparably limited in impacts on identified architectural and archaeological sites. In addition, although both routes follow parallel alignments for a significant portion of their lengths, only Alternative Route F parallels an existing 500 kV line, thereby benefiting from the opportunity to use existing access roads for the construction and operation the line and from the relatively smaller visual impact caused by construction of PATH adjacent to another EHV line.

Frederick and Clarke Counties, Virginia

Alternative Route H

Alternative Route H was selected as the Proposed Route for this segment because it takes advantage of more existing ROW to reduce potential environmental and visual impacts. Although differences are small between the three alternatives considered for this segment, Alternative Route H was the shortest route, required the least amount of forest clearing, and had the lowest amount of non-parallel alignments. All attempts were made to keep Alternative Route H as close to the existing Mt. Storm-Doubs ROW by using special ROW configurations and rebuilding the existing 500 kV line where necessary. In this high density residential development area, the Routing Team considered this characteristic to be the greater advantage over all others.

Jefferson County, West Virginia

Alternative Route J

Alternative Route J was selected as the Proposed Route for this segment because it takes advantage of more existing ROW to reduce potential environmental and visual impacts. Key advantages of this route are that it crosses no wetlands, less forest and less agricultural land, and passes through less of the county's historic districts overall. While the route passes more residences within 500 feet, most of these residences are already adjacent to the existing transmission corridor. Likewise, potential effects on the historic properties in the county, particularly Bullskin Run Historic District, would be reduced by following the existing transmission corridor. Alternative Route J is the preferred route through the NPS lands at the Virginia state line, particularly the Appalachian Trail, whereas Alternative Route K would require a new crossing over park lands.

Loudoun County, Virginia

Alternative Route L

Alternative Route L has lower potential impacts in almost every category, primarily because it is the shortest route and follows the existing transmission corridor all the way through the county. The new line would use the 138 kV ROW and replace the line with double-circuit structures, reducing the amount of new ROW and associated clearing required. This route would avoid a new crossing of the Appalachian Trail and avoid being within one mile of the Lovettsville Historic District. Alternative Route L crosses some open space easements. In these cases, the existing transmission corridor already runs through theses areas, and in order to keep the height of the structures lower, the Applicant would work with the holders of these easements to modify them in order to acquire approximately 105 feet of additional ROW.

Frederick County, Maryland

Alternative Route N

Alternative Route N was selected as the Proposed Route because it was considered to have less potential impacts on historical resources in the area and it would have less visibility. The Proposed Route was adjusted in some places away from the existing ROW to reduce potential environmental impacts Moreover, the clearing of forest or wetlands would be a marginal increase at the edge of an existing ROW rather than a new corridor through stands of forest.

1 INTRODUCTION

1.1 OVERVIEW

1.1.1 Purpose and Need

The 2007 RTEP issued by PJM directed the construction of the PATH Original Configuration in the Allegheny Power Transmission Zones and the AEP Transmission Zones. Subsequently, PJM was advised by PATH-WV and PATH-Allegheny of siting constraints near Bedington Substation. PJM reviewed alternative configurations that would achieve the electric reliability purposes of the PATH Original Configuration. On October 17, 2008, PJM announced the PATH Project, comprised of PATH, a new single 765 kV line from Amos Substation to the proposed Kemptown Substation, with a proposed substation in West Virginia in the vicinity of eastern Grant County, northern Hardy County, or southern Hampshire County, which has since been identified as the proposed Welton Spring Substation.

1.1.2 Project Siting

The initial configuration and siting effort focused on planning a 765 kV line connecting the Amos Substation north of Charleston, West Virginia, with the Bedington Substation north of Martinsburg, West Virginia. Beyond Bedington Substation, two 500 kV lines were planned heading east and connecting to the proposed Kemptown Substation, southeast of New Market, Maryland. During the routing study this electrical configuration was reconsidered as a result of interactions with government agencies, public input, and a desire by PATH-Allegheny and PATH-WV to identify a solution that minimizes the impact on communities and the environment. Each of these elements played a role in spurring additional review and revision of the electrical configuration, ultimately resulting in the PATH Project.

Working on the PATH Original Configuration, the Routing Team identified a range of 765 kV routing alternatives between the Amos and Bedington Substations and a range of 500 kV routing alternatives between the Bedington Substation and the proposed Kemptown Substation. These alternatives were developed between February and July 2008; presented at a series of public open houses between late July and early August 2008; and continually analyzed, reviewed, and revised, as part of the normal route selection process during that period.

Throughout this period, the Routing Team continued to develop a greater understanding of the study area and the many routing constraints in and around the Bedington Substation and Jefferson County, West Virginia, as well as in areas further to the east in Washington and Frederick Counties, Maryland. Information gathered through agency consultations, public open houses, and time spent in the field reviewing a wide range of potential routes provided insight into the high level of residential development and mosaic of state and federal lands that PATH potentially would affect if it crossed these areas. Routes through Washington County and northern Frederick County would inescapably cross some sensitive state lands such as Department of Natural Resources

(DNR) park lands, open space, and conservation easements. The alternatives going south from Bedington Substation into Jefferson County, while following an existing 138 kV transmission line, would pass through the major growth area in the county, including multiple subdivisions developing along that existing line.

In recognition of the environmental constraints, and likely impacts of constructing a 765 kV line to the Bedington Substation and not one, but two 500 kV lines east to the proposed Kemptown Substation, the PATH Project Management Team asked PJM to review other electrical alternatives or connecting a single 765 kV line directly from Amos Substation to the proposed Kemptown Substation. Assuming a single direct 765 kV line configuration could provide a similar overall improvement to the reliability of the regional transmission grid; it would reduce the overall length of new line needed by 70 to 90 miles and thereby greatly reduce impacts to the human and natural environment. PJM reviewed the proposed alternatives and conducted further review of the previously identified reliability issues and resulting baseline upgrades, including those precipitating the PATH line under its original configuration. On October 17, 2008, PJM announced revisions to identified baseline upgrades needed for the PJM system. The result of the PJM decision, in turn, was an approval of the re-configuration of the PATH Project.

Once the electrical configuration for the PATH Project was finalized, reviewed by PJM, and confirmed to address PJM's reliability concerns, the Routing Team revised the route identification effort to incorporate the following new elements:

- a single 765 kV line from Amos Substation to the proposed Kemptown Substation;
- elimination of the connection with the Bedington Substation and the twin-circuit 500 kV lines from Bedington Substation to proposed Kemptown Substation, including many previously evaluated routes in that area; and
- a new West Virginia substation in the vicinity of eastern Grant County, northern Hardy County, or southern Hampshire County.

The Routing Team revised the project study area to include areas south of Bedington that would allow for a more direct route to the proposed Kemptown Substation and began the revised route selection and new substation siting activities, including additional public open houses through January 2009.

1.1.3 Scope of this Document

This document describes and reports on the route selection methodology, process, and results for the portion of PATH beginning at the proposed Welton Spring Substation and ending at the proposed Kemptown Substation, the Welton Spring and Kemptown Substations themselves, as well as mitigation measures proposed to minimize impacts of the construction and operation of the line and substations. A companion report, *PATH Line Route Evaluation Report and Environmental Report: Amos to Welton Spring Segment*, addresses the segment of PATH to the west of the proposed Welton Spring Substation.

1.2 PROJECT DESCRIPTION

1.2.1 Location

The PATH Project will connect the Amos Substation near the Kanawha River in Putnam County, West Virginia, to the proposed Kemptown Substation located roughly 3 miles southeast of the town of New Market, in Frederick County, Maryland (**Figure 1.2-1**). The segment of PATH discussed in this report covers the second portion of the project extending from the proposed Welton Spring Substation, located roughly 2 miles north of Old Fields, West Virginia, just west of State Route (SR) 220, to the proposed Kemptown Substation. The straight line distance between these two locations is just over 93 miles, accounting for roughly 36 percent of the total straight line distance of the overall PATH Project.

1.2.2 Structures

Although several different structure types may be used depending on the presence of existing transmission infrastructure and site-specific conditions,[1] the most common conceptual designs for PATH employ either a galvanized steel lattice structure on four cylindrical concrete foundations or a tubular "H-frame" structure on two cylindrical foundations supporting three phases (**Figure 1.2-2**). Each phase will consist of six conductors arranged in a circular-shaped bundle about 30 inches in diameter. Each individual conductor will be approximately 1 inch in diameter composed of aluminum wire strands wrapped around inner strands of steel. The phases will be suspended by two strings of porcelain insulators arranged in a "V" pattern. Above the conductors will be two lightning shield optical ground wire (OPGW) wires. The fiber optics will provide for communications involved in the control of PATH.

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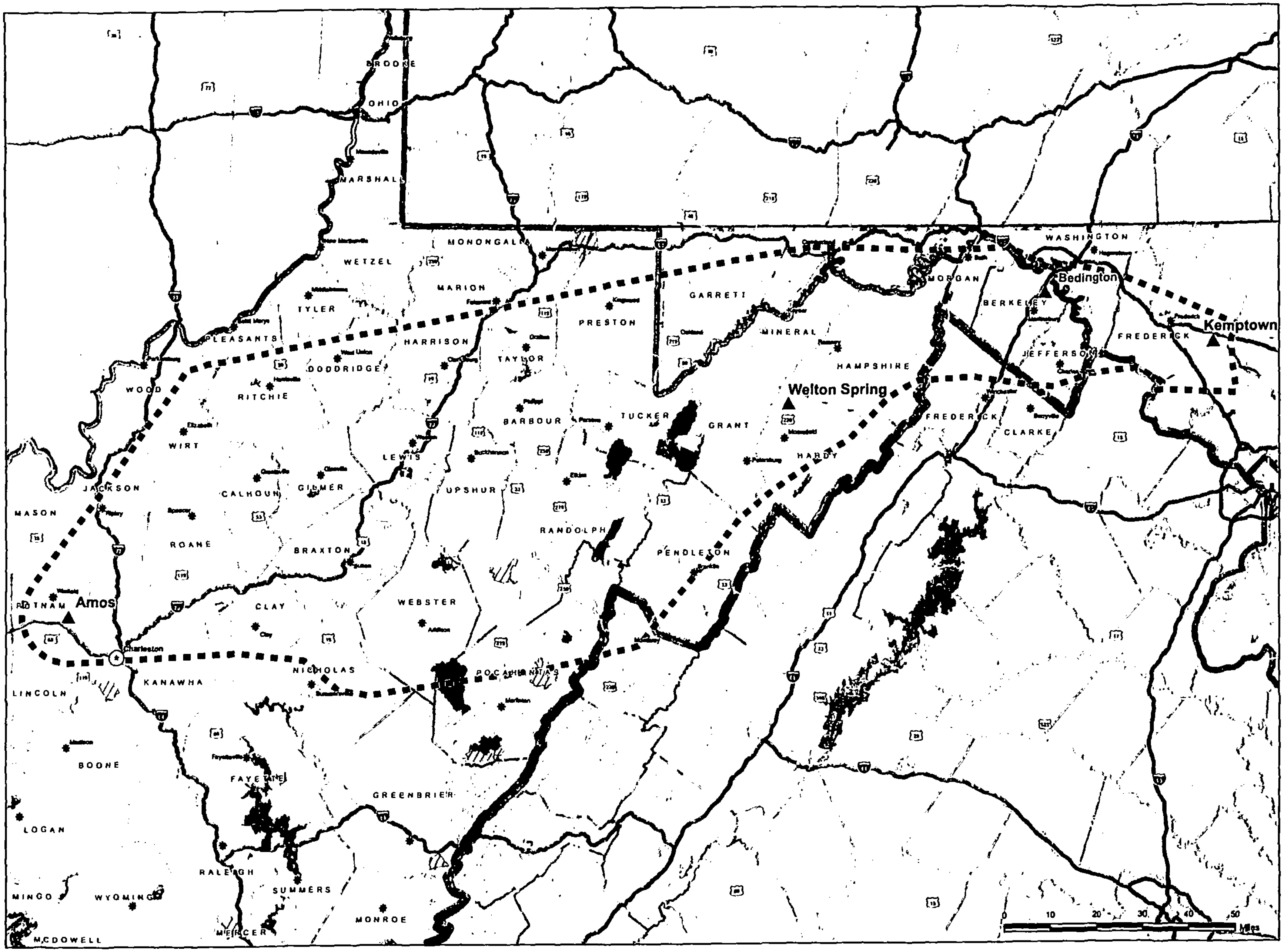
[1] Line and ROW configurations vary along the line route depending on the presence of existing lines and ROWs and other environmental and engineering constraints. For clarity, alternative specific line configurations are described and presented where relevant under the description of the Alternative Routes.



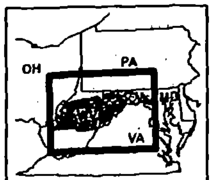


Figure 1.2-1 Project Vicinity & Study Area

Legend
- Substation
- Study Area
- State Forest
- Wildlife Management Area
- WV Wilderness Area
- National Forest
- State/National Park
- National Wildlife Refuge

PATH

Geographic Coordinate System: Universal Transverse Mercator (UTM). Datum: North American Datum of 1983 (NAD83). Zone: 17N. Projection: Transverse Mercator. Linear Unit: Meter. Ellipsoid: Geodetic Reference System 80.

Sources: WV Department of Natural Resources, MD Department of Natural Resources, PA Department of Conservation and Natural Resources, WV GAP Analysis, ESRI.

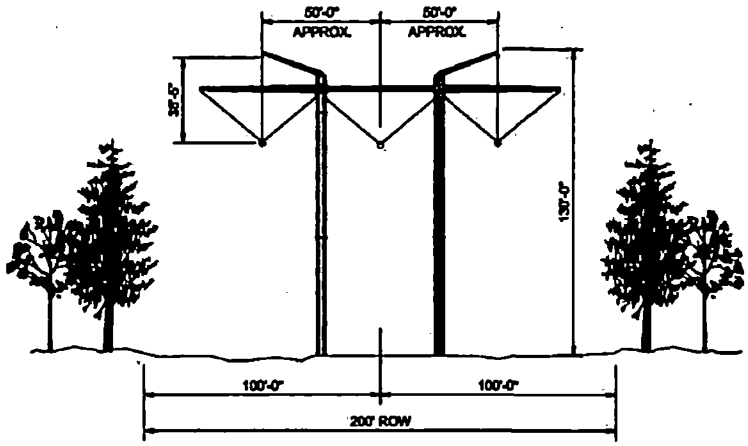


Figure 1.2-2 Standard Conceptual Design of the Line and ROW: Single Circuit Configuration

The PATH Project also includes construction of a new proposed Welton Spring Substation north of Old Fields, West Virginia, and additional 765 kV line from the proposed Welton Spring Substation to the new Kemptown Substation which will be built in Frederick County, Maryland. The siting and route selection methods, process, and results for these two project elements are discussed in Section 2.2 in this report.

1.2.3 Right-of-Way (ROW)

PATH will be constructed on the center of a ROW, which will be optimally 200-feet-wide and comprised of easements across private land or special-use permits on government-controlled property. The ROW will be cleared of tall growing vegetation to its full width centered on the line or as deemed necessary for the safe and reliable operation of the line. See **Figure 1.2-2** for a typical cross section (shown with a steel pole H-frame type structure), and Section 3.3.4, *Vegetation*, for a description of standard ROW clearing practices.

1.2.4 Substations

The PATH Project requires additions to the Amos Substation, to terminate the new 765 kV line, as well as the construction of the proposed Welton Spring Substation and the proposed Kemptown Substation. Changes at the Amos Substation are completely within the property boundaries of the Amos Power Plant and are not discussed in this document or in *PATH Line Route Evaluation Report and Environmental Report: Amos to Welton Spring Segment*. Impacts associated with the construction of the proposed Welton Spring Substation and Kemptown Substation are discussed in Section 2.2.

1.2.5 Construction, Operation, and Maintenance

PATH will be constructed in several phases using rubber-tired and tracked equipment and helicopters. Surveyors will begin by establishing the center line of the ROW within the certified corridor. Crews will then clear all woody vegetation within the ROW pursuant to project policies (see Section 3.3.4, *Vegetation*, for further description of measures for vegetation clearing). The appropriate materials will be delivered and assembled at each structure location. Foundations will be excavated with a backhoe for grillage foundations or with an auger for concrete piers. Concrete or grillage foundations will be installed for each pole or lattice tower leg, and structures will be erected on site using a crane or assembled at an alternate location and flown in by helicopter. Conductors will be pulled through each structure using stringing pulleys and tensioning equipment. Excess soil from the holes will be distributed evenly at each structure site and the soil stabilized and seeded. In wetland areas, the method used for the installation of structures will depend on the nature of the subsurface conditions, and excess soil will be removed to an upland site (see Section 3.3.3, *Wetlands*, for complete description of mitigation measures in wetland areas).

2 ALTERNATIVES DEVELOPMENT

2.1 OVERVIEW OF THE ROUTING PROCESS

2.1.1 Goal of the Route Selection Study

The goal of the route selection study was to develop alternative routes, evaluate potential impacts associated with the alternative routes, and select the most suitable route for a 765 kV electrical transmission line between the proposed Welton Spring Substation and the proposed Kemptown Substation. The most suitable route was defined as the route minimizing the effect of the transmission line on all factors of the natural and human environment, while avoiding unreasonable and circuitous routes, extreme costs, and non-standard design requirements.

2.1.2 The Routing Team

The routing study was performed by a multi-disciplinary Routing Team. Team members were selected to bring wide experience to the routing study to achieve a good review of all aspects of developing the route. Members of the Routing Team brought experience in EHV transmission line routing, impact assessment for a wide variety of natural resources and the human environment, impact mitigation, engineering, ROW acquisition, and construction management. The team's charge was to identify the route that provides a reasonable balance between impacts on local communities and the natural environment, as determined through application of appropriate siting criteria and subject to technical guidelines, addressed in detail below.

The Routing Team consisted of staff from two environmental consulting firms, plus staff from AEP and Allegheny. Personnel with the Louis Berger Group assisted with the siting of the proposed Welton Spring Substation and the routing and environmental studies for the portion of PATH that crosses Hardy and Hampshire Counties, West Virginia and Frederick and Clarke Counties, Virginia. Burns & McDonnell personnel assisted with the routing and environmental studies for the portion of PATH that crossed Jefferson County, West Virginia; Loudoun County, Virginia; and Frederick County, Maryland, as well as the siting of the proposed Kemptown Substation.

The team worked together during the route selection study to develop the routing criteria, define the study area, identify routing constraints, collect and analyze environmental and design data, meet with the public, meet with resource and permitting agencies, develop and revise the siting alternatives, and analyze and report on the selection of the preferred route. **Appendix A** lists the Routing Team members.

2.1.3 Study Area Definition

While this report focuses on a segment of PATH that will be constructed in West Virginia, Virginia, and Maryland, the entire study area for the project was designed around connecting two primary electrical endpoints: the Amos Substation in West Virginia and the proposed Kemptown Substation in Maryland (see **Figure 1.2-1**). Two additional intermediary points were also considered in the development of the study area boundary: the Bedington Substation, which was later removed from the routing study as a result of the project reconfiguration, and the proposed Welton Spring Substation, which was included for electrical purposes as a result of the PATH Project reconfiguration.

The Routing Team generally defined the study area as the geographic area encompassing the two end-point substations and the intermediate substations that were considered during the study. However, the presence and extent of certain relevant resources within the study area also were considered while delineating the study area boundary. One of the major factors that guided the definition of the study area boundary is the presence of existing ROWs, particularly existing transmission line ROWs. Siting new lines parallel to existing lines is a standard practice in transmission line siting and is supported by many state regulatory authorities. Incorporating the location and trajectory of existing transmission and other utility lines in the delineation of the study area ensures that routes that can be paralleled are considered in the study.

Major constraint areas also are considered in the development of the study area boundary. In this study, the Appalachian Trail and the C&O Canal are major federal land areas and environmental constraints running north to south between the proposed Welton Spring Substation and the proposed Kemptown Substation. Due to the sensitivities associated with crossing these long linear federal land areas, the study area was expanded in a north/south direction to allow for the consideration of a range of potential crossings of the Appalachian Trail and the C&O Canal.

Although the term "study area boundary" suggests that the study area is initially established and subsequently maintained throughout the study as a fixed boundary, in practice this is not usually the case. As the routing study progresses, additional opportunities and constraints are naturally identified, and some of these require modification of the study area boundary. In addition, replacement of the PATH Original Configuration with the PATH Project had an effect on the study area boundary. Thus, the study area boundary shown in **Figure 2.1-1** shows the final study area boundary, both before and after the project reconfiguration, inclusive of all areas considered in the route selection effort.

2.1.4 Data Collection

Many sources of information were employed to develop data for the route selection study. These sources are described in the following section.

Aerial Photography

Aerial photography is an important tool for route selection. Several sources of aerial imagery were used in the route identification, analysis, and selection effort for the Welton Spring Substation to Kemptown Substation segment of PATH:

- 2007 color aerial photography produced by the National Agriculture Imagery Program;
- 2004 color aerial photography produced by the West Virginia Statewide Addressing and Mapping Board;
- 2006 true color aerial photography provided by Frederick County, Virginia;
- 2007 true color aerial photography provided by Jefferson County, West Virginia;
- 2007 true color aerial photography provided by Frederick County, Maryland;
- 2007 true color aerial photography provided by Aerials Express for Jefferson County, West Virginia and Loudoun County, Virginia; and
- 2008 true color aerial photography provided by Aerials Express for Frederick, Clarke and Loudoun Counties, Virginia; Jefferson County, West Virginia; and Frederick County, Maryland.

Aerial photography from these sources was used in both a Geographic Information System (GIS) environment and printed electronically at a scale of 1 inch = 500 feet as a set of 22-inch by 34-inch map sheets to support the planning process and to gather input at public open houses. Updated information, such as the location of new residences and other constraints, was annotated on the photography on either paper maps and transferred into a GIS environment or digitized directly into GIS during field inspections.

Maps

Many existing paper and electronic maps were obtained for the study and examined as a part of the routing process. These included U.S. Geological Survey (USGS) 7 ½ minute topographic quadrangle maps, various state and county road maps, transmission line information, railroad maps, land ownership maps, U.S. Forest Service (USFS) maps, and other mapped resources. As the project progressed, several other maps were obtained, primarily as a result of contacts made at public meetings and meetings with local county agencies or interest groups. These maps showed the locations of development plans such as residential lots, wind generators, conservation easements, the planned "Corridor H" interstate highway, the new WV SR 9, and other features of interest to the Routing Team.

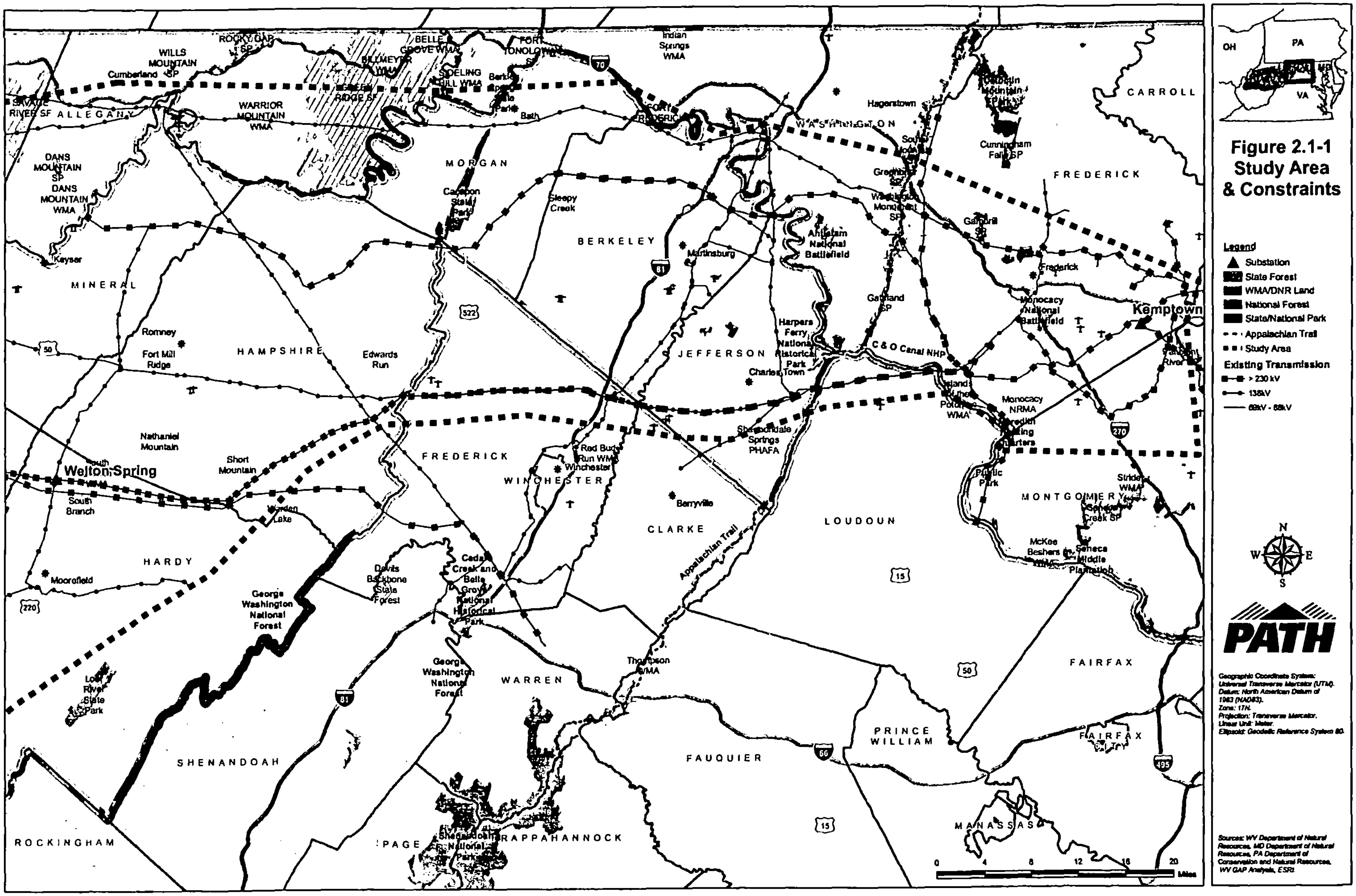


Figure 2.1-1 Study Area & Constraints

GIS Data Sources

Extensive use was made in the study of information from existing GIS data. This information was obtained from many sources, including federal, state, and county governments. Much of this information was obtained through official agency GIS data access websites, some was provided directly by government agencies, and some was created by the Routing Team by either digitizing information from paper-based maps or through aerial photo interpretation.

The use of GIS data allows for the consideration and efficient use of a wide variety of information that would otherwise be unavailable or impractical to consider for a planning effort of this scope and schedule. GIS information is a highly effective tool when used for broad-level planning studies, identifying and characterizing landscape level constraints and features, and developing environmental inventory information useful for comparisons between planning alternatives.

However, GIS data sources vary widely with respect to their accuracy and precision; presentation, analysis, and calculations derived from these data sources require careful consideration when used for planning purposes. For this reason, GIS-based calculations and maps presented throughout this study should be considered by the reader to be reasonable approximations of the resource or geographic feature they represent, and not absolute measures or counts. They are presented in this study to allow for relative comparisons between alternatives, with the assumption that any inherent error or inaccuracies would be generally equal across all alternatives.

Field Inspections

Routing team members conducted route reconnaissance efforts throughout the study area. The team members examined Potential Routes by automobile from points of public access, typically road crossings, and by helicopter. Relevant features were recorded on aerial photography printed as 1":500' hardcopy maps or viewed in a GIS software environment supported by GPS tracking.

Public Input

Routing team members participated in public open houses held throughout the study area. The purpose of the open houses was to inform the public of the project and involve them in providing information for the route decision-making process. Section 2.1.5, *Public Involvement Activities*, provides a description of the public open houses and data gathered through these open houses. Section 2.1.5 also describes how these inputs were received and evaluated in the routing process.

Agency Contacts

The Routing Team contacted numerous federal, state, and local agencies to gather information for the route planning process. The agencies consulted are provided in the list below. Copies of correspondence with federal and state agencies are provided in **Appendix B**.

Federal Agencies

- U.S. Fish and Wildlife Service, West Virginia Field Office
- U.S. Department of Transportation, National Scenic Byways Program
- U.S. Natural Resource Conservation Service, West Virginia State Office
- U.S. Fish and Wildlife Service, Virginia Field Office
- Federal Emergency Management Agency
- National Park Service
    - Antietam National Battlefield
    - Monocacy National Battlefield
    - Chesapeake & Ohio (C&O) National Historic Trail
    - Appalachian Trail
    - Appalachian Trail Conservancy
    - Harpers Ferry National Park
    - American Battlefield Protection Program
    - Northeast Region
- Natural Resource Conservation Service
- United States Army Corps of Engineers

State Agencies

- Virginia Department of Game and Inland Fisheries
- Virginia Department of Conservation and Recreation
- Virginia Department of Historic Resources
- Virginia Department of Agriculture & Consumer Services
- Virginia Department of Aviation
- Virginia Department of Conservation and Recreation
- Virginia Department of Environmental Quality
- Virginia Department of Forestry
- Virginia Department of Transportation
- Virginia Marine Resources Commission
- Virginia Department of Mines, Minerals, and Energy
- Virginia Outdoors Foundation
- West Virginia Division of Natural Resources, Parks and Recreation Section
- West Virginia Division of Natural Resources, Wildlife Resources Section
- West Virginia Division of Natural Resources, Forestry Division
- West Virginia State Historic Preservation Office
- West Virginia Department of Transportation
- West Virginia Aeronautics Commission
- West Virginia Department of Agriculture
- Maryland Department of Transportation, State Highway Administration
- Maryland Department of Agriculture
- Maryland Department of Natural Resources, Power Plant Research Program
- Maryland Department of the Environment, multiple divisions

- Maryland Wildlife and Heritage Service
- Maryland Historic Trust
- Maryland Aviation administration
- Maryland Department of Planning

County/Local Agencies

- Hardy County Economic Development Office
- Hampshire County Planners
- Frederick County Planning Department (Virginia and Maryland)
- Clarke County Planning Department
- Jefferson County Planning Department
- Berkeley County Planning Department
- Washington County Planning Department
- Loudoun County Planning Department
- Potomac Appalachian Trail Club

Stakeholder Meetings

The Applicant held four stakeholder meetings during the route selection process in Maryland at the suggestion of the Maryland Power Plant Research Program. Stakeholders were invited to participate in workshop-style meetings. Stakeholders included representatives of federal and state agencies and local area officials including (but not limited to) representatives of Maryland DNR; all NPS units in the study area, local counties and communities, and various interest groups.

The first set of meetings was held June 4 and 5, 2008. Attendees were briefed on the PATH Original Configuration, general engineering topics, and siting practices and given questionnaires. The questionnaires asked stakeholders to identify route evaluation factors, constraints, and opportunities.

At the second set of meetings on July 9 and 10, 2008, results from the questionnaires were reviewed and maps with potential segments were distributed. According to the questionnaires, the top route evaluation criteria were:

1) viewshed impacts (scenic quality, cultural landscape);
2) protected lands (federal and state parks, agricultural conservation districts, and conservation easements);
3) use existing corridors (roads, railroads, and transmission lines);
4) historic/archaeological impacts; and
5) avoid established communities/populated areas.

The top-listed constraints were:

1) protected lands (federal and state parks, agricultural conservation districts, and conservation easements);
2) historic districts/properties; and

3) important viewsheds.

The top opportunities were:

1) existing corridors (roads, railroads, and transmission lines); and
2) previously disturbed areas (industrial/commercial areas).

After reviewing the questionnaire results, stakeholders were given the opportunity to mark off segment links to indicate areas of potential constraints or unforeseen problems and draw in suggested alternatives.

Meetings were also held with representatives of Montgomery County, Maryland on July 11, 2008. The PATH Original Configuration along with the preliminary segments that crossed Montgomery County, were presented to them.

In between the two sets of stakeholder meetings, the Routing Team held two public informational meetings, in Frederick and Washington Counties, Maryland. These meetings were established to present information on the project and receive general input on the siting and route selection process from the public. The responses were similar to those from the first stakeholder meetings.

2.1.5 Public Involvement Activities

The Routing Team developed, monitored, and administered a public outreach data collection effort (as it related to siting and routing) using a comprehensive public outreach campaign and multiple data management tools. The public outreach campaign included opportunities for the public to give their input on the PATH Project at multiple open houses throughout the study area, and/or by also submitting comments electronically (through the PATH Project website), by phone, or by U.S. mail.

The public outreach campaign educated the public on the need for the PATH Project and on substantial issues related to the planning, siting, construction, and operation of a 765 kV transmission line. The ultimate goal in this effort was to educate the public about the project and provide multiple avenues and opportunities for public input on the project. These efforts were primarily directed at residents of West Virginia, Virginia, and Maryland; however, AEP and Allegheny also opened up a website, a mailing address, and a toll-free telephone number for stakeholders outside of the region.

After three months of planning, PATH Project staff launched a public outreach effort that included: coordination and implementation of 24 open houses across three states; outreach to media; production of an educational DVD; and production of an interactive online open house for the PATH Project web site.

Public comments were received and coordinated through a public comment database. Public comments were compiled from a variety of sources, including:

- electronic comments submitted by the public through the project website
- letters to the PATH Project owners, the Routing Team, and the WV PSC

- letters from concerned citizens and property owners
- phone records from telephone calls to PATH Project owners and Routing Team
- comments from public meetings

Because the public input was collected in one repository, this report reflects the data collected for the PATH Project in its entirety.

Public Open Houses

Public open houses were held in and around the more densely populated areas along the Potential Routes for the entire study area.[2] PATH Project staff set up stations at the meetings and provided information related to engineering and design of the structures, EMF concerns, project schedule, project need (with PJM in attendance), real estate and ROW issues, natural and cultural resources, and route alternatives. Representatives were available to talk with the public specifically about siting and routing, cultural and natural resources, and public outreach initiatives.

Printed maps at a scale of 1 inch = 500 feet were provided for the public to review and provide written comment concerning sensitive resources in their local environment. Participants were provided pens and encouraged to document the location of their house, place of business, and property of concern on the printed maps. After each meeting, hand written comments were digitized and entered into a GIS database, and all aerial photo maps were scanned for later reference. Routing team staff reviewed many comments in the field and, where applicable, incorporated information derived from the public open houses when reviewing, revising, and comparing Potential Routes. In addition to supplying maps at public meetings, staff provided visual aids and web-enabled maps through the PATH Project website to reflect the progress of the project.

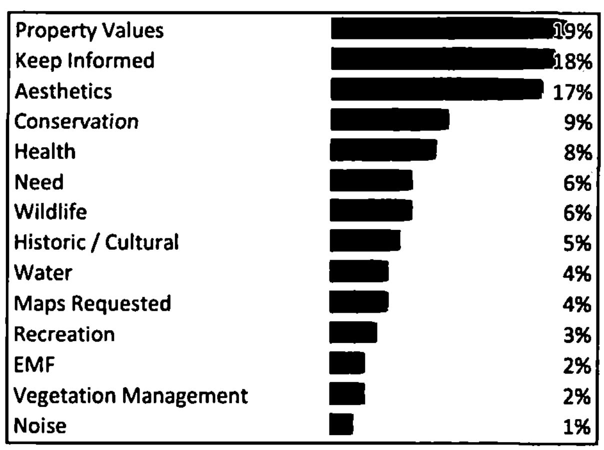
Comment cards were distributed at every meeting. All meeting attendees were given a card with an identification number. The public was asked to fill out the card completely, including contact information. The bottom of the card detached and the public was given additional space to express more specific comments. All comment cards were entered into the public comment database as a record of meeting attendance. Those who completed the form in its entirety (i.e., provided a complete name and address and comment) were documented as a participant in the public involvement process. The following table provides a list of the conference attendees at each of the public open houses for the entire PATH Project (Amos to Kemptown).

[2] Because public input was gathered through a variety of methods and many of the comments received were either non-geographically specific or covered multiple parts of PATH, the results of the overall public involvement process are presented here for the entire PATH Project.

Date	Open House Location	Conference Attendance
July 21, 2008	Roanoke, WV	15
July 22, 2008	Glenville, WV	2
July 23, 2008	Spencer, WV	55
July 24, 2008	Flatwoods, WV	12
July 28, 2008	Buckhannon, WV	88
July 29, 2008	Elkins, WV	48
July 30, 2008	Mount Storm, WV	6
July 31, 2008	Romney, WV	29
August 4, 2008	Institute, WV	60
August 5, 2008	Davis, WV	65
August 6, 2008	Martinsburg, WV	160
August 7, 2008	Frederick County, VA	65
August 11, 2008	Harpers Ferry, WV	125
August 11, 2008	Moorefield, WV	35
August 12, 2008	Frederick, MD	125
August 13, 2008	Boonsboro, MD	130
August 14, 2008	Lovettsville, VA	30
August 14, 2008	Berkeley Springs, WV	268
August 18, 2008	New Market, MD	130
August 19, 2008	Middletown, MD	112
December 2, 2008	Clear Brook, VA	126
December 3, 2008	Charles Town, WV	190
December 4, 2008	Frederick, MD	180
January 22, 2009	Lovettsville, VA	365
	Total	**2,426**

Summary of Public Comments Received

As of February 25, 2009, more than 2,700 comments were submitted on the PATH Project. The highest volume of comments was received over the month of August, which was when the majority of the public open houses were held.



All comments were catalogued and categorized through review of the email/letter, phone memo, or comment card. Categories of noted public concern included aesthetics, property values, conservation (environmental), health, wildlife, historic/cultural resources, need, water resources, recreation, EMF, vegetation management, and simply asking to be kept informed. Many people requested to be kept informed about the project but did not voice specific concerns. The top issues of concern included: aesthetics, property values/residential concerns, conservation (environmental concerns), and health effects.

In addition, there were many entries in the database representing individuals who attended the public meeting, but did not provide a comment or complete contact information. These people are listed as "Other: attended meeting" in the database. Approximately half of these people attended meetings for the section of the proposed routes west of the proposed Welton Spring Substation.

2.2 IDENTIFICATION OF SUBSTATION SITES

2.2.1 Substation Siting Criteria

The PATH Project required identifying a suitable site for the proposed Kemptown Substation, and after project reconfiguration, a suitable site for a proposed substation somewhere near the mid-point of PATH. Many of the initial considerations for substation site selection are dictated by the system planners. System planning considerations typically dictate the regional need and general location of the substation as well as the necessary transmission interconnections needed to promote system reliability. Once these key system requirements are identified, the engineers and environmental planners identify potential sites and evaluate the potential engineering obstacles, construction logistics, potential operational constraints, and potential environmental and human impacts associated with each potential site.

The following list provides a summary of the substation siting criteria from system, engineering, environmental, and human environment perspectives.

Electrical Load Center: Identified sites must meet the electrical need and requirements identified by the system planners and do so in an economic and reliable manner.

Transmission Access: Proximity to the EHV transmission lines that are to connect into the substation. Both PATH and TrAIL will need to be routed to the proposed Welton Spring Substation site. Additionally future access to the 138/230 kV system would be preferred for both substations.

Engineering/Operations

Space Requirements: Based on current engineering requirements for needed electrical equipment, the size of the graded and fenced site must be a minimum of 2,500 feet by 1,500 feet. In addition, buffer areas for cuts, fills, and screening must be available outside this fenced area on the property.

Access Requirements: Due to the heavy power transformers (on the order of 300 tons) expected at the site, consideration of bridge/public roadway weight limits is necessary. Access to the site should be via a reasonable grade, length, and turning radius. Proximity to railroads for transformer delivery is required within a reasonable hauling distance, with consideration for the ability to extend a rail siding to the proposed facilities. Joint access to public roads with other private owners should be avoided.

Geotechnical Considerations: Consideration should be given to soil types and soil stability. Soils with excessive restrictions on engineering and construction factors should be avoided, including areas prone to slips, slides, large rock outcrops, evidence of coal mining, and karst features. Sites in close proximity to quarries should be avoided.

Substation Electric Needs: Proximity to the distribution and sub-transmission systems should be considered for main and back-up station service power supplies to avoid lengthy, costly extensions of lines to serve the new facilities.

Cost: Relative site development and construction costs should be part of the overall analysis.

Natural and Human Environment Impacts

Terrain/Slope Considerations: Sites should not be located on excessively steep terrain that will require extensive grading work and have increased potential for erosion and sedimentation effects. Low lying sites prone to flooding should be avoided. Allowance should be provided for excavation cuts and fills, drainage and detention ponds, construction disturbed areas, and material lay-down areas.

Historic and Archaeological Concerns: Sites should be reviewed for any impact to historic or archeological features and these impacts should be minimized.

Hazardous wastes: Sites should be reviewed for the potential for hazardous materials, and avoided where possible.

Public Use Facilities: Where possible, sites in close proximity to schools, churches, community buildings, and parks should be avoided.

Recreational Areas: Recreational areas should be avoided during site selection. Aesthetic impacts should be reviewed to avoid conflicts with these uses.

Aesthetics: Consideration should be given to the aesthetics of the area when locating the substations. Vegetation and terrain should be either available or easily planted to screen the facilities from extended views from nearby residents and travelers, if possible.

Residential Land Use: Vacant lands are the preferred location for substation sites, and high-density residential areas should be avoided during preliminary site selection if possible and practical.[3] Consideration should be given to all dwellings located in proximity to the sites.

[3] This is not always the case, because the electrical need for the substation site location may actually require the substation to be placed in a residential area.

Whenever possible, the number of individual property owners involved should be minimized. However, line routing (both transmission and distribution) to and from the site should be observed for current needs and future station equipment expansion.

Utility Lines: Consideration should be given to the presence of underground gas or water pipelines, other utilities, and proposed adjacent development plans.

Water Resources/Wetlands: The site should not be located in floodplains or near high quality streams or reservoirs if possible. Sites with Corps of Engineer jurisdictional wetlands should be avoided if possible or be able to be easily mitigated.

2.2.2 Substation Site Selection

2.2.2.1 Welton Spring Substation

The objective of the proposed Welton Spring Substation siting effort was to find a site that most effectively met the electrical requirements and purpose, fell within the engineering constraints of substation design, and minimized impacts on the natural and human environment. The electrical requirements for the substation narrowed the initial scope of the site search by dictating that the site be located roughly midway between the Amos Substation and the proposed Kemptown Substation (with an electrical preference for areas east of Mt. Storm) and allow for an interconnection with TrAIL.

As a result of these requirements, the siting team focused its attention on sites between the Mt. Storm Power Station in Grant County and Rio, in Hampshire County, West Virginia. Nine sites were identified by the engineering team and reviewed by the engineering and environmental teams as potential substation sites (**Figure 2.2-1**). Identified sites were positioned loosely with respect to topographic and other site concerns, anticipating that subsequent reviews would encompass the greater area and allow for more detailed positioning of the substation layout at each site. Brief descriptions of these sites are provided below.

Site 1

Site 1 is located near the intersection of SR 93 and SR 42 in Grant County, West Virginia. The site is directly adjacent to the TrAIL line. The Mt. Storm-Doubs 500 kV line passes directly to the north of the site while the Mt. Storm to Meadow Brook 500 kV line passes directly to the south. Site 1 can be accessed from County Route (CR) 42/1; 3,600 feet off of SR 93. The nearest railroad access is at the Mt. Storm Substation, an additional 3 miles along SR 93. There are 5 houses within 0.5 miles of the site, most along CR 42/1 to the sites west. The Allegheny Church of the Brethren is within a 0.5 miles of the site, also on CR 42/1.

Site 2

Site 2 is located near the intersection of CR 3 and Belle Babb Lane in Grant County. The site is roughly 1,500 feet north of the TrAIL line and 350 feet north of the Mt. Storm-Doubs line. The site can be accessed from SR 93 by taking CR 3/3 to Knobly Road, a total distance of 5.5 miles. The nearest railroad access is an additional 8.2 miles along SR 42 and SR 93. There are 6 houses within 0.5 miles of the site, most along Knobly Road to the west. Two species of state concern are located within 0.5 miles.

Site 3

Site 3 is located near the intersection of CR 3/2 and Belle Babb Lane in Grant County. The site is 4,250 feet north of the TrAIL line and 3,500 feet north of the Mt. Storm-Doubs line. This site has access to U.S. 220 via Belle Babb Lane to Patterson Creek Road to Old Fields Road-Williamsport Road, a distance of 9.2 miles. Access to the South Branch Valley Railroad is an additional 3 miles along U.S. Highway 220 and Cunningham Lane. There are 4 houses within 0.5 miles of the site. Two ponds are located on the edge of the 0.5 miles site buffer.

Site 4

Site 4 is located along an unnamed road off of Old Fields Road-Williamsport Road in Hardy County. The TrAIL line is 50 feet south of the site and the Mt. Storm-Doubs 500 kV line passes 250 feet south of the site. The site has access to U.S. 220 along Old Fields Road-Williamsport Road, a distance of 2.9 miles. Access to the South Branch Valley Railroad is an additional 3 miles along U.S. Highway 220 and Cunningham Lane. There are 14 houses within 0.5 miles of the site, predominatly along Old Fields Road-Williamsport Road. A pair of smalls streams cross the site including Turnmill Run, flowing to the east.

Site 5

Site 5 is located at the end of an unnamed road off of Old Fields Road-Williamsport Road in Hardy County. The TrAIL line is 1,000 feet south of the site and the Mt. Storm-Doubs 500 kV line passes 1,350 feet north of the site. The site has access to U.S. 220 along Old Fields Road-Williamsport Road, a distance of 2.9 miles. Access to the South Branch Valley Railroad is an additional 3 miles along U.S. Highway 220 and Cunningham Lane. There are no houses within 0.5 miles of the site. Two small streams border the northeastern and southwestern edges of the site.

Site 6

Site 6 is located off of Trough Road in Hardy County. The site is 850 feet south of the Mt. Storm-Doubs 500 kV line. The TrAIL line is an additional 4,150 feet to the south. The site has access to U.S. 220 via Cunningham Lane and Trough Road, a distance of 8.1 miles. The nearest railroad is reached along the same route (7.5 miles). A series of unnamed roads branch off of Trough Road and cross the site. There are 5 houses within 0.5 miles of the site, predominately along Trough Road. Several small streams cross the site flowing north towards the South Branch of the Potomac River.

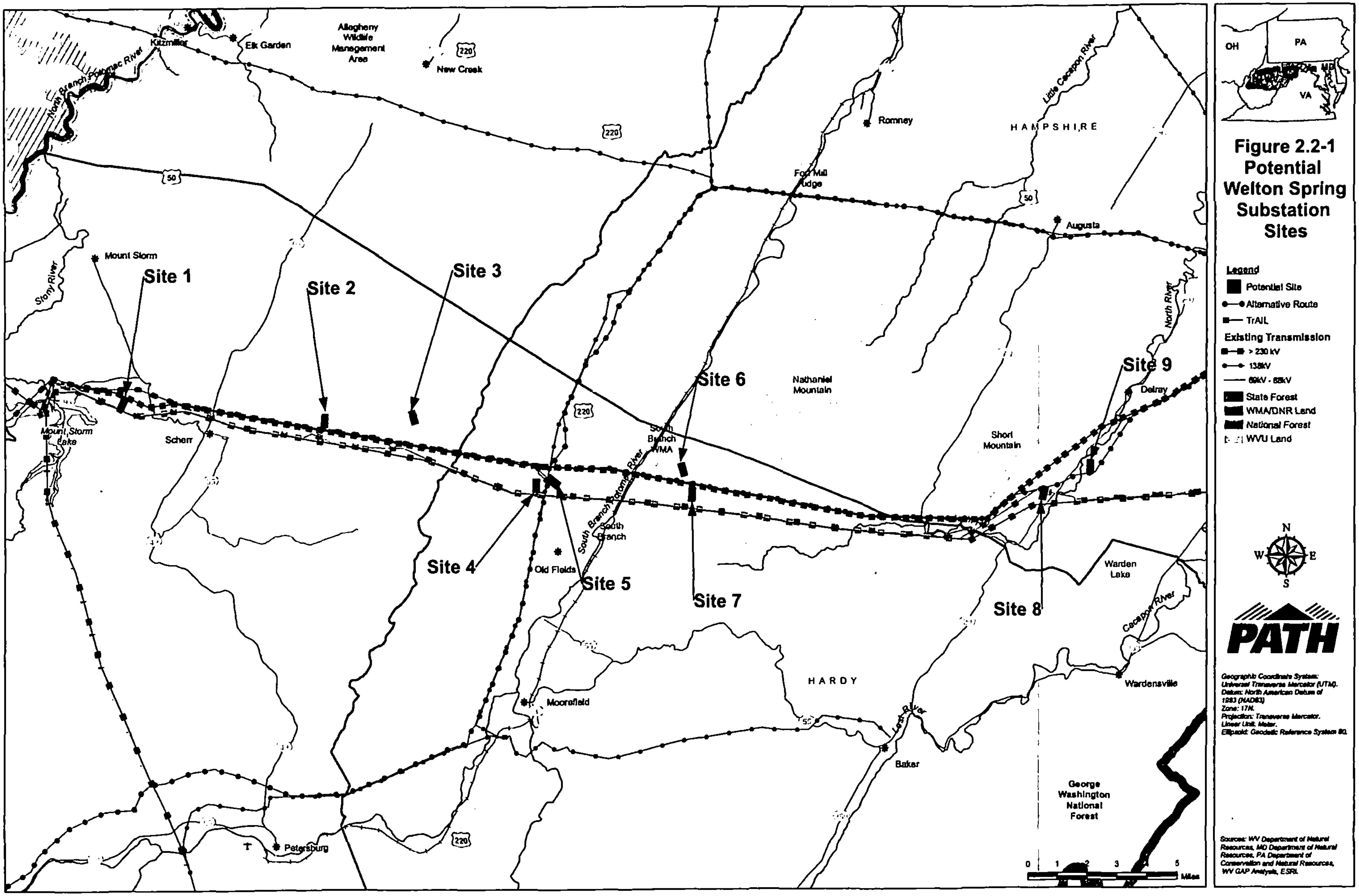


Figure 2.2-1 Potential Welton Spring Substation Sites

Site 7

Site 7 is located on an unnamed road off of Trough Road in Hardy County. The site is in between the Mt. Storm-Doubs 500 kV line (450 feet to the north), the TrAIL line, and Mt. Storm-Meadow Brook 500 kV line (900 feet to the south). The site has access to U.S. 220 via Cunningham Lane and Trough Road, a distance of 8.8 miles. The nearest railroad is reached along the same route (8.2 miles). A series of unnamed roads branch off of Trough Road and cross the site. There are 4 houses within 0.5 miles of the site. Several small streams cross the site, including Stony Run.

Site 8

Site 8 is located at the intersection of Persimmon Drive and SR 29 in Hampshire County. The site is crossed by the TrAIL line, lies 600 feet north of the Mt. Storm–Meadow Brook line, and is 1,900 feet southwest of the Mt. Storm-Doubs line. The site is 0.4 miles from SR 29 with access off of Persimmon Drive. The nearest railroad is 25.5 miles to the west off of U.S. 220. There are 24 houses and the historic Deep Run School within 0.5 miles of the site. The North River passes 1,300 feet to the east of the site. Deep Run and several other small streams cross the site.

Site 9

Site 9 is located 1,800 feet east of the intersection of North River Highlands Road and SR 29 in Hampshire County. The site lies 4,050 feet north of the TrAIL line and 3,080 feet southwest of the Mt. Storm-Doubs 500 kV transmission line. The site is 630 feet from SR 29; however, the closest access across the North River is several miles downstream. The route to SR 29 is 7.6 miles with more than 3 miles along unpaved roads and the remainder along Saurkraut Road and CR 55/1. The nearest railroad is 26.8 miles to the west off of U.S. 220. There are 11 houses within 0.5 miles of the site, many of which are part of a housing development to the west. The North River passes within 500 feet of the site, flowing in between the housing development and site location. More than half of the site is on land under conservation easement.

Substation Review and Selection

The above nine substation sites were initially located by the siting team through a review of the existing transmission network, topography, road network, and aerial photography. Concerted efforts were made to identify a series of potential sites distributed along the length of the lines where TrAIL and PATH were in close proximity to ensure that a broad geographic range of potential sites were considered. The following data tables provide a brief summary of information for each site as part of the comparison process. Other evaluations, such as bridge integrity, grading needs, and aesthetic character were developed through field reviews of each site.

Table 2.2-1. Summary of Proposed Welton Spring Substation Engineering and Environmental Factors

Site Number	1	2	3	4	5	6	7	8	9
Engineering									
Distance from 138 kV lines (miles)	14.3	7.5	4.5	850 ft	0	4.2	4.7	16.5	18
Distance from TrAIL line (ft)	-	1,500	4,250	50	1,000	5,000	900	-	4,050
Proximity to Major Road (ft)	3,100	550	1,300	4,000	1,500	1,300	4,600	1,500	600
Proximity to Railroad (miles)	2.1	8.9	7.2	2.5	2.0	1.0	1.9	11.4	10.0
Steep Slopes >20 percent (acres)	139	304	343	115	119	326	531	389	481
Environmental									
Sensitive Species within 1/2 mile	0	2	3	0	0	1	3	0	0
Cultural sites within 1/2 mile	0	0	1	0	0	0	0	0	0
Houses within 1/2 mile	5	6	4	14	0	5	4	24	11
Public Facilities within 1/2 mile	1	1	1	0	0	0	0	1	0
Recreation Areas within 1/2 mile	0	0	0	0	0	0	0	0	1
Streams within 1/2 mile	2	7	7	8	5	4	8	9	5
Wetlands within 1/2 mile (acres)	7.8	7.4	63.2	5.3	2.4	0.0	0.0	6.8	1.8
Hydric Soils Percent	0%	4%	5%	7%	5%	0%	0%	17%	24%

As the team reviewed each site in the field and with a broader range of available environmental and infrastructure information, several sites quickly dropped from consideration. Sites 2, 3, 6, and 7 were removed from consideration due primarily to concerns regarding access issues, most notably with respect to concerns regarding weight limitations for the roads and bridges along the likely access routes. Suitable rail lines for these sites are either to the west over New Creek Mountain and up the Allegheny Front along narrow county highways, or to the east over Patterson Creek Mountain and south to Moorefield. In addition, Site 2 is adjacent to the American Discovery Trail (a continuous, multi-use trail that stretches 6,800+ miles from Cape Henlopen State Park, Delaware, to Pt. Reyes National Seashore, California), and Site 3 is in a generally low area with 60 acres of potential wetland areas in the immediate vicinity. Sites 6 and 7 are in generally inaccessible areas, serviced only by the narrow Trough Road running between Mill Creek Mountain and Nathaniel Mountain, with little, readily available access to the distribution and sub-transmission system of the area.

The siting team considered Sites 1, 4, 5, 8, and 9 in greater detail. Sites 8 and 9 have a reasonable access route, U.S. Highway 29, but have little access to nearby rail lines or the existing 138 kV transmission system. Site 9 is located partially in a conservation easement and near or within the floodplain of the North River. Though additional options were potentially available for realigning the site in that area, none of the options would remove the site significantly from the floodplain and would still involve a reasonable amount of grading. Furthermore, due to its location within the broad farmlands of the North River floodplain, this site is a prominent visual feature for travelers along the relatively picturesque U.S. Highway 29. In contrast, Site 8 is located west of Highway 29, above the floodplain and in the foothills of Short Mountain near Short Mountain Heights. This site had the greatest number of homes within 0.5 miles (though equal to Site 4) and would likely require significant grading. Access to the site from the existing road network to U.S. Highway 29 likely would be unsuitable, requiring the development of a new entrance road. Eventually, both Sites 8 and 9 were removed from consideration as a result of these constraints.

Sites 1, 4, and 5 were considered generally the best sites for the construction of the proposed Welton Spring Substation. Site 1 was one of the last sites to be identified and considered by the siting team. This site is situated between the Mt. Storm-Doubs 500 kV and Mt. Storm-Meadow Brook 500 kV lines and adjacent (slightly to the west) of NedPower's Mt. Storm Wind Project. In general, this site is considered suitable due to the presence of consistent land uses in the area, the absence of nearby residences, and the presence of suitable access opportunities along SR 93 and the CSX Rail Line servicing Mt. Storm. However, the site does not provide readily available interconnection opportunities to the 138 kV system and, due to the adjacent wind farm and future Corridor H alignment, substation design and operations would be spatially constrained. Additional concerns include the subsurface conditions at the site which appear to be impacted by past surface mining activities on site. Recent construction at the Greenland Gap Substation (the tie-in for the Mt. Storm Wind Project) ran into considerable difficulty during the grading process as a result of unstable subsurface conditions, requiring significant grading and soil reconstruction efforts. Due to the importance and sensitivity of the transmission infrastructure at the proposed Welton Spring Substation, the substation engineers considered this level of subsurface rehabilitation problematic for both the construction and potentially the operation of the substation in the future. One other factor considered for this site, as a result of the engineering team's specific knowledge of the Mt. Storm operations, relates to icing. Mt. Storm's location on top of the Allegheny Plateau makes it susceptible to frequent icing events that cause operational interruptions at the Mt. Storm Substation. These events occur periodically, and if they were to affect both the Mt. Storm Substation and a future Welton Spring Substation constructed at this same location, outages may occur that would degrade overall system reliability. For these reasons, Site 1 was eventually considered to be a less than preferred site for substation construction.

Sites 4 and 5 are well situated for interconnections with the existing 500 kV and 138 kV system. SR 220 provides adequate access for heavy machinery, and the nearby South Branch Valley Rail line provides reasonable access to the site from Moorefield. However, Site 4 is closer to the houses along Old Fields Road resulting in far more houses within 0.5 miles, is farther away from SR 220, and has slightly more wetlands and streams in its vicinity. All of these issues make it a less desirable location than Site 5.

As a result, the siting team selected Site 5 as the location for the proposed Welton Spring Substation. Site 5 provides the necessary access roads, access to rail lines, and existing transmission system connections. At the same time, Site 5 has generally the fewest houses within the immediate vicinity, has no known cultural or historic resource concerns, and does not have any identified subsurface issues.

2.2.2.2 Kemptown Substation

For the proposed Kemptown Substation, the objective was to find a location as close to Kemptown Junction as possible, which greatly narrowed the siting possibilities. The junction involves two existing 500 kV transmission lines owned by BGE and Pepco, which intersect roughly in a 'T' configuration (see **Figure 2.1-1).** The new substation would connect the proposed line to these other two lines.

A site of approximately 150 acres is necessary for the new substation. Any site must include connections to all of the lines that form the junction. Therefore, if the substation is not located at the junction, the existing 500kV transmission lines must be routed to the new site. Furthermore, any connection running from an existing line to the substation site needs to go into the substation and then back again to the existing line. This means the construction of a transmission line would be required to the substation and back to the existing line, which would have more impacts than a single new line into the Kemptown Junction site.

Kemptown Junction is located approximately 3,800 feet west of Bartholows Road in Frederick County, Maryland. A review of the area included the identification of several potential sites along the BGE 500 kV line either southwest or northeast of the junction or along the Pepco line to the south. The main focus of the study, however, was to determine the suitability of the land surrounding the junction itself because that site had been identified as the best electrical location for the project.

The land immediately to the east and west of the junction is agricultural. Research determined that the land to the east would provide sufficient space for the substation and was available for purchase. Initial investigation of the site determined that there seemed to be enough space to build the site without disturbing wetlands, and that there are no known cultural resources or threatened or endangered species on the site. The site has paved access via Bartholows Road and trees on the north, south, and west sides to serve as a buffer for visual and audible effects. The east side of the site is along Bartholows Road, which is sunken in this area, thus providing visual screening on that side as well. In addition, a railroad line is within 2 miles of the substation site along with reasonable roadways between the rail siding and the substation site to enable the delivery of power transformers. Based on the factors, the site was determined suitable, and PATH Allegheny negotiated the purchase of this property.

2.3 ROUTE DEVELOPMENT CRITERIA, GUIDELINES, AND PROCESS

2.3.1 Routing Criteria

The primary goal in selecting a route for the transmission lines associated with the PATH Project was to minimize the effect of the line on humans, animals and plants, and the environment, as well as cultural, historical, and recreational resources. No proposed route reasonably can be expected to optimize every such effect. For example, a route with fewer effects on environment or wildlife likely may have more effects on cultural resources than another alternative, or vice versa. In addition, federal and state laws and input from federal and state agencies may limit or affect siting choices.

The preceding primary goal and following criteria and technical guidelines (the listed criteria are not in order of importance or weight) were used in arriving at recommendations for siting the PATH Project in all jurisdictions.

Criteria

In identifying, evaluating, and selecting routes, the Routing Team attempted to minimize:

1. Route length, circuity, cost, and special design requirements.
2. The removal or substantial interference with the use of existing residences.
3. The removal of existing barns, garages, commercial buildings, and other nonresidential structures.
4. Substantial interference with the use and operation of existing schools, existing and recognized places of worship, existing cemeteries, and existing facilities used for cultural and historical, and recreational purposes.
5. Substantial interference with economic activities.
6. Crossing of designated public resource lands such as national and state forests and parks, large camps and other recreation lands, designated battlefields or other designated historic resources and sites, and wildlife management areas.
7. Crossing large lakes and large wetland complexes, critical habitat, and other scarce, distinct natural resources.
8. Substantial visual impact on residential areas and public resources.

2.3.2 Technical Guidelines

The Routing Team also was guided by the use of: (1) the technical expertise of engineers and other industry professionals responsible for the reliable and economic construction, operation, and maintenance of the PATH Project and other electric system facilities, (2) NERC reliability standards as implemented by PJM, (3) industry "best practices," and (4) the electrical need determination for the PATH Project. In implementing the foregoing route selection criteria, the Routing Team consulted with internal and external electric industry professionals as necessary in the consideration of any proposed routes that may be inconsistent with the application of the following technical guidelines.

Guidelines Applicable to 765 kV Line:

1. Avoid double-circuiting or crossing existing 765 kV lines. Do not parallel existing 765 kV lines for more than 1 mile in any particular location.
2. Minimize the crossing of 345 kV and 500 kV transmission lines.
3. Minimize paralleling corridors with more than one existing 345 kV or 500 kV circuit.
4. Maintain 200 feet of centerline-to-centerline separation when paralleling existing 345 kV, 500 kV, and 765 kV transmission lines.

5. Maintain 150 feet of centerline-to-centerline separation when paralleling 138 kV or lower voltage transmission lines.
6. Minimize angles greater than 65 degrees and sloping soils more than 30 degrees (20 degrees at angle points).
7. Do not triple-circuit lines of 345 kV or greater voltage.

2.3.3 Routing Process Steps and Terminology

The route development process is inherently iterative, with frequent adjustments, additions, and deletions made throughout the study as a result of the identification of new constraints, the periodic reassessment of routes with respect to the routing criteria, and through changes in the overall route network (i.e., removal/addition of a route segment in one part of the network may result in the removal of another route segment connected to it). As a result of the progressive nature of the route development process, the Routing Team uses specific vocabulary to describe the routes at different stages in the process.

Routes that are first identified and studied by the Routing Team are referred to as Potential Routes. Where Potential Routes intersected, links were formed as the segment of the route between two intersections. Together, the Potential Routes and their intersecting links are referred to as the Potential Route Network. The links are numbered for identification by the Routing Team and for referencing purposes when presented to the general public at the public open houses and through the maps provided online.

As the Routing Team continues to gather information and review the links of the Potential Route Network, links are modified, removed, or added. Eventually, after many iterative refinements, formal Alternative Routes are developed by assembling the better links into continuous routes for analysis and comparison. The Proposed Route is then selected from these alternatives.

Although attempts were made throughout the early route selection and public involvement phases to avoid changing the link numbers between the proposed Welton Spring Substation and the eastern Jefferson County border to provide a consistent referencing tool for the Routing Team and the public, periodic additions, deletions, and modifications eventually made this system cumbersome and confusing as the route finalization and comparative analysis effort began. By the later stages of the routing effort, numerous links had been modified, added, or deleted, resulting in an awkward assemblage of link numbers, links that started and stopped without an intersection (because of the removal of an intersecting link), and links that were modified beyond the level where they are easily traceable back to their origin. Thus, to provide clarity in the referencing of the links for the route analysis and proposed route selection discussion, we have renumbered the links in this report.[4] In Jefferson County, West Virginia, Loudoun County, Virginia, and Frederick County, Maryland, the new links created after the

[4] Link 201 replaces Links 43, 44, 56, and 57; Link 202 replaces Links 41, 63, and 66; Links 203, 204, 206, and 208 replace Link 73; Link 210 replaces Links 73, 82, and 86.

reconfiguration begin with 101. Links that were modified or bisected were given a sub-letter such as 42a.

2.3.4 Identifying Routing Constraints

Routing constraints in the study area were identified and mapped by the Routing Team. The constraints were defined as specific areas that should be avoided to the extent feasible by the route selection process. The constraints were divided into two groups based on the size of the geographic area encompassed by the constraint. The first group included constraints covering large areas of land in the study area. Large area constraints were avoided to the extent possible and were considered unfavorable by the Routing Team for developing Potential Routes.

The constraint list was adjusted many times as the Routing Team developed greater familiarity with the project area. The final list of large area constraints consisted of:

- urban areas, cities, towns, small villages, and other built up areas;
- federal forest and wildlife management lands;
- state forest and wildlife management lands;
- areas near airports and airstrips;
- National Register Historic Districts and adjacent areas;
- large recreational sites;
- large lakes and reservoirs that could not be spanned with the structures set well back from the shores; and
- large wetlands or wetland complexes.

Large area constraints are shown in **Figure 2.1-1** for Welton Spring to Kemptown segment of the PATH Project.

The second group of constraints encompassed many other types of features covering smaller geographic areas or specific point locations. After the Potential Routes were developed to avoid large area constraints, the alignments were adjusted to the extent possible to avoid point-specific constraints. Point-specific constraints consisted of:

- individual residences (including houses, permanently established mobile homes, and multi-family buildings); barns, garages, and other outbuildings;
- commercial and industrial buildings;
- recorded sites of designated historic buildings and sites, including any specified buffer zone around each site;
- recorded sites of designated threatened, endangered, and other rare species or unique natural areas and the specified buffer zone around each site;
- small wetlands;
- developed recreational sites or facilities;
- communications towers;
- windmills; and
- designated scenic vista points.

The intent of the Routing Team was to attempt to keep the routes and all areas of the required ROW from passing over these point-specific constraints. However, in some instances complete avoidances of small-area and point-specific constraints were not possible due to the large numbers of these small constraints in the project area. Specific constraints are described under each resource area in Chapter 3.

2.3.5 Identifying Routing Opportunities

Routing opportunities were identified by the Routing Team as locations where the proposed transmission line might be located with less disruption to the natural and cultural environment. Routing opportunities were uncovered by examining the project area in the field, studying aerial photography and maps, meeting with members of the general public and stakeholder groups, meetings with federal, state and local agencies, discussing the project with engineers and ROW personnel, and from the Routing Team's past experience with similar projects.

A range of existing ROWs were reviewed on maps and in the field. The Routing Team concluded that existing ROWs for lower voltage transmission or distribution lines, and most railroads, gas pipelines, and highways did not offer feasible paralleling or ROW sharing opportunities because they did not offer pathways in the direction desired, were too narrow or irregular in width and direction, or were surrounded by land uses or development patterns that were not consistent with the other route selection criteria. Furthermore, paralleling major gas pipelines with a 765 kV transmission line was not considered desirable due to engineering considerations.

Feasible routing opportunities in the study area were found to be limited to paralleling existing 138 kV, 230 kV (see section 2.4.1), and 500 kV transmission line ROWs. Some limited use of double circuit structures with 138 kV and lower voltage lines was considered by Routing Team engineers. However, double-circuiting with existing EHV lines was not acceptable due to reliability concerns or physical space limitations. See Section 2.4.1 for a review of existing transmission lines considered for development of Potential Routes.

2.4 DEVELOPMENT OF POTENTIAL ROUTES

The Routing Team began by establishing a wide range of initial Potential Routes. The initial network of Potential Routes was largely conceptual to allow for the team to consider a wide array of routing constraints and opportunities in the study area, including government lands, developed areas, and existing linear ROWs that could be paralleled.

Once the initial Potential Route network was developed, the Routing Team began to review each route in the field by conducting study area reconnaissance. Efforts included reviewing each Potential Route from public points of access and documenting locations of residences and other small area constraints. Comments and routing notes were recorded digitally on laptops over aerial photography using GIS software supported by real time Global Positioning System (GPS) tracking for positional information.

As the process continued, the route network was continually modified, with route adjustments, link removals, and link additions. **Figure 2.4-1** shows the Welton Spring to Kemptown Potential Routes that were considered in the analysis.

2.4.1 Existing Rights of Way considered for Potential Route Development

The existing transmission network east of the identified proposed Welton Spring Substation served as a major factor for the development of Potential Routes. Where possible and practical, Potential Routes were developed to utilize paralleling opportunities along 500 kV, 230 kV, and 138 kV transmission lines. **Figure 2.1-1** shows the existing lines considered suitable for developing paralleled Potential Routes.

Due to the presence of the existing transmission corridor running through the entire study area from the proposed Welton Spring Substation to the proposed Kemptown Substation, the Routing Team developed a series of conceptual routes that generally would follow this corridor. In places where following the existing lines was limited by adjacent resources, such as residences, historic sites, or sensitive environmental resources, the Routing Team developed alternatives to avoid them.

The Appalachian Trail and the C&O Canal run north-south across the entire study area; the PATH Project cannot avoid crossing these lands. Early in the development of the Potential Route Network, Routing Team members met with representatives of NPS and other federal and state agencies to review the routing process. Input from these meetings and the Appalachian Trail Conference *Policy on Roads and Utility Developments*, 2000, indicated that any crossing of these resources should be at an already disturbed location, such as at an existing transmission line or highway crossing. The Routing Team identified locations where existing transmission lines and road corridors would allow for logical crossing points with minimal impact on NPS lands.

In Maryland, multiple existing transmission lines run through the study area. The Potential Route network includes links that follow portions of both the 500 kV corridor and some lower voltage lines, as well as ones that do not follow existing corridors.

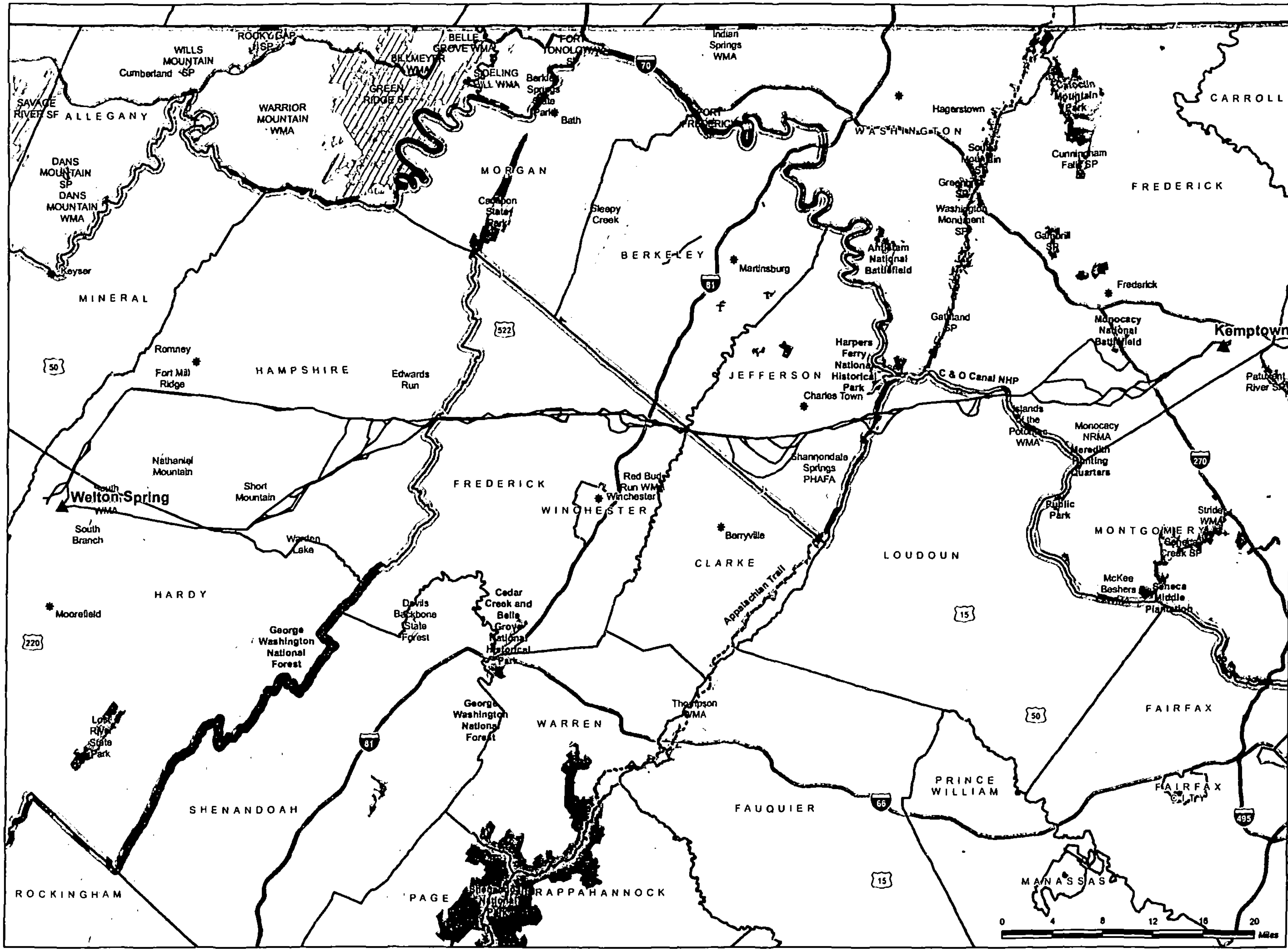


Figure 2.4-1 Welton Spring to Kemptown Potential Routes

Legend
- Substation
- Potential Route
- Appalachian Trail
- State Forest
- WMA/DNR Land
- National Forest
- State/National Park

PATH

Geographic Coordinate System: Universal Transverse Mercator (UTM). Datum: North American Datum of 1983 (NAD83). Zone: 17N. Projection: Transverse Mercator. Linear Unit: Meter. Ellipsoid: Geodetic Reference System 80.

Sources: WV Department of Natural Resources, MD Department of Natural Resources, PA Department of Conservation and Natural Resources, WV GAP Analysis, ESRI.

2.4.2 Potential Routes – Hardy and Hampshire Counties, West Virginia

Two Potential Routes were considered between the proposed Welton Spring Substation and Frederick County, Virginia. The general location of these routes was governed by both the minimization of impacts on large area constraints, such as the South Branch Potomac, Nathaniel Mountain, and Short Mountain Wildlife Management Areas (WMAs), as well as the use of existing transmission corridors that traverse the area. Both Potential Route alignments generally met at the crossing point of the Mt. Storm-Doubs 500 kV line and the Frederick, Virginia border.

The first Potential Route heads north from proposed Welton Spring Substation for roughly 12 miles aligned parallel to the Junction-Hardy 138 kV/Purgitsville 34.5 kV ROW, loosely paralleling U.S. Highway 220. At the community of Junction, the route turns east and parallels or double circuits the French's Mill-Hampshire 138 kV line for approximately 24 miles on a heading that runs just south of Augusta and Capon Bridge before entering Frederick, Virginia near where the Mt. Storm-Doubs 500 kV line crosses the state line.

The second Potential Route considered through this area largely follows the Mt. Storm-Doubs 500 kV line east for roughly 15 miles, crossing the South Branch Potomac WMA, a narrow portion of the Nathaniel Mountain WMA, and the southern tip of Short Mountain WMA before turning northeast. This route continues northeast for slightly more than 17 miles passing between Rio and Delray, West Virginia, before reaching the Frederick, Virginia, border.

Few other logical routing opportunity features are available through this area. Although other transmission lines are available in the area for paralleling, they either did not head in a useful direction, like the northwest-southeast heading Hampshire Meadow Brook 138 kV line, or were not suitable due to the presence of more than one 500 kV line in the same ROW, like the TrAIL/Mt. Storm-Meadow Brook 500 kV corridor.

2.4.3 Potential Routes – Frederick and Clarke Counties, Virginia

Potential routing opportunities crossing Frederick County, Virginia are also limited, but even more so than for the Hardy and Hampshire Counties Segment. As described previously, the Routing Team focused on developing Potential Routes that largely followed the joint Mt. Storm-Doubs 500 kV/and an adjoining ROW (hereafter referred to as the Doubs ROW) for the value of its paralleling opportunities and its near direct easterly heading toward the proposed Kemptown Substation.

Several route alignments were considered and reviewed by the Routing Team on either side of the Doubs ROW through Frederick and the small portion of Clarke County. Initial route alignments on both the north and south of the Doubs ROW were considered upon entering Frederick County. However, residences to the north of the line between Fletcher Road, U.S. Highway 50, and Parishville Road, as well as at the crossing of U.S. Highway 50 near its intersection with Whitacre Road prevented a northern alignment that would be adjacent and parallel to the existing corridor. An alignment along the south of the Doubs ROW, Link 203, ultimately was preferred, because it could (1) be aligned immediately parallel to the existing corridor, (2) take advantage of the use of a double circuit configuration with the Gore-Stonewall 138 kV line when necessary, (3) not place many houses between the new 765 kV and existing 500 kV lines, and (4) only require a small deviation near the intersection of the line and U.S. Highway 50.

Just east of Harmony Hollow Road, two potential alignments were developed either through or just north of a Virginia Outdoors Foundation (VOF) easement. The existing line passes through the middle of this 303 acre parcel. The Routing Team developed routes that both avoided the easement by following the boundary of the parcel northeast and then southeast back to the Doubs ROW, and that passed through it in a double circuit configuration.

Similar north- and south-side alignment alternatives were considered between the VOF easement, U.S. Route 522, and Hunting Ridge Road. Parallel and immediately adjacent alignments along the northern side of the Doubs ROW were largely unsuccessful because of the houses immediately adjacent to the northern side of the Doubs ROW just beyond U.S. Route 522, and along Chestnut Grove, Myers Road, Hunting Ridge Road, Spirit Hollow Road, and Manitou Road. The parallel alignment along the southern side of the Doubs ROW allowed for a more consistent parallel alignment, took advantage of the use of a double circuit configuration with the Gore-Stonewall 138 kV line when necessary, and avoided existing houses on Myers Road by reconfiguring the ROW in that area.

Significant residential development between Cedar Grove Road and Interstate 81 required the Routing Team to develop an array of potential routing alternatives. Potential Routes were developed that paralleled along the north side of the Doubs ROW: (1) along Link 213, (2) along a parallel and adjacent alignment on the south side of the Doubs ROW along Link 214, and (3) along a non-parallel alignment to the south through the agricultural fields and lower density residential areas at Welltown Road and south of Cedar Hill Road. All of these Potential Routes were considered for alternative development due to the concentrated residential development immediately adjacent to the line in this area.

East of Interstate 81, alternative alignments were limited largely to following along either the north side of the Doubs ROW in a parallel alignment or along the south side of the Doubs ROW in either a parallel and/or non-parallel alignment to avoid residential development. Two of the alternatives closest to the existing Doubs ROW would impact a proposed industrial development site on the immediate east side of the Interstate. The existing ROW crosses this site, which has been recently rezoned and planned for industrial use.

2.4.4 Potential Routes – Jefferson County, West Virginia

The Potential Routes begin at the west boundary of Jefferson County, on either side of the existing Doubs ROW. Up to Summit Point, approximately 4 miles, the area is undeveloped so the routes are adjacent to the existing lines. To the east of Summit Point is the beginning of the newly-formed Bullskin Run Historic District. Further east, residential development from the city of Charles Town has taken place along the existing line.

To provide options around these resources, the Routing Team developed alternatives to the south, including links 106 and 125. Link 106 deviates from the Doubs ROW and runs southeast across U.S. Highway 340 then loops back to the northeast, avoiding a subdivision. Initially, a link roughly parallel to Bullskin Run was developed, but when the boundaries of the historic district were determined, that link was found to be running through a large portion of the district, and it was dropped. Link 125 is a longer alternative around the Bullskin Run Historic District, which runs south almost to the county line, then turns east across U.S. Highway 340. This link follows an existing 138 kV transmission line for almost 2 miles before rejoining the Doubs ROW.

East of SR 9 the existing 138 kV and 500 kV lines separate. One link follows the 138 kV line to and around the Millville Substation and crosses the Shenandoah River. The other link follows the 500 kV line south of the substation and across the river.

The east side of the county is along the Blue Ridge, which forms the state line, and is the base for the Appalachian Trail. The Routing Team identified three links to cross the trail. Two of these follow the Doubs ROW across the trail; and one turns southeast to cross the trail where it crosses SR 9.

2.4.5 Potential Routes – Loudoun County, Virginia

As noted above, the Potential Routes enter Loudoun County from two points. One is along the Doubs ROW and the other from SR 9. The Doubs ROW passes through the Blue Ridge Center after crossing Harper's Ferry National Historical Park and the Appalachian Trail National Park. The other option runs northeast, bypassing the Blue Ridge Center and rejoining the Doubs ROW east of SR 671. The Routing Team identified the existing Doubs ROW as the best option for the next 4 miles to SR 287. East of the highway the Doubs ROW passes through a large-lot subdivision, with dedicated open space. Consequently, an alternate route (Link 119) was developed as an option to avoid this dedicated open space easement. From the east side of the subdivision, the option is again limited to following the Doubs ROW.

2.4.6 Potential Routes – Frederick County, Maryland

All options enter Frederick County, Maryland following the Doubs ROW to take advantage of this existing crossing of the river and the C&O Canal National Historical Park. After a thorough investigation, the Routing Team could not identify another feasible crossing of the C&O Canal that would have low impacts comparable to the existing crossing. The single option continues for approximately 1.7 miles to the Doubs Substation.

At the Doubs Substation, the Potential Routes split three ways. One option continues east along the existing 500 kV transmission line on Link 46; one option turns northeast along a 230 kV transmission line to the Lime Kiln Substation (links 120, 121, 44a); and one option follows the 230 kV line for a short distance, then turns east on a new cross-country alignment (Link 122).

The existing 500 kV line continues east through Lilypons water garden nursery and follows a stream south of Urbana as it continues northeast to the Kemptown Junction, the site of the proposed Kemptown Substation. Link 122 rejoins this corridor on the north side of the Lilypons nursery. Link 44a passes the Lime Kiln Substation and then turns back southeast along an existing 230 kV transmission line. This route crosses the Monocacy River south of the Monocacy Battlefield and then turns east to parallel Interstate 270 south past Urbana, where it turns east for approximately 1.5 miles before rejoining the existing transmission corridor east of Urbana Pike. Several alternative links were developed to minimize impacts on the wetlands and other resources between the crossing of the Monocacy River and Urbana Pike, including Sugarloaf Mountain.

2.5 DESCRIPTION OF ALTERNATIVE ROUTES

The following section provides a detailed description of each of the Alternative Routes that were developed by the Routing Team. As described previously, the Routing Team met frequently throughout the route identification and review process, continually modifying, eliminating, and reviewing the Potential Routes. Those Potential Route links that remained at the end of the process were compiled into Alternative Routes for analysis and comparison. These Alternative Routes are described in the following sections and detailed in **Figure 2.5-1.**

Where appropriate, ROW configuration diagrams are referenced where alignments of the PATH line are described. All ROW configuration diagrams are lettered and presented in Section 2.6. Note, all diagrams are presented as if the viewer were standing in the ROW facing down the ROW toward the proposed Kemptown Substation, and all lettering of the ROW configurations is based on the ROW Cross Section Exhibits provided under separate cover in the Application.

2.5.1 Hardy and Hampshire Counties, West Virginia

2.5.1.1 Alternative Route E

Alternative Route E (**Figure 2.5-2**) exits the proposed Welton Spring Substation running parallel to the Junction-Hardy 138 kV line (see Configuration CC), north towards the Hampshire County border. This configuration continues for approximately 400 feet when the route diverges to the northeast to pass through a gap in housing along CR 220/2. After 3,900 feet, the route returns to parallel the 138 kV on its east side for another 6,500 feet to the Hampshire County border.

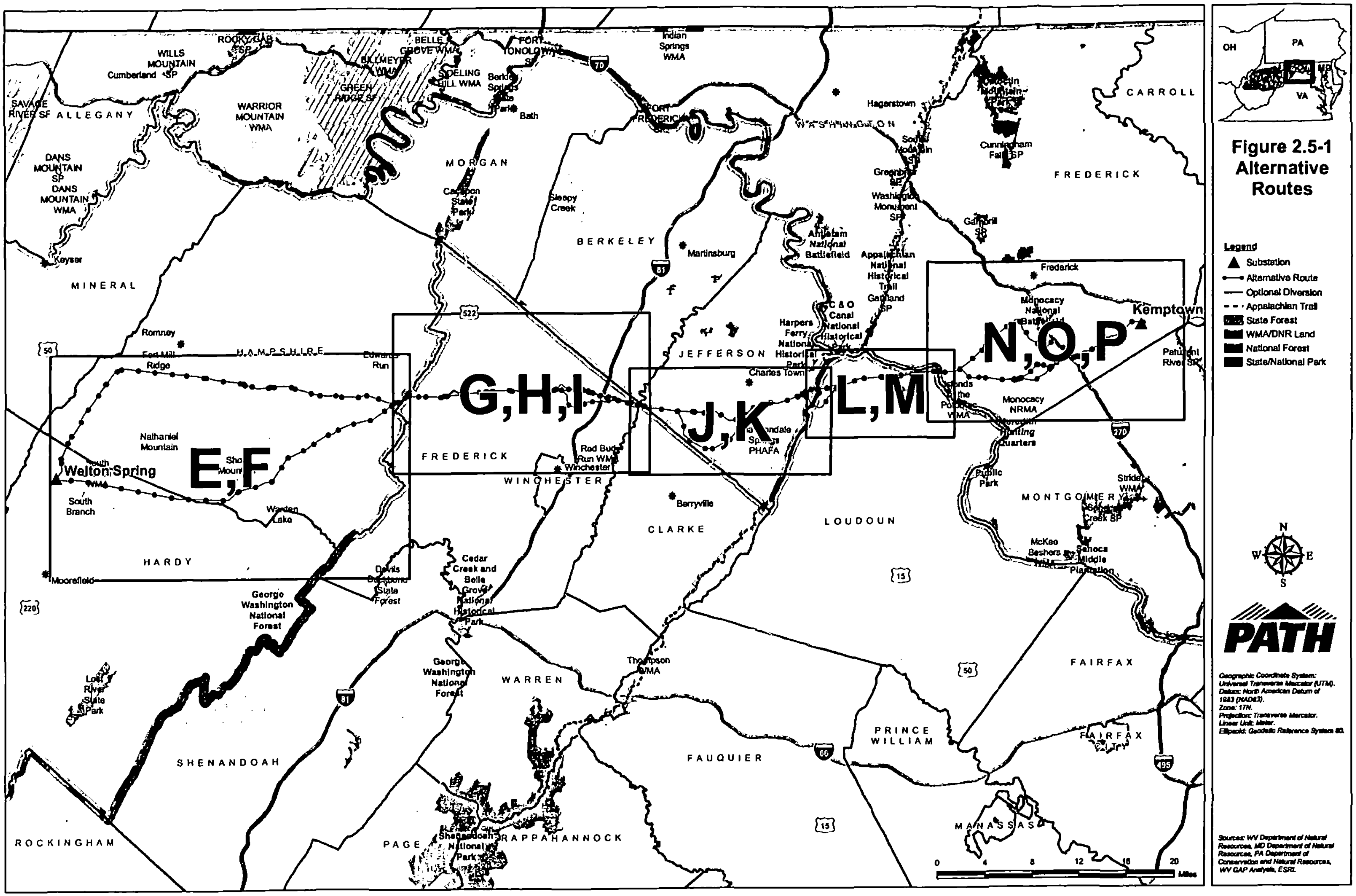


Figure 2.5-1
Alternative Routes
Legend
Substation
Alternative Route
Optional Diversion
Appalachian Trail
State Forest
WMA/DNR Land
National Forest
State/National Park
OH
PA
MD
VA
PATH
E,F
G,H,I
J,K
L,M
N,O,P
Welton Spring
Kemptown
ALLEGANY
MINERAL
HAMPSHIRE
HARDY
MORGAN
BERKELEY
JEFFERSON
FREDERICK
WASHINGTON
CARROLL
MONTGOMERY
LOUDOUN
CLARKE
WINCHESTER
WARREN
FAUQUIER
FAIRFAX
PRINCE WILLIAM
SHENANDOAH
ROCKINGHAM
PAGE
RAPPAHANNOCK
MANASSAS
Cumberland
Keyser
Romney
Moorefield
Bath
Hagerstown
Martinsburg
Charles Town
Berryville
Frederick
WARRIOR MOUNTAIN WMA
WILLS MOUNTAIN
DANS MOUNTAIN SP
DANS MOUNTAIN WMA
Nathaniel Mountain
South Branch
Warden Lake
Cacapon State Park
Sleepy Creek
Antietam National Battlefield
Appalachian National Historical Trail
C & O Canal National Historical Park
Harpers Ferry National Historical Park
Monocacy National Battlefield
Monocacy NRMA
Cunningham Falls SP
Greenbrier SP
Washington Monument SP
Gathland SP
George Washington National Forest
Cedar Creek and Belle Grove National Historical Park
Shenandoah National Park
Thompson WMA
Red Bud Run WMA
Patuxent River SP
Seneca Creek SP
McKee Beshers WMA
Sugarloaf Mountain
Lost River State Park
Devils Backbone State Forest
Indian Springs WMA
0 4 8 12 16 20 Miles
Geographic Coordinate System: Universal Transverse Mercator (UTM). Datum: North American Datum of 1983 (NAD83). Zone: 17N. Projection: Transverse Mercator. Linear Unit: Meter. Ellipsoid: Geodetic Reference System 80.
Sources: WV Department of Natural Resources, MD Department of Natural Resources, PA Department of Conservation and Natural Resources, WV GAP Analysis, ESRI.

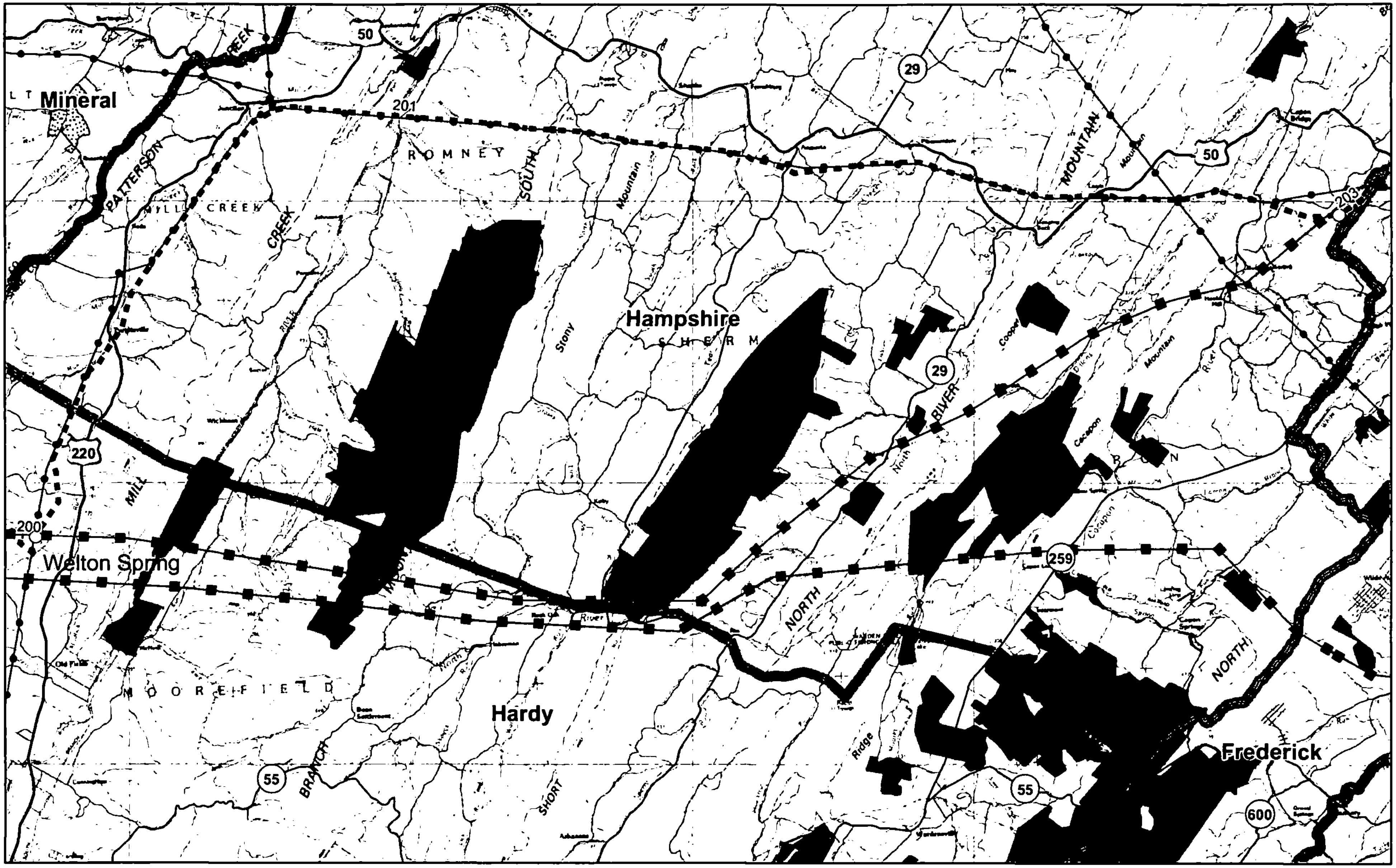


Figure 2.5-2
Alternative Route E

LEGEND

- Alternative Route
- Rebuild Segments
- Federal Lands
- State Lands
- Open Space Easements
- Ag Easements/Districts
- Historic Districts

Existing Transmission

- 500 kV
- 138/230 kV

N
W E
S

0 1 2 3
Miles

Sources: WV Department of Natural Resources, MD Department of Natural Resources, PA Department of Conservation and Natural Resources, WV GAP Analysis, USGS, ESRI.