U.S. Department of the Interior
National Park Service

Appalachian National Scenic Trail
Delaware Water Gap National Recreation Area
Middle Delaware National Scenic and Recreational River

New Jersey and Pennsylvania

Susquehanna to Roseland 500kV Transmission Line Right-of-Way and Special Use Permit Final Environmental Impact Statement

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Volume I

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
SUSQUEHANNA TO ROSELAND 500-kV TRANSMISSION LINE RIGHT-OF-WAY AND SPECIAL USE PERMIT FINAL ENVIRONMENTAL IMPACT STATEMENT

APPALACHIAN NATIONAL SCENIC TRAIL, DELAWARE WATER GAP NATIONAL RECREATION AREA, MIDDLE DELAWARE NATIONAL SCENIC AND RECREATIONAL RIVER, PENNSYLVANIA AND NEW JERSEY

Lead Agency: National Park Service, U.S. Department of the Interior
Cooperating Agency: U.S. Fish and Wildlife Service

This *Susquehanna to Roseland 500-kV Transmission Line Right-of-Way and Special Use Permit Final Environmental Impact Statement (EIS)* was prepared for the Delaware Water Gap National Recreation Area (DEWA), Appalachian National Scenic Trail (APPA), and Middle Delaware National Scenic and Recreational River (MDSR) in Pennsylvania and New Jersey. This EIS describes the proposal of PPL Electric Utilities Corporation and Public Service Electric and Gas Company (PSE&G), jointly known as the applicant, to construct a portion of the Susquehanna to Roseland 500-kV transmission line (S-R Line) and reconstruct an existing 230-kV line along their current right-of-way (ROW) through the parks, and details the six alternatives for the route of the transmission line, the resources that would be affected by the alternatives, and the environmental consequences of the alternatives.

Federal action by the National Park Service (NPS) is needed because the applicant has submitted an application and plan to construct its line across areas under NPS jurisdiction. The applicant requests NPS permission to expand the size of the current ROW, access the ROW through existing natural and cultural areas, construct new and taller power line towers, and remove and replace the existing 230-kV Bushkill-to-Kittatinny Line (B-K Line) with a new double-circuit 500-kV transmission line (the S-R Line). The purpose of the proposed action is to respond to the applicant's request to construct a double-circuit 500-kV power line across three units of the national park system considering the purposes and resources of the affected units as expressed in statute, regulation, and policy.

Under alternative 1 (no action), the permit to allow construction of the applicant's proposal would be denied and current conditions would be presumed to continue. Alternative 2 (applicant's proposed route) would cross approximately 4.3 miles of NPS lands along the existing B-K Line corridor and require the cleared ROW to be expanded to between 200 to 350 feet in width. Alternative 2b (applicant's alternate route) would follow the same route as alternative 2, but would be constructed within the applicant's existing deeded ROW without expansion. Alternative 3 would cross approximately 5.4 miles of NPS lands along a different existing transmission line corridor and would require a ROW ranging between 150 and 300 feet in width. Alternative 4 would cross approximately 1.5 miles of NPS lands along another existing transmission line corridor and would require a ROW ranging between 200 to 300 feet in width. This alternative would not cross the MDSR. Alternative 5 would follow the same route as alternative 4, but would not include a 0.6-mile stretch of NPS land found west of the Bushkill substation. Alternative 2 is the ***NPS preferred alternative***, and alternative 1 is the ***environmentally preferable alternative***. The EIS analyzes the impacts of the alternatives in detail for geologic resources (including topography and paleontology); floodplains; wetlands; vegetation; landscape connectivity, wildlife habitat, and wildlife; special-status species; rare and unique communities; archeological resources; historic structures; cultural landscapes; socioeconomics; infrastructure, access, and circulation; visitor use and experience; visual resources; soundscapes; wild and scenic rivers; park operations; and health and safety.

The draft EIS was released in November 2011 and was available for public and agency review and comment beginning with publication of the notice of availability in the Federal Register. Comments were accepted during the 60-day public comment period. After this public review, NPS identified the preferred alternative and revised this document in response to public comments. A 30-day no-action period will follow the notice of availability in the Federal Register for the release of the final version of this document. After this period, the alternative or actions constituting the approved plan will be documented in a record of decision that will be signed by the Regional Director of the Northeast Region of the NPS. For further information regarding this document, please visit http://parkplanning.nps.gov/dewa.

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EXECUTIVE SUMMARY

This *Susquehanna to Roseland 500-kilovolt (kV) Transmission Line Right-of-Way and Special Use Permit Final Environmental Impact Statement* (EIS) analyzes the environmental consequences of constructing a transmission line through portions of the Delaware Water Gap National Recreation Area (DEWA), Appalachian National Scenic Trail (APPA), and the Middle Delaware River National Scenic and Recreation Area (MDSR), in Pennsylvania and New Jersey in order to inform the National Park Service's decision on whether to issue the permits required to do so. The EIS assesses the impacts that could result from the denial of the permits and the continuation of current conditions (the no-action alternative) or the implementation of any of the five action alternatives (2, 2b, 3, 4, and 5). This EIS has been prepared in accordance with the National Environmental Policy Act (NEPA), the Department of Interior regulations implementing NEPA, and the National Park Service (NPS) Director's Order 12: Conservation Planning, Environmental Impact Analysis, and Decision Making. The NPS is integrating the NEPA compliance process with that for Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended, and using the NEPA documentation and coordination processes for Section 106 compliance pursuant to 36 CFR § 800.8(c). Integration of the requirements of Section 106 of the NHPA into the NEPA process and documentation are accomplished by meeting the criteria set forth in 36 CFR § 800.8(c)(1)-(4).

PURPOSE OF ACTION

The federal action under consideration in this EIS is deciding whether to issue the applicant the permits it needs to construct a double-circuit 500-kV transmission line across three units of the national park system. The purpose of the federal action is to respond to the applicant's proposal considering the purposes and resources of the affected units of the national park system, as expressed in statute, regulation, policy, and the NPS objectives in taking action.

NEED FOR ACTION

Federal action by the NPS is needed because the applicant has submitted an application and a plan to construct its line across areas under NPS jurisdiction. The applicant requests NPS permission to expand the size of the current right-of-way (ROW), to access the ROW through existing natural and cultural resource areas, to construct new and taller support towers, and to remove and replace the existing 230-kV Bushkill-to-Kittatinny Line (B-K Line) with a new double-circuit 500-kV transmission line (the Susquehanna-to-Roseland (S-R Line)). Under NEPA, before the NPS can issue a permit allowing a transmission line to cross a unit of the national park system it must consider and assess the impact on the human environment.

BACKGROUND AND PURPOSE OF DEWA, MDSR, AND APPA

DEWA, MDSR, and APPA are three separate units of the national park system. DEWA, MDSR, and APPA are central components of nature-based recreation for the New York City/Philadelphia metroplex.

DEWA is a 67,210-acre park along the shores of the Delaware River in New Jersey and Pennsylvania. DEWA offers a variety of outdoor recreational opportunities, including boating, fishing, swimming, biking, cross-country skiing, rock climbing, sightseeing, natural and cultural history, and the general solitude of a rural environment. Each year, DEWA receives more than 5.2 million recreational visitors (NPS 2012c). The park is the eighth most visited unit (depending on the year) in the national park system and visitation is growing at a steady rate. Much of this visitation is from the nearby, rapidly expanding, New York/northern New Jersey and Philadelphia suburban areas (NPS 2010c, NPS 2012c). The Delaware River is one of the primary recreational attractions in the park unit. The river is the last free-flowing river

on the eastern seaboard (NPS 2003a, 1). Some of the important purposes of DEWA are to meet outdoor recreational needs, as well as to preserve scenic, scientific, and historic resources that contribute to the public enjoyment of the lands and waters in the park, and to leave the resources unimpaired for future generations.

MDSR was established as a scenic and recreational river in 1978 under the Wild and Scenic Rivers Act. The Delaware River is one of the cleanest rivers in the nation making it a popular destination for swimming, fishing, boating, canoeing, kayaking, rafting, and tubing. It is estimated that more than 15 million persons in the United States, including New York City, Philadelphia, and surrounding urban areas, depend on the water of the Delaware River Basin for public water supply and industrial use (Sloto and Buxton 2006, 2). A portion of the Delaware River Water Trail, a national scenic trail from Hancock, New York to Trenton, New Jersey, runs through MDSR. The purpose of the MDSR is to protect and enhance those values which contribute to making the river a recreational and scenic river, and that provide public use and enjoyment of these values.

APPA is a 2,175-mile-long public footpath from Maine to Georgia conceived in 1921 and completed in 1937. APPA was designated as the nation's first national scenic trail by the National Trails System Act in 1968. It is arguably the most famous hiking path in the world. The trail was built and is still maintained by private citizen volunteers across 14 states. It is enjoyed by an estimated two to three million people each year and is within a day's drive of two-thirds of the U.S. population. APPA is managed cooperatively by the NPS, the Appalachian Trail Conservancy, volunteers from 31 local Appalachian Trail Clubs, the U.S. Department of Agriculture Forest Service, and a variety of other state and local land-managing agencies. APPA crosses over 75 federal and state forests and park lands (NPS 2010d). APPA was created with the purpose of providing maximum outdoor recreational potential as an extensive footpath, as well as to provide for the enjoyment of and conservation of the scenic, historic, natural, and cultural resources found in areas where the trail passes. It also stands as a monument to the historical movement of the visionaries and volunteers who conceived of and brought the Trail into existence.

OBJECTIVES

Physical resources

- Avoid adverse effects on geologic resources (geology, paleontology, and rare and unique geologic features), soil resources (soils and prime and unique farmlands), and water resources (surface waters and groundwater).

Natural resources

- Avoid adverse effects on natural resources (vegetation, landscape connectivity and wildlife habitat, special-status species, and rare and unique communities).
- Protect existing functions and values of wetlands and floodplains by avoiding adverse impacts or limiting impacts to an insignificant level.
- Maintain the ecological integrity of rare and unique communities and prevent degradation of the communities from occurring.
- Protect threatened and endangered species by avoiding impacts. Complete consultation with federal agencies as required under the Endangered Species Act of 1973, as amended (16 United States Code [USC] § 1531–1544), and coordinate with state agencies regarding state-listed species.

- Manage any construction and maintenance activities to avoid or reduce impacts on wildlife and plant species as much as possible.
- Manage any construction and maintenance activities to avoid or reduce the introduction and spread of invasive species.
- Avoid or minimize adverse effects on migratory birds in accordance with Migratory Bird Treaty Act and the 2010 *Memorandum of Understanding Between the U.S. Department of the Interior National Park Service and the U.S. Fish and Wildlife Service to Promote the Conservation of Migratory Birds*.
- Mitigate impacts on landscape connectivity.

Cultural resources

- Avoid, minimize, or mitigate adverse effects on identified archeological resources.
- Avoid, minimize, or mitigate adverse effects on identified historic structures.
- Avoid, minimize, or mitigate adverse effects on identified cultural landscapes.
- Protect the eligibility of cultural resources for National Register of Historic Places (National Register) nomination.

Socioeconomics

- Avoid impacts on surrounding land use; socioeconomics; and infrastructure, access, and circulation; or gateway communities.

Visitor use and experience

- Maintain visitor experience, including preservation of key qualities such as primitive, solitary, and pastoral experiences. If impacts are unavoidable, mitigate impacts as appropriate, including any lost use due to closures or diminished experience caused by construction.

Visual resources

- Avoid, minimize, or mitigate impacts to scenic viewsheds and landscapes.

Soundscapes

- Avoid, minimize, or mitigate impacts on soundscapes.

Wild and scenic rivers

- Avoid adverse effects on the esthetic, scenic, historic, archeological, and scientific features of MDSR.

Park operations

- Avoid adverse effects on the parks' fiscal and operating resources, including long-term management of resources and volunteer organizations.

Human health and safety

- Protect the safety of staff and visitors; measures taken to ensure human health and safety could include closures of roads, the river, trails, and airspace, as necessary.

SUSQUEHANNA TO ROSELAND TRANSMISSION LINE LOCATION AND BACKGROUND

In 2007, the regional transmission operator, PJM Interconnection (PJM), identified a 500-kV transmission line between the Susquehanna Substation in Pennsylvania and the Roseland Substation in New Jersey as the preferred and most effective solution for reliability violations forecasted as part of the Federal Energy Regulatory Commission-approved Regional Transmission Expansion Plan process. Responding to this assessment, the applicant proposed to construct a 500-kV transmission to connect the two substations on a route that included crossings of DEWA, APPA, and MDSR.

The applicant applied for permits to allow the construction, maintenance, and operation of the S-R Line across three units of the national park system, the expansion of the existing ROW, and the replacement of an existing 230-kV transmission line it owns. The existing 230-kV transmission line runs from the Bushkill substation to the Kittatinny substation, crossing DEWA, MDSR, and APPA, and is referred to in this document as the Bushkill-to-Kittatinny line or B-K Line. It also crosses a small panhandle of DEWA en route to and northwest of the Bushkill Station. This line and its ROW predate the establishment of all of the three Park units and has been described by the applicant as almost or actually obsolete. The B-K Line towers are approximately 80 feet in height and its deeded ROW varies from 100 to 380 feet in width through the parks. The applicant proposes to replace the B-K Line towers with new towers up to 195 feet tall, install an additional circuit (the S-R Line), and widen the ROW to accommodate these new facilities. The new replacement B-K Line would be capable of carrying 500-kV, though it would be initially energized at only 230-kV. The applicant's proposal and the action alternatives to it discussed herein include both the construction of the S-R Line and the replacement of the B-K Line as part of the project. References in this document to "the line" refer to both lines and the single set of towers they share.

The applicant's purpose for the proposed S-R Line is to strengthen the reliability of the grid at the direction of the regional transmission operator, PJM. PJM oversees the overall movement of wholesale electricity between many electric utilities in all or parts of 13 states and the District of Columbia. The PJM 2007 load forecast model identified 23 projected grid reliability criteria violations starting in 2012. PJM advised that an upgrade to this line would aid in resolving several violations and issues related to reliability and congestion. The need for the proposed S-R Line has been expressed several times by PJM in planning documents. PJM's Regional Transmission Expansion Plans from 2007 to 2010 have identified the proposed S-R Line as an important project on what was termed by PJM as a "backbone" line. The North American Electric Reliability Corporation also identified the proposed S-R Line as a "backbone," while the applicant has repeatedly noted the need for and importance of increased electrical transmission capacity between Berwick, Pennsylvania and Roseland, New Jersey. If constructed, the new S-R Line would make the current transmission line corridor an even more important link in the regional grid than it is now. The two new lines proposed would require a much higher level of access roads and activity to monitor and maintain.

The public has expressed concerns about the need for and impacts of the project. Individuals and public organizations have questioned the need for an expanded transmission line, given the static-to-recessional economic climate and advances in energy efficiency. In areas served by the proposed S-R Line, energy consumption has decreased in recent years, and forecasts of a continued downward trend in regional demand cause some to question whether there is a verifiable need for the proposed line. Three municipalities have questioned the need for the line, and have noted engineering concerns with long-

distance electrical power transmission and its potential to cause cascading power failures due to the increased current needed to maintain power flows across such lines.

The Pennsylvania Public Utility Commission and the New Jersey Board of Public Utilities have approved the S-R Line, although the approval included conditions and the New Jersey Board of Public Utilities decision is being challenged in court.

Whether there is a need for the proposed S-R Line project is not for the NPS to decide, nor is it a factor in the preparation of this EIS; that question is within the purview of the Pennsylvania Public Utility Commission and New Jersey Board of Public Utilities. The NPS prepared this EIS to determine whether to grant or deny the applicant's request for construction and ROW permits within NPS lands.

ALTERNATIVES CONSIDERED

This EIS considers six alternatives that would cross NPS lands and require an NPS permit. The NPS does not control the route of the proposed S-R Line in areas outside NPS lands. Although the applicant could choose any route outside of NPS jurisdiction, the NPS identified possible routes in each alternative that could connect the Susquehanna and Roseland substations only to determine suitable alternative locations where the line could cross park lands. The NPS identified routes solely to determine if construction on the routes is technically feasible. Route identification does not constitute any NPS attempt to determine the actual location of the proposed lines outside of NPS jurisdiction. The routes and requirements of the proposed alternatives are presented as follows.

DESCRIPTION OF THE ALTERNATIVES

Alternative 1: The No-action Alternative

Under the no-action alternative, the NPS would deny the applications for right-of-way and construction permits to expand the B-K Line to a new double-circuit line through NPS lands. The existing B-K Line traverses approximately 4.3 miles of DEWA. Within DEWA boundaries, the route crosses MDSR and APPA approximately perpendicularly. Within the study area, the alternative 1 alignment is approximately 5.6 miles long. The deeded width of the existing B-K Line ROW ranges from 100 to 380 feet in Pennsylvania and New Jersey; however, the ROW is currently cleared to a width between approximately 80 and 150 feet. There are 22 existing transmission towers located within DEWA boundaries for the existing B-K Line and there are no existing access roads to the ROW, except public roads such as Route 20, Community Drive, and others. This alternative would have no effect on the existing transmission line outside of NPS property and assumes that the existing line within the parks would remain in place without expansion or replacement. In essence, it assumes that current conditions on the ground will continue indefinitely into the future. However, the applicant could seek to expand or replace the existing utility lines within the existing easements through the parks. There are no proposals to do so at this time.

Alternative 2: Applicant's Proposed Route

The route proposed by the applicant would follow the route of the existing B-K Line, which traverses approximately 4.3 miles of DEWA. Within DEWA boundaries, the route crosses MDSR and APPA approximately perpendicularly. Within the study area, the alternative 2 alignment is approximately 5.6 miles long. The deeded width of the existing B-K Line ROW ranges from 100 to 380 feet in Pennsylvania and New Jersey; however, the ROW is currently cleared to a width between approximately 80 and 150 feet. This alternative would require clearing of vegetation for an additional 50 to 200 feet of ROW.

Alternative 2b: Applicant's Alternate Proposal

The alignment for the applicant's alternate proposal would follow the route of the existing B-K Line, which traverses approximately 4.3 miles of DEWA. Within DEWA boundaries, the route crosses MDSR and APPA approximately perpendicularly. Within the study area, the alternative 2 alignment is approximately 5.6 miles long. The deeded width of the existing B-K Line ROW ranges from 100 to 380 feet in Pennsylvania and New Jersey; however, the ROW is currently cleared to a width between approximately 80 and 150 feet. The difference between alternative 2 and alternative 2b is that the former would require widening the existing ROW, while the latter would be constructed within the existing ROW. The towers for alternative 2b would be the same height as those described for alternative 2, but alternative 2b would require two additional towers within NPS lands compared to alternative 2. These towers would be constructed within the 100-foot-wide portion of the alignment. Because the ROW under alternative 2b is narrow, the applicant's plans require these additional towers to protect against fire hazards presented by the risk of conductor blowout. The minimum horizontal clearance to the edge of the ROW under high wind conditions to prevent conductor blowout was determined to be greater than 100 feet, and the NPS has expressed concern about the safety of constructing within the existing ROW. The feasibility of this alternative is dependent on the applicant's ability to clear danger trees beyond the existing ROW. This ability is based upon the controversial assumption that they have a right to clear danger trees on NPS property outside any deeded ROW. In communications with NPS, the applicant has indicated they have the right to clear danger trees from NPS property without additional permission from NPS. NPS does not agree with this determination.

Alternative 3

The alternative 3 alignment would pass through DEWA along the ROW of existing transmission and distribution lines. The existing transmission and distribution lines would be removed before construction of the S-R Line. The existing transmission line ROW is 100 feet wide, and this alternative would require clearing the ROW of vegetation for an additional 50 to 200 feet. The structures of the transmission and distribution lines would be constructed so that these lines and the S-R Line would run parallel to one another within the expanded ROW. That is, two separate sets of structures would be constructed, one set for the proposed S-R Line and one set for the existing transmission and distribution lines along the alternative 3 alignment. Alternative 3 would cross a total of 5.4 miles within the DEWA boundary. The route would also cross about 1.7 miles of the northern end of Worthington State Forest, which is located adjacent to DEWA. Alternative 3 also runs along the eastern boundary of DEWA for approximately 1.8 miles. The alignment for this alternative also crosses MDSR within DEWA, and crosses APPA. Construction of this alternative would require the removal and relocation of the existing B-K Line crossing inside the parks.

Alternative 4

Alternative 4 would pass through the southernmost portion of DEWA along the path of an existing distribution line ROW and would also pass through a small section of the park along the alignment of the B-K Line. The existing ROW ranges from 100 to 200 feet wide, and this alternative would require clearing the ROW of vegetation for an additional 100 to 200 feet. The existing line along alternative 4 would be removed before construction of the S-R Line. The structures of the existing distribution line would be replaced so that it and the double-circuited S-R Line would run parallel to one another within the expanded ROW. The route would cross about 1.5 mile of NPS lands, including DEWA and APPA. This alternative would also cross the Lower Delaware River; however, the crossing of the Delaware River would occur outside the DEWA and MDSR boundaries and outside the study area. The alternative 4 alignment would also cross through portions of Cherry Valley National Wildlife Refuge (NWR).

Construction of this alternative would require the removal and relocation of the existing B-K Line crossing inside the parks.

Alternative 5

Alternative 5 would follow the same alignment as alternative 4 (described above) but would not cross the 0.6 mile portion of DEWA west of the Bushkill Substation associated with alternative 4. This is the only difference between 4 and 5 over which NPS exercises any discretion or control. Inside the study area, alternative 5 would be approximately 1.7 miles long, with approximately 0.9 mile within NPS lands.

NPS PREFERRED ALTERNATIVE

The Council on Environmental Quality (CEQ) regulations for implementing NEPA require that an agency identify its preferred alternative or alternatives in a final EIS [1502.14(e)]. The preferred alternative is the alternative "which the agency believes would fulfill its statutory mission and responsibilities, giving consideration to economic, environmental, technical and other factors" (Question 4a of the Council on Environmental Quality's "Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations" (1981)). **The NPS has identified alternative 2, the applicant's proposed alternative, as the preferred alternative, with the incorporation of critical mitigation measures.**

ENVIRONMENTALLY PREFERABLE ALTERNATIVE

The environmentally preferable alternative is the alternative that would promote the requirements of the national environmental policy expressed in section 101(b) of NEPA. It is the alternative that causes the least damage to the biological and physical environment and that best protects, preserves, and enhances historic, cultural, and natural resources (CEQ 1981, Q6a). **Alternative 1, the no-action alternative, was selected as the environmentally preferable alternative by the NPS.** This decision was based on the available scientific data about the proposal and mitigation measures presented by the applicant and collected by NPS. An analysis of this data made it clear that alternative 1 best meets the requirements of the environmentally preferable alternative.

ENVIRONMENTAL CONSEQUENCES

The summary of environmental consequences considers the actions being proposed and the cumulative impacts to resources from occurrences inside and outside the park. The potential environmental consequences of the actions are addressed for geologic resources (including topography and paleontology); floodplains; wetlands; vegetation; landscape connectivity, wildlife, and wildlife habitat; special-status species; and rare and unique communities. Other topics considered in detail include archeological resources; historic structures; cultural landscapes; socioeconomics; infrastructure, access, and circulation; visitor use and experience; visual resources; soundscapes; wild and scenic rivers; park operations; and health and safety. A brief summary of the major environmental consequences for each alternative is presented below.

Alternative 1 would not have significant impacts on the environment. Any cumulative impacts to resources would remain adverse primarily from other actions taken outside the study area. While there are adverse impacts associated with the continued operation and maintenance of the 230-kV transmission line, the duration and intensity of these impacts are not such as to make them significant impacts in the context of the park. Alternative 1 would not accomplish the transmission grid stability objectives of the applicant.

Alternative 2 would cause significant adverse impacts to geologic resources; wetlands; vegetation; landscape connectivity, wildlife habitat, and wildlife; special-status species; rare and unique communities; archeological resources; historic structures; cultural landscapes; socioeconomics; infrastructure, access and circulation; visual resources; visitor use and experience; wild and scenic rivers; and park operations.

Alternative 2b would cause significant adverse impacts to geologic resources; wetlands; vegetation; landscape connectivity, wildlife habitat, and wildlife; special-status species; rare and unique communities; archeological resources; historic structures; cultural landscapes; socioeconomics; infrastructure, access and circulation; visual resources; visitor use and experience; wild and scenic rivers; park operations; and human health and safety

Alternative 3 would have significant adverse impacts on geologic resources; vegetation; landscape connectivity, wildlife habitat, and wildlife; special-status species; rare and unique communities; archeological resources; historic structures; cultural landscapes; socioeconomics; infrastructure, access, and circulation; visual resources; visitor use and experience; wild and scenic rivers; and park operations.

Alternative 4 would have significant adverse impacts on many resources, including geologic resources; wetlands; rare and unique communities; archeological resources; historic structures; cultural landscapes; socioeconomics; infrastructure, access and circulation; visual resources; and visitor use and experience.

Alternative 5 would have significant adverse impacts on many resources including geologic resources; wetlands; rare and unique communities; archeological resources; historic structures; cultural landscapes; socioeconomics; infrastructure, access and circulation; visual resources; and visitor use and experience.

Resource	Alternative 1: No-Action Alternative	Alternative 2: The Applicant's Proposed Route	Alternative 2b	Alternative 3	Alternative 4	Alternative 5
Geologic Resources	No impacts from vegetation maintenance activities on geology and topography; vegetation maintenance could increase access to and visibility of paleontological specimens, particularly at previously identified sites. No significant impacts.	Impacts from tower construction and grading on geology, topography, and paleontology; the installation of **7 tower foundations/crane pads** in rare or unique features and in unstable geologic formations and **12** in areas with slopes greater than 10%, could impact geologic resources; drilling and excavation could disturb paleontological resources. Significant impacts.	Same as alternative 2.	Impacts on geology due to the drilling, and excavation activities; the installation of **at least 25 tower foundations/crane pads** in areas with slopes greater than 10% and **11 to 15 towers/crane pads** in unstable areas and in rare or unique geologic features; construction and clearing would impact paleontology through direct damage, collection, or vandalism of paleontological sites. Significant impacts.	Impacts from tower construction and grading on geology, topography, and paleontology; **the installation of 2 tower foundations/crane pads** in areas with slopes greater than 10% and in unstable areas; no towers would be constructed within rare or unique geology inside the study area; construction and clearing would impact paleontology through direct damage, collection, or vandalism of paleontological sites. Significant impacts.	Impacts from tower construction and grading on geology, topography, and paleontology; **the installation of 2 tower foundations/crane pads** in areas with unstable geologic formations and 1 in an area with slopes greater than 10%; no towers would be constructed within rare or unique geology inside the study area; construction and clearing would impact paleontology through direct damage, collection, or vandalism of paleontological sites. Significant impacts.
Floodplains	Impacts from vegetation maintenance in the floodplain; vegetation clearing would impact some floodplain functions and values, but is not likely to affect overall natural floodplain values. No significant impacts.	A maximum of **14.3 acres of vegetation in the floodplain** would be affected by vegetation management; access roads and crane pads would develop **0.14 acre of the floodplain**. No significant impacts.	A maximum of **8.4 acres of vegetation in the floodplain** would be affected by vegetation management; access roads and crane pads would develop **0.14 acre of the floodplain**. No significant impacts.	A maximum **of 7.9 acres of vegetation in the floodplain** would be affected by vegetation management; access roads and crane pads would develop **0.22 acre of the floodplain**. No significant impacts.	**No vegetation in the floodplain** would be cleared; access roads and crane pads would develop **0.16 acre of the floodplain**. No significant impacts.	**No vegetation in the floodplain** would be cleared and **no development in the floodplain** would occur. No significant impacts.
Wetlands	Impact from vegetation maintenance, resulting in **conversion of 8.64 acres of wetlands** to scrub shrub or emergent wetlands; 5.46 acres of rare and unique wetlands, which are also Exceptional Value Wetlands, would be affected. No significant impacts.	Impacts from clearing wetlands, resulting in **conversion of 20.28 acres of forested wetlands** to scrub shrub and/or emergent wetlands; construction of access roads and crane pads in wetlands (1.02 acres), and from drilling activities; **15.22 acres of Exceptional Value Wetlands and/or rare and unique wetlands** would be affected. Significant impacts.	Impacts from clearing wetlands, resulting in **conversion of 10.28 acres of forested wetlands** to scrub shrub and/or emergent wetlands; construction of access roads and crane pads in wetlands (1.01 acres), and from drilling activities; **6.35 acres of Exceptional Value Wetlands and/or rare and unique wetlands** would be affected. Significant impacts.	Impacts from clearing wetlands, resulting in **conversion of 1.93 acres of forested wetlands** to scrub shrub and/or emergent wetlands; construction of access roads in wetlands (0.02 acres) and from drilling activities; no permanent impacts on Exceptional Value Wetlands and/or rare and unique wetlands. No significant impacts.	Impacts from clearing wetlands, resulting in **conversion of 4.52 acres of forested wetlands** to scrub shrub and/or emergent wetlands; construction of access roads in wetlands (0.09 acres) and from drilling activities; no permanent impacts on Exceptional Value Wetlands and/or rare and unique wetlands. Significant impacts.	Impacts from clearing wetlands, resulting in **conversion of 4.31 acres of forested wetlands** to scrub shrub and/or emergent wetlands; construction of access roads in wetlands (0.09 acres) and from drilling activities; no permanent impacts on Exceptional Value Wetlands and/or rare and unique wetlands. Significant impacts.
Vegetation	Impacts would result from vegetation maintenance activities and maintenance of scrub shrub habitat in the ROW; functionality of the plant communities would not be affected. No significant impacts.	Approximately **240 acres of vegetation would be cleared** in the ROW, 129 acres of this which is mature forest; impacts would also result from spread of invasive species, vegetation maintenance activities, and vegetation clearing from other construction activities outside the ROW (25.4 acres); functionality of the plant communities would decline. Significant impacts.	Approximately **144 acres of vegetation would be cleared in the ROW**, 42 acres of this which is mature forest; impacts would also result from spread of invasive species, vegetation maintenance activities, and vegetation clearing from other construction activities outside the ROW (26.7 acres); functionality of the plant communities would decline. Significant impacts.	Approximately **313 acres of vegetation would be cleared in the ROW**, 204 acres of this which is mature forest; impacts would also result from spread of invasive species, vegetation maintenance activities, and vegetation clearing from other construction activities outside the ROW (100.6 acres); functionality of the plant communities would decline. Significant impacts.	Approximately **113 acres of vegetation would be cleared in the ROW**, 70 acres of this which is mature forest; impacts would also result from spread of invasive species, vegetation maintenance activities, and vegetation clearing from other construction activities outside the ROW (55.9 acres); functionality of the plant communities would decline. No significant impacts.	Approximately **74 acres of vegetation would be cleared in the ROW**, 44 acres of this which is mature forest; impacts would also result from spread of invasive species, vegetation maintenance activities, and vegetation clearing from other construction activities outside the ROW (55.3 acres); functionality of the plant communities would decline. No significant impacts.

Resource	Alternative 1: No-Action Alternative	Alternative 2: The Applicant's Proposed Route	Alternative 2b	Alternative 3	Alternative 4	Alternative 5
Landscape Connectivity, Wildlife Habitat, and Wildlife	Impacts would result from the continued maintenance of the ROW, loss of habitat from removal of danger trees outside the ROW, and disturbance and direct mortality of wildlife. No significant impacts.	Impacts would result from habitat loss, habitat alteration, the continued maintenance of the ROW, the isolation of habitat patches, increased edge habitat, the disturbance and direct mortality of wildlife, and the isolation of some species. Significant impacts.	Same as alternative 2.	Impacts would result from habitat loss, habitat alteration, the continued maintenance of the ROW, the isolation of habitat patches, increased edge habitat, the disturbance and direct mortality of wildlife, and the isolation of some species. Benefit from restoration of the B-K Line, resulting in larger patches of contiguous habitat. Significant impacts.	Impacts would result from habitat loss, habitat alteration, the continued maintenance of the ROW, the isolation of habitat patches, increased edge habitat, the disturbance and direct mortality of wildlife, and the isolation of some species. Benefit from restoration of the B-K Line, resulting in larger patches of contiguous habitat, and moving the infrastructure to the edge of DEWA. No significant impacts.	Impacts would result from habitat loss, habitat alteration, the continued maintenance of the ROW, the isolation of habitat patches, increased edge habitat, the disturbance and direct mortality of wildlife, and the isolation of some species. Benefit from restoration of the B-K Line, resulting in larger patches of contiguous habitat, and moving the infrastructure to the edge of DEWA. No significant impacts.
Special-status Species Overall*	No significant impacts.	Significant impacts.	Significant impacts.	Significant impacts.	No significant impacts.	No significant impacts.
Special-status Species: Aquatic Species	Impacts from temporary changes to water quality during maintenance activities.	Impacts from direct mortality, habitat loss, and some changes to habitat during construction and maintenance activities.	Same as alternative 2.	Impacts from changes to habitat during construction and maintenance activities.	No impact because no aquatic species are likely to exist in the ROW.	Same as alternative 4.
Special-status Species: Terrestrial Invertebrate Species	Vegetation maintenance activity would maintain and could expand suitable habitat (herbaceous).	Same as alternative 1.	Same as alternative 1.	N/A	N/A	N/A
Special-status Species: Birds	Impacts from maintenance activities could destroy nesting habitat and disturb breeding/nesting activities; conversely maintenance could create additional scrub shrub habitat in ROW; electrocution/collision potential.	Impacts from construction of line resulting in habitat loss, from presence of line resulting in collision or electrocution, and from disturbance during construction and maintenance activities; could create additional scrub shrub habitat in ROW; this alternative would not be consistent with the Bald Eagle Guidelines.	Same as alternative 2.	Same as alternative 2.	Impacts from construction of line resulting in habitat loss, from presence of line resulting in collision or electrocution, and from disturbance during construction and maintenance activities; could create additional scrub shrub habitat in ROW; this alternative would be consistent with the Bald Eagle Guidelines.	Same as alternative 4.
Special-status Species: Reptiles and Amphibians	Impacts from maintenance and human activities from disturbance of denning, basking, foraging, nesting, and breeding activities as well as introduction of invasive species.	Impacts from direct mortality, destruction of nests and/or overwintering areas; impacts on habitat used for foraging and basking; habitat loss / fragmentation / degradation during construction and maintenance activities. Potential for illegal collection of special-status reptiles due to easier access from maintained access roads.	Same as alternative 2.	Same as alternative 2.	Same as alternative 2.	Same as alternative 2.
Special-status Species: Mammals	Impacts from disturbance during maintenance activities and from tree removal in areas with potential habitat.	Impacts from noise and disturbance during construction; loss of potential habitat, including roosting sites or maternity colonies.	Same as alternative 2.	Same as alternative 2.	Same as alternative 2.	Same as alternative 2.
Special-status Species: Plants	Impacts from maintenance activities, including some wetland areas that support listed plants; disturbance as well as introduction of invasive species would occur.	Impacts from forest clearing, construction in wetland areas from access roads and crane pads, and drilling, as well as from vegetation maintenance.	Same as alternative 2.	Same as alternative 2.	Same as alternative 2.	Same as alternative 2.

Resource	Alternative 1: No-Action Alternative	Alternative 2: The Applicant's Proposed Route	Alternative 2b	Alternative 3	Alternative 4	Alternative 5
Rare and Unique Communities	Impacts from artificially maintaining scrub shrub habitat in the park artificially maintaining scrub shrub habitat in the parks; soils and wildlife would be affected. No significant impacts.	Impacts from vegetation clearing, line construction, deconstruction of the existing line, and potential spread of invasive species, as well as artificial maintenance of scrub shrub habitat; six communities would be affected (Arnott Fen, Delaware River Riparian Corridor, eastern hemlock forests, Hogback Ridge, Kittatinny Ridge, Van Campen). Significant impacts.	Same as alternative 2.	Impacts from vegetation clearing, line construction, deconstruction of the existing line, and potential spread of invasive species, as well as artificial maintenance of scrub shrub habitat; three communities would be affected (Delaware River Riparian Corridor, eastern hemlock forests, Kittatinny Ridge). Significant impacts.	Impacts from vegetation clearing, line construction, deconstruction of the existing line, and potential spread of invasive species, as well as artificial maintenance of scrub shrub habitat; for communities would be affected (eastern hemlock forests, Kittatinny Ridge, Minsi Lake / Bear Swamp, Totts Gap). Significant impacts.	Same as alternative 5 but would not impact eastern hemlock forests. Significant impacts.
Archeological Resources	Impacts on archeological sites due to physical impacts from the maintenance of vegetation along the existing ROW. No significant impacts.	Impacts from physical impacts of construction and disturbance of archeological resources; **2 known archeological sites** could be directly affected by construction activities; impacts would depend on the nature and extent of physical disturbance to the archeological resources. **Adverse effects on one site** with prehistoric components Significant impacts.	Same as alternative 2.	Possible impacts from physical impacts of construction and disturbance of archeological resources; **1 potential archeological site** exists along this alternative; impacts would depend on the nature and extent of physical disturbance to the potential archeological resources. **Adverse effects on one site** with historic components. Significant impacts.	Possible impacts from physical impacts of construction and disturbance of archeological resources; **1 potential archeological site** exists along this alternative; impacts would depend on the nature and extent of physical disturbance to the potential archeological resources. **Adverse effects on one site** with prehistoric components. Significant impacts.	Same as alternative 4.
Historic Structures	Impacts from the visual impact of vegetation removal during maintenance activities. No significant impacts.	Impacts on historic structures from physical destruction and removal of vegetation and the visual impact of larger towers and lines, which would diminish the integrity of the setting, feeling, and association of numerous historic structures. **Adverse effects on at least 17 identified historic structures**, one through physical destruction and at least 16 through visual effects. Significant impacts.	Same as alternative 2.	Impacts on historic structures from removal of vegetation and the visual impact of larger towers and lines, which would diminish the integrity of the setting, feeling, and association of numerous historic structures; physical destruction of the B-K Line, an historic structure. **Adverse effects on at least 7 identified historic structures** through visual effects. Significant impacts.	Impacts on historic structure from removal of vegetation and the visual impact of larger towers and lines, which would diminish the integrity of the setting, feeling, and association of numerous historic structures; physical destruction of the B-K Line, an historic structure. **Adverse effects on at least 4 identified historic structures** through visual effects. Significant impacts.	Same as alternative 4.
Cultural Landscapes	Physical and visual impacts of the existing line and vegetation maintenance; would diminish the integrity of setting, feeling, and association of numerous cultural landscapes. No significant impacts.	Impacts on cultural landscapes from vegetation clearing and construction of new towers, altering character-defining features and resulting in measurable changes, thus diminishing the overall integrity of the resources, or producing noticeable changes or alterations to the character-defining features of the cultural landscapes. **Adverse effects on 18 cultural landscapes** through visual intrusions and physical impacts. Significant impacts.	Same as alternative 2.	Impacts on cultural landscapes from vegetation clearing and construction of new towers, altering character-defining features and resulting in measurable changes, thus diminishing the overall integrity of the resources. **Adverse effects on 6 cultural landscapes** through visual intrusions and physical impacts. Significant impacts.	Impacts on cultural landscapes from vegetation clearing and construction of new towers, altering character-defining features and resulting in measurable changes, thus diminishing the overall integrity of the resources. **Adverse effects on 4 cultural landscapes** through visual intrusions and physical impacts. Significant impacts.	Same as alternative 4.

Resource	Alternative 1: No-Action Alternative	Alternative 2: The Applicant's Proposed Route	Alternative 2b	Alternative 3	Alternative 4	Alternative 5
Socioeconomics	No impact on socioeconomics. No significant impacts.	Impacts to the local and regional economy due to changes in recreation, visitation, tourism, and agricultural revenue. Opportunity for job placement during the construction period. Significant impacts.	Same as alternative 2.	Same as alternative 2.	Same as alternative 2.	Same as alternative 2.
Infrastructure, Access, and Circulation	Temporary, brief road closures or detours during the maintenance periods. Hamilton Trail in New Jersey, the McDade Trail near Community Drive, and part of the Van Campen Glen Trail would be used for maintenance activities. No significant impacts.	Use of heavy construction equipment on historic River Road and 1.5 miles of Old Mine Road would result in impacts on infrastructure. Impacts on access and circulation would occur at specific locations during the construction period. Significant impacts.	Same as alternative 2.	Use of heavy construction equipment on approximately 4.5 miles of River Road and 6.5 miles of Old Mine Road would result in impacts to infrastructure. Impacts on access and circulation would occur at specific locations during the construction period. Benefit from removal of large infrastructure along the B-K Line under alternative 3. Significant impacts.	The use of heavy equipment on NPS Drive, Totts Gap Road, and Mountain Road would result in impacts to infrastructure. Impacts on access and circulation would occur during the construction period at specific locations. Benefit from removal of large infrastructure along the B-K Line under alternative 4. Significant impacts.	Same as alternative 4.
Visual Resources	The presence of the existing alignment would affect visual intactness from continued operation of the existing transmission line. No significant impacts.	Changes to visual resources from the deconstruction and construction activities would be most apparent along Millbrook Flatbrook Road and Old Mine Road in New Jersey. Affected sites in Pennsylvania potentially include Fernwood Resort, Pennsylvania Hwy 209 near Bushkill, McDade Trail, the cultural landscape related to the Schoonover house, and Community Drive. Affected sites in New Jersey potentially include Van Campen Glen, Hamilton, and Pioneer trails, Watergate Recreation Site, and Millbrook Village. The higher towers would also impact the viewshed at Walpack Bend, and the Appalachian Trail. Significant impacts.	Changes to visual resources from the deconstruction and construction activities would be similar to alternative 2. The impacts would be most apparent along McDade Trail near the Schoonover House and Community Drive, and MDSR. There would be two additional nearly 200-foot towers. Significant impacts.	Changes to visual resources from the deconstruction and construction activities would be most apparent along McDade Trail, Old Mine Road, MDSR, and APPA. Improved visual cohesiveness and unity resulting from the unobstructed natural forest cover within due to the removal of the existing B-K Line, but there would be greater visual impact along the alternative 3 ROW from two sets of structures. Line would also be visible from popular recreation sites, including Smithfield Beach and Hialeah Air Park Significant impacts.	Changes to visual resources from the deconstruction and construction activities would be most apparent where the line would be in proximity to APPA, but would also occur at Mount Tammany summit and the Karamac Trail. Improved visual cohesiveness and unity resulting from the unobstructed natural forest cover within due to the removal of the existing B-K Line, but there would be greater visual impact along the alternative 4 ROW from two sets of structures. Significant impacts.	Changes to visual resources from the deconstruction and construction activities would be most apparent where the transmission line would cross APPA because it would also be intersected by an access road. Improved visual cohesiveness and unity resulting from the unobstructed natural forest cover within due to the removal of the existing B-K Line, but there would be greater visual impact along the alternative 5 ROW from two sets of structures. Significant impacts.
Soundscapes	Intermittent impacts on soundscapes due to maintenance activities associated with continued operation of the existing transmission line. No significant impacts.	Impacts would result from disturbance during decommissioning, construction, and maintenance activities. Some readily detectable impacts would be expected within 350 feet of the alignment centerline from the operation of the line. No significant impacts.	Same as alternative 2.	Impacts would result from disturbance during decommissioning, construction, and maintenance activities. Some readily detectable impacts would be expected within 300 feet of the alignment centerline during operation and maintenance. No significant impacts.	Same as alternative 2.	Same as alternative 2.

Resource	Alternative 1: No-Action Alternative	Alternative 2: The Applicant's Proposed Route	Alternative 2b	Alternative 3	Alternative 4	Alternative 5
Visitor Use and Experience	Impacts would result primarily from the continued visual impacts of the existing transmission line. Noise and visual intrusions would result in slight impacts during maintenance activities. No significant impacts.	Impacts to visitor use and experience with the most intense impacts at Watergate Recreation Site. Visitors would experience impacts where the transmission line crosses APPA. Impacts related to deconstruction and construction would be localized, particularly related to noise. Significant impacts.	Same as alternative 2.	The 90-degree bend of the line would affect views from several vantage points, affecting many visitors. New visual intrusions would be created at Raccoon Ridge along APPA, and would be seen from other vantage points along the trail. Impacts at APPA would occur for 2.5 miles. Construction-related impacts would occur from impacts on soundscapes based on location. Significant impacts.	Impacts would occur at the Red Dot (Tammany) Trail and Karamac Trail. Construction-related impacts would occur from impacts on soundscapes based on location. Significant impacts.	Same as alternative 4.
Wild and Scenic Rivers	**No additional impact** on the values on which the river was designated from any maintenance activities. No significant impacts.	Many of the values for which the river was designated would be perceptibly changed and would result in visual changes that would affect a relatively large area, a large number of users, and would exist for the period of analysis. Significant impacts.	Same as alternative 2.	Many of the values for which the river was designated would be perceptibly changed and would result in visual changes that would affect a relatively large area, a large number of users, and would exist for the period of analysis. Enhancement of MDSR values from the decommissioning and restoration of the B-K alignment. Significant impacts.	Enhancement of MDSR values from the decommissioning and restoration of the B-K Line. Significant impacts.	Same as alternative 4.
Park Operations	Some adverse impacts from continued operation and maintenance of the existing B-K Line. Park staff would monitor vegetation maintenance activities, but the maintenance would not be conducted on a regular basis; there would be **no change in the number of park staff** and no change to the parks' budgets because it is assumed that the applicant would be responsible for the costs associated with the NPS managing the permit. No significant impacts.	Adverse impacts from need for park staff for patrolling, monitoring, and enforcement; Impacts on park operations would result from construction-related activities and monitoring activities; 2 to 3 new employees would be hired; there would be no change to the parks' or divisions' budgets because the applicant would be responsible for the parks' costs associated with the NPS managing the permit. Significant impacts.	Same as alternative 2.	Same as alternative 2.	Adverse impacts, but moderated by shorter construction period, shorter crossing of NPS lands and fewer sensitive resources present. Impacts on park operations would result from construction-related activities and monitoring activities (including actions along APPA); 1 new employee would be hired; there would be no change to the parks' or divisions' budgets because the applicant would be responsible for the parks' costs associated with the NPS managing the permit. No significant impacts.	Same as alternative 4, but impacts may be even less as route does not include section of DEWA west of the Bushkill Substation. No significant impacts.
Health and Safety	Adverse impacts from continuing operation and maintenance of the existing B-K Line. No significant impacts.	Impacts on visitors/staff at DEWA, MDSR, and APPA from potential safety hazards associated with construction, equipment related hazards, and transportation of materials. Impacts to safety would be minimized and temporary. No significant impacts.	Impacts to visitors and staff from potential safety hazards associated with construction activities. Impacts to safety would be minimized and temporary. Additional impacts to health and safety due to fire risk and potential power outages from failure to meet NERC clearance standards. Significant impacts.	Impacts on visitors/staff at DEWA, MDSR, and APPA from potential safety hazards associated with construction, equipment related hazards, and transportation of materials. Impacts for park staff and visitors at APPA slightly less severe than alternative 2 due to a smaller area affected by construction. Impacts to safety would be minimized and temporary. No significant impacts.	Same as alternatives 2 and 3, but area affected is smaller. No significant impacts.	Same as alternative 4, but the area affected is slightly smaller. No significant impacts.

*Significance criteria only evaluated on a resource level, not species specific.

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ACRONYMS AND ABBREVIATIONS

ACCC	aluminum conductor composite core
ACHP	Advisory Council on Historic Preservation
ACSR	aluminum conductor steel reinforced
AMSL	above mean sea level
APE	area of potential effects
APLIC	Avian Power Line Interaction Committee
APPA	Appalachian National Scenic Trail
BA	biological assessment
B-K Line	Bushkill-to-Kittatinny Line
BMP	Best Management Practice
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
dB	decibels
dBA	A-weighted decibel scale
DDT	dichlorodiphenyltrichloroethane
DEWA	Delaware Water Gap National Recreation Area
EIS	Environmental Impact Statement
EMF	electromagnetic field
FHWA	Federal Highway Administration
FR	Federal Register
GIS	Geographic Information System
GMP	general management plan
GPS	Global Positioning System
IBA	important bird area
IMA	important mammal area
KOP	key observation point
kHz	kilohertz
kV	kilovolt
MDSR	Middle Delaware National Scenic and Recreational River
National Register	National Register of Historic Places
NEPA	National Environmental Policy Act
NERC	North American Electric Reliability Corporation
NESC	National Electric Safety Code
NHPA	National Historic Preservation Act of 1966
NJDEP	New Jersey Department of Environmental Protection
NJENSP	New Jersey Endangered and Nongame Species Program
NJNHP	New Jersey Natural Heritage Program
NJ HPO	New Jersey Historic Preservation Office or Officer
NOAA	National Oceanic and Atmospheric Administration

NPS	National Park Service
NRCS	U.S. Department of Agriculture Natural Resources Conservation Service
NWI	National Wetlands Inventory
NWR	National Wildlife Refuge
Organic Act	National Park Service Organic Act of 1916
ORV	off-road vehicle
PADCNR	Pennsylvania Department of Conservation and Natural Resources
PADEP	Pennsylvania Department of Environmental Protection
PADOT	Pennsylvania Department of Transportation
PFBC	Pennsylvania Fish and Boat Commission
PEPC	Planning, Environment, and Public Comment
PFO	Palustrine Forested Wetlands
PJM	PJM Interconnection
PL	Public Law
PNHP	Pennsylvania Natural Heritage Program
PPL	Pennsylvania Power and Light Electric Utilities Corporation
PSE&G	Public Service Electric and Gas Company
PSS	Palustrine Scrub Shrub Wetlands
PUBHx	Palustrine Non-vegetation Wetlands
ROW	right-of-way
RTO	Regional Transmission Operator
SHPO	State Historic Preservation Office
S-R Line	Transmission Line Upgrade and Expansion from Susquehanna, Pennsylvania, to Roseland, New Jersey
TNC	The Nature Conservancy
TSS	total suspended solids
USACE	U.S. Army Corps of Engineers
USC	United States Code
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
VSL	visual split location
ZVI	zone of visual influence

Chapter 1
Purpose of and Need for Action

CHAPTER 1: PURPOSE OF AND NEED FOR ACTION

INTRODUCTION

A consortium of utilities, consisting of PPL Electric Utilities Corporation and Public Service Electric and Gas Company (PSE&G), jointly known as the applicant, propose to construct a 500,000-volt (500-kilovolt [kV]) transmission line from the Susquehanna Substation (Berwick, Pennsylvania) to the Roseland Substation (Roseland, New Jersey) (the "Susquehanna-to-Roseland" or S-R Line), which would require crossing three units of the national park system: the Delaware Water Gap National Recreation Area (DEWA), the Middle Delaware National Scenic and Recreational River (MDSR), and the Appalachian National Scenic Trail (APPA), in Pennsylvania and New Jersey (figure 1). The applicant has requested permits to authorize construction activity and expand its right-of-way (ROW) in order to build the S-R Line across these three units. The federal action analyzed in this environmental impact statement (EIS) is deciding whether or not, and under what conditions, to issue the applicant the permits it has requested.

PURPOSE AND NEED

The purpose component of an EIS defines the goals and objectives that the National Park Service (NPS) intends to fulfill by taking action. The need component explains why taking action is necessary. (Director's Order 12: *Conservation Planning, Environmental Impact Analysis, and Decision Making Handbook* (NPS 2001c)).

The purpose of and need for action by the NPS, consistent with the Department of the Interior National Environmental Policy Act (NEPA) regulations, 43 CFR § 46.420, is distinct from that of the applicant.

PURPOSE OF ACTION

The purpose of the federal action here is to respond to the applicant's proposal considering the purposes and resources of the affected units of the national park system, as expressed in statute, regulation, policy, and the NPS objectives in taking action, detailed later in this chapter.

NEED FOR ACTION

The federal action by the NPS is needed because the applicant has submitted an application and plan to construct its line across areas under NPS jurisdiction. The applicant requests NPS permission to expand the size of the current ROW, to access the ROW through existing natural and cultural areas, to construct new and taller support towers, and to remove and replace the existing 230-kV Bushkill-to-Kittatinny Line (B-K Line) with a new double-circuit 500-kV transmission line.

COOPERATING AGENCY

In February 2011, the NPS formally invited the U.S. Fish and Wildlife Service (USFWS) to participate as a cooperating agency in the review for this EIS. The S-R Line could affect lands proposed to be a part of the Cherry Valley National Wildlife Refuge (NWR), which was established in October 2010 with the acquisition of the first 185 acres (USFWS 2010f, 1). Cherry Valley, Pennsylvania contains a variety of wetland and upland habitats, as well as a portion of a migration flyway used by migrating raptors, and supports federally and Pennsylvania state-listed species (USFWS 2008, xi). The request to add USFWS as a cooperating agency is based on USFWS expertise and local knowledge of the resources within

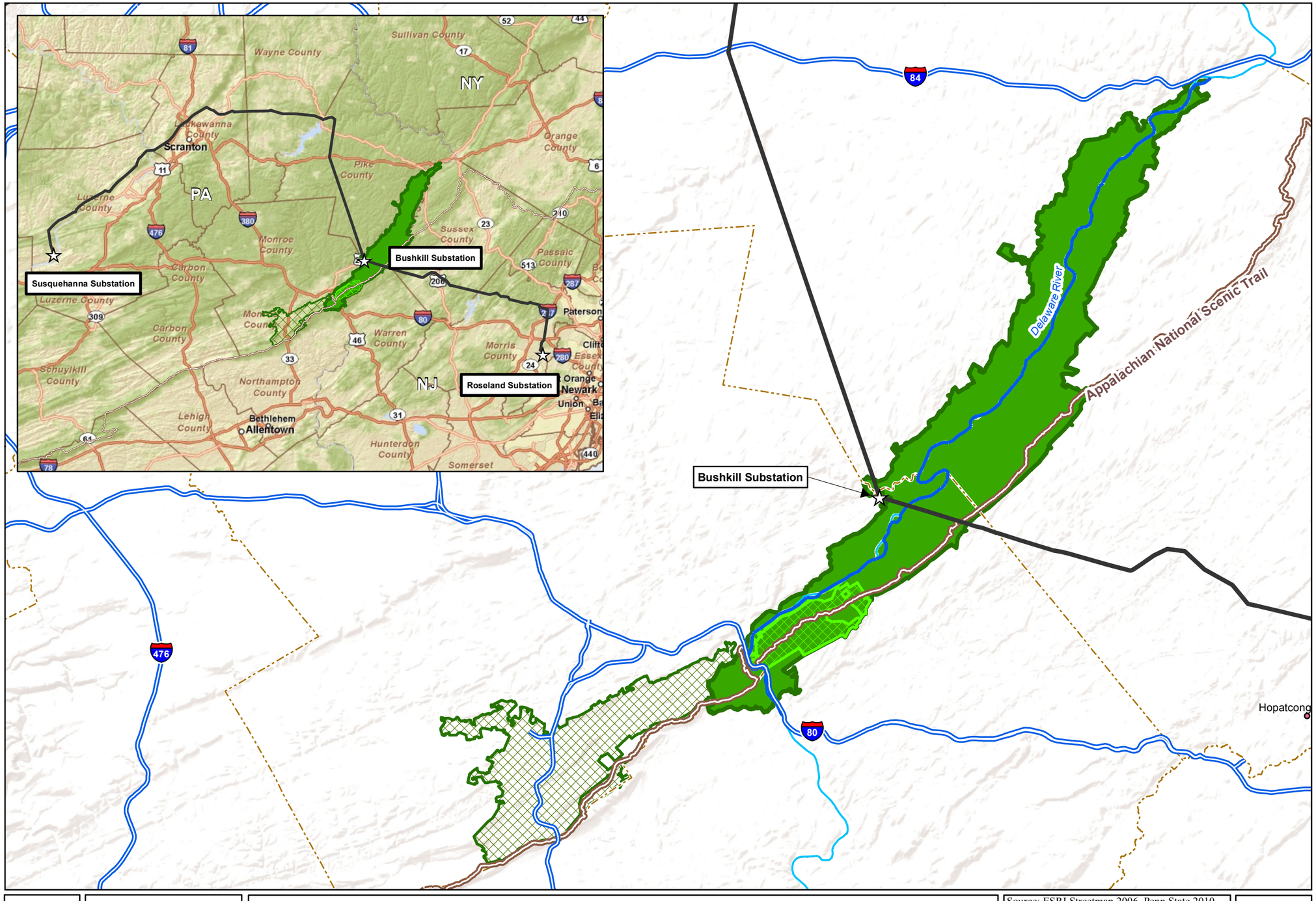
Cherry Valley NWR that could be affected by the proposed S-R Line. The USFWS has accepted that invitation. The U.S. Army Corps of Engineers (USACE) was also invited to be a cooperating agency but declined.

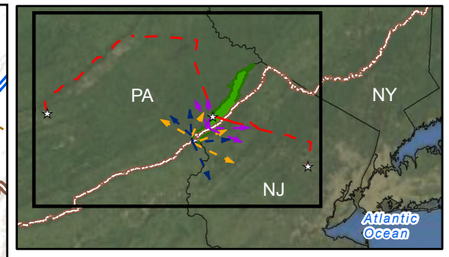
SUSQUEHANNA TO ROSELAND TRANSMISSION LINE LOCATION AND BACKGROUND

In 2007, the regional transmission operator, PJM Interconnection (PJM), identified a 500-kV transmission line between the Susquehanna Substation and the Roseland Substation as the preferred and most effective solution for reliability violations forecasted as part of the Federal Energy Regulatory Commission - approved Regional Transmission Expansion Plan process. Responding to this assessment, the applicant proposed to construct a double-circuit 500-kV transmission to connect the two substations on a route that included crossings of DEWA, APPA, and MDSR.

The applicant applied for permits to allow the construction, maintenance and operation of the S-R Line across three units of the national park system, the expansion of the existing ROW, and the replacement of an existing 230-kV transmission line it owns. The existing 230-kV transmission line runs from the Bushkill substation to the Kittatinny substation, crossing DEWA, MDSR, and APPA, and is referred to in this document as the B-K Line. It also crosses a small panhandle of DEWA en route to and northwest of the Bushkill Station. This line and its ROW predate the establishment of all of the three park units and has been described by the applicant as almost or actually obsolete. The B-K Line towers are approximately 80 feet in height and its deeded ROW varies from 100 to 380 feet in width through the parks. The applicant proposes to replace the B-K Line towers with new towers up to 195 feet tall, install an additional circuit, and widen the ROW to accommodate these new facilities. The new replacement B-K Line would be capable of carrying 500 kV, though it would be initially energized at only 230 kV. The applicant's proposal and the action alternatives to it discussed herein include both the construction of the S-R Line and the replacement of the B-K Line as part of the project. References in this document to "the line" refer to both lines and the set of towers they share.

The applicant's purpose for the proposed S-R Line is to strengthen the reliability of the grid at the direction of the regional transmission operator, PJM. PJM oversees the movement of wholesale electricity between many electric utilities in all or parts of 13 states and the District of Columbia. The PJM 2007 load forecast model identified 23 projected grid reliability criteria violations starting in 2012. PJM advised that an upgrade to this line would aid in resolving several violations and issues related to reliability and congestion. The need for the proposed S-R Line has been expressed several times by PJM in planning documents. PJM's Regional Transmission Expansion Plans from 2007 to 2010 have identified the proposed S-R Line as an important project on what was termed by PJM as a "backbone" line. The North American Electric Reliability Corporation (NERC) also identified the proposed S-R Line as a "backbone," while the applicant has repeatedly noted the need for and importance of increased electrical transmission capacity between Berwick, Pennsylvania and Roseland, New Jersey. If constructed, the new S-R Line would make the current transmission line corridor an even more important link in the regional grid than it is now. The two new lines proposed would require a much higher level of access roads and activity to monitor and maintain.





Legend

- Substation
- Existing B-K Line
- Appalachian National Scenic Trail
- Middle Delaware National Scenic & Recreational River
- Delaware River
- Interstate
- Delaware Water Gap National Recreation Area
- Worthington State Forest
- CVNWR Boundary
- County Line

Note: Designated boundary of CVNWR is depicted, not all property is owned within the boundary

0 4 8
Miles

Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 1
Location Map for the Parks and Existing Transmission Line

Source: ESRI Streetmap 2006, Penn State 2010, ESRI ArcGISonline Map Service 2010, PennDOT 2011, NJOIT 2010, USGS 2006, NJ DEP 2008,

Projection: NAD 83 UTM Zone 18N
Date: July 2012

The public has expressed concerns about the need for and impacts of the project. Individuals and public organizations have questioned the need for an expanded transmission line, given the static-to-recessional economic climate and advances in energy efficiency. In areas served by the proposed S-R Line, energy consumption has decreased in recent years, and forecasts of a continued downward trend in regional demand cause some to question whether there is a verifiable need for the proposed line. Three municipalities have questioned the need for the line, and have noted engineering concerns with long-distance electrical power transmission and its potential to cause cascading power failures due to the increased current needed to maintain power flows across such lines.

The Pennsylvania Public Utility Commission and the New Jersey Board of Public Utilities have approved the S-R Line, although the approval included conditions and the New Jersey Board of Public Utilities decision is being challenged in court.

Whether there is a need for the proposed S-R Line project is not for the NPS to decide, nor is it a factor in the preparation of this EIS. The NPS prepared this EIS to determine whether to grant or deny the applicant's request for construction and ROW permits within NPS lands.

BACKGROUND OF THE PARKS

DEWA, MDSR, and APPA are three separate units of the national park system (figure 1). DEWA, MDSR, and APPA are central components of nature-based recreation for the New York City/Philadelphia metroplex.

DELAWARE WATER GAP NATIONAL RECREATION AREA

DEWA is a 67,210-acre park along the shores of the Delaware River in New Jersey and Pennsylvania. DEWA offers a variety of outdoor recreational opportunities, including boating, fishing, swimming, bicycling, cross-country skiing, rock climbing, sightseeing, natural and cultural history, and the general solitude of a rural environment. In addition, the recreation area offers more than 200 miles of hiking trails, including more than 27 miles of Appalachian Trail (NPS 2010a).

Delaware Water Gap National Recreation Area is a 67,210-acre park along the shores of the Delaware River in New Jersey and Pennsylvania.

DEWA was established in 1965. When conducting initial studies for inclusion of DEWA into the national park system, the NPS investigated relocating the B-K Line to make the area compatible with the uses of the proposed park, including the "preservation of the scenic, scientific, and historic features contributing to public enjoyment of such lands and waters" (Public Law (PL) 89-158; 89th. Congress H.R.89.); however, the B-K Line through DEWA was not removed and remains in use today. Figure A-1 in appendix A is a map from 1962 that presents the proposed relocation of the B-K Line.

Each year, DEWA receives more than 5.2 million recreational visitors (NPS 2012c). The park is the eighth most visited unit (depending on the year) in the national park system and visitation is growing at a steady rate. Much of this visitation is from the nearby, rapidly expanding, New York/northern New Jersey and Philadelphia suburban areas (NPS 2010c, 2012c). Open spaces, combined with other regional protection and preservation initiatives, create a multistate greenway corridor. This corridor preserves essential habitat for the sustained health of plant and animal communities, including special-status species, in the region.

The park contains an environment of unique geologic and natural features as well as cultural landscapes and historic resources. The diverse ecosystems and landscape features provide unique scenery and experiences for visitors and crucial habitat for plants and animals. The park's outstanding geologic and

natural features form some of the best-known scenic landscapes in the northeastern United States and illustrate the characteristic landforms and biotic areas of the Appalachian Ridge and Valley Province and the Southern Appalachian Plateau Province. The most popular geologic feature is the Delaware Water Gap itself which is approximately 1,200 feet deep from the tops of the mountains to the surface of the Delaware River. The Gap is a mile wide from New Jersey's Mount Tammany to Pennsylvania's Mount Minsi. The park also contains a significant concentration of cultural resources spanning 12,000 years of human habitation. The valley has been inhabited for thousands of years, and dozens of historic structures dot the park's scenic roads. Historic rural villages from the eighteenth and nineteenth centuries remain intact on the New Jersey side, and landscapes of past settlements are scattered throughout the park (NPS 2010a). Additionally, the park encompasses significant Native American archeological sites.

MIDDLE DELAWARE NATIONAL SCENIC AND RECREATIONAL RIVER

Middle Delaware National Scenic and Recreational River was established as a scenic and recreational river in 1978 under the Wild and Scenic Rivers Act.

The Delaware River is the longest undammed river in the Eastern United States. MDSR was established as a scenic and recreational river in 1978 under the Wild and Scenic Rivers Act. For 40 miles the MDSR passes between low, forested mountains with barely a house in sight. Then the river cuts through the mountain ridge to form the famed Delaware Water Gap. Exiting the park, the river runs 200 miles south to the Delaware Bay at Wilmington, Delaware, and then to the Atlantic Ocean. The Delaware River is one of the cleanest rivers in the nation due to years of work to protect and restore it (NPS 2010a; Delaware River Keeper n.d.), making it a popular destination for swimming, fishing, boating, canoeing, kayaking, rafting, and innertubing. It is estimated that more than 15 million people in the United States, including New York City, Philadelphia, and surrounding urban areas, depend on the water of the Delaware River Basin for public water supply and industrial use (Sloto and Buxton 2006, 2). A portion of the Delaware River Water Trail, a national scenic trail from Hancock, New York, to Trenton, New Jersey, runs through MDSR.

APPALACHIAN NATIONAL SCENIC TRAIL

The Appalachian National Scenic Trail is a 2,175-mile-long public footpath.

APPA is a 2,175-mile-long public footpath. It traverses through the scenic, wooded, pastoral, wild, and culturally resonant lands across 14 of the eastern United States, from Katahdin in Maine to Springer Mountain in Georgia. Conceived in 1921 and completed in 1937, the trail was built and is still maintained by volunteers, giving rise to its nickname: "the people's trail." APPA was designated as the nation's first national scenic trail by the National Trails System Act in 1968. It is arguably the most famous hiking path in world. It is enjoyed by an estimated 2–3 million people each year and within a day's drive of two-thirds of the U.S. population. People of all ages and abilities come to APPA to enjoy short walks, day hikes, long-distance backpacking journeys, or the revered "thru-hike" on this iconic trail. APPA offers a variety of opportunities for viewing spectacular scenery, for adventure, for exercise, for nature study, for personal exploration, and for renewal (NPS 2010d).

APPA is managed cooperatively by the NPS, the Appalachian Trail Conservancy, volunteers from 31 local Appalachian Trail Clubs, the U.S. Department of Agriculture Forest Service (USFS), and dozens of other state and local land-management agencies. Within this partnership, thousands of volunteers do much of the work each year to keep the trail open for all to enjoy. Although APPA is considered a unit of the NPS, the Appalachian Trail traverses a complex patchwork of lands consisting of 75 federal and state parks and forests in addition to the extensive corridor of NPS-managed lands (NPS 2010d).

The Appalachian Trail Conservancy is the volunteer-based nonprofit organization dedicated to the protection and management of APPA and its associated lands, Appalachian Trail Conservancy serves as the primary source of information to visitors about the Appalachian Trail (NPS 2010d).

ENABLING LEGISLATION OF THE NATIONAL PARK SYSTEM UNITS

DEWA, MDSR, and APPA are three separate units of the national park system, each with distinct enabling legislation. Each of the parks' enabling legislation was created in accordance with the NPS Organic Act of 1916 (Organic Act): "to conserve the scenery and the natural and historical objects and the wildlife therein and to provide for the enjoyment of the same in such a manner and by such means as will leave them unimpaired for the enjoyment of future generations." In enabling legislation, Congress and the president create and define a park unit's boundaries and management. The DEWA, MDSR, and APPA enabling laws follow.

DELAWARE WATER GAP NATIONAL RECREATION AREA

DEWA Enabling Legislation: PL 89-158; 89th Congress H.R. 89 (September 1, 1965): This legislation authorizes the establishment of DEWA from an area of the Tocks Island Dam and Reservoir, a project that was never implemented and was later deauthorized by Congress. The legislation authorized DEWA for outdoor recreational purposes, and included among the purposes of DEWA the preservation of the scenic, scientific, and historic resources of the area contributing to public enjoyment of the lands and waters. A full text of the entire legislation authorizing the establishment of DEWA is provided in appendix A.

MIDDLE DELAWARE NATIONAL SCENIC AND RECREATIONAL RIVER

MDSR Enabling Legislation: Wild and Scenic Rivers Act, PL 90-542 (16 U. S. Code [USC] §§ 1271–1287) (November 10, 1978): In 1978, the Delaware River within DEWA was designated as a scenic and recreational river under the Wild and Scenic Rivers Act. The provisions of the act stipulate that as a scenic and recreational river, the Middle Delaware

> shall be administered in such manner as to protect and enhance the values which caused it to be included in [the wild and scenic rivers] system without … limiting other uses that do not substantially interfere with public use and enjoyment of these values. In such administration primary emphasis shall be given to protect [the area's] esthetic, scenic, historic, archeological, and scientific features. (Wild and Scenic Rivers Act [16 USC 1271–1287])

APPALACHIAN NATIONAL SCENIC TRAIL

APPA Enabling Legislation: National Trails System Act, PL 90-543 (16 USC § 1241 et seq.), as amended through PL 103-145 (November 17, 1993). The National Trails System Act established APPA and directed the Secretary of the Interior, in cooperation with the Secretary of Agriculture, state and local governments, and private citizens, to protect and administer APPA. The act provided the Secretary of the Interior and the Secretary of Agriculture with the authority to relocate APPA; administer use of and access to APPA; regulate incompatible uses, including motorized uses, bicycles, and horses; and enter into agreements with state agencies and nongovernment organizations to protect, manage, maintain, and develop APPA. It also encouraged state agencies to pass similar legislation and take active steps to protect APPA and authorized federal land acquisition, as necessary, to establish a permanent route and protective corridor surrounding the footpath.

On March 21, 1978, President Carter signed the "Appalachian Trail Amendments" to the National Trails System Act. This law reauthorized the APPA Advisory Council, required a comprehensive management plan for APPA, and increased the amount of funding for land acquisition. Authority to acquire by eminent domain was increased to an average of 125 acres per mile, and the Secretary of the Interior and the Secretary of Agriculture were directed to substantially protect APPA within three years.

On March 28, 1983, President Reagan signed an Act of Congress (PL 98-11) to amend the National Trails System Act, thus strengthening support for volunteers and volunteer-based organizations, refining the process for designating side and connecting trails, providing the authority for administrative transfers of land, authorizing whole tract acquisition with the consent of the landowner, defining trail uses, and clarifying that donated easements qualify as conservation tax exemptions.

PURPOSE AND SIGNIFICANCE OF THE THREE PARKS

National park system units are established by Congress to fulfill specified purposes. A park unit's purpose is the fundamental building block for its decisions to conserve resources and "to allow visitation in such a manner as to leave these resources unimpaired for future generations" (Organic Act). The Organic Act of August 25, 1916, states that "the Service thus established shall promote and regulate the use of Federal areas known as national parks, monuments and reservations … by such means and measures as to conform to the fundamental purpose of the said parks, monuments and reservations, which purpose is to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations."

The purpose and significance of the three parks are described below.

DELAWARE WATER GAP NATIONAL RECREATION AREA

Establishment: Congress established DEWA in 1965 to provide for "public outdoor recreation use and enjoyment of the proposed Tocks Island Reservoir and lands adjacent thereto and for the preservation of the scenic, scientific, and historic features contributing to public enjoyment of such lands and waters" (PL 89-158).

Purpose: The purposes of the national recreation area are as follows:

> *Park Resource Protection*: Preserve the natural, cultural, and scenic resources contributing to public enjoyment of the national recreation area's lands and waters.
>
> *River Resource Protection*: Protect and enhance the values which caused the river to be included in the national wild and scenic river system.
>
> *Education*: Foster preservation and educational activities that support natural and cultural resource protection.
>
> *Research and Conservation*: Protect the national recreation area's resources through research and appropriate resource conservation and restoration practices.
>
> *Recreation Use and Enjoyment*: Provide for public outdoor recreation use and enjoyment, assuring that such use and enjoyment has minimal impacts on the national recreation area's natural and cultural resources (NPS 1999).

Significance: DEWA provides a distinctive combination of natural resources, cultural resources, and recreational features that collectively offer outstanding opportunities for public use and enjoyment in an increasingly urbanized region. The following resources and features contribute to the national recreation area's significance:

- Outstanding geologic and natural features form some of the best-known scenic landscapes in the northeastern United States and illustrate the characteristic landforms and biotic areas of the Appalachian Ridge and Valley Province and the Southern Appalachian Plateau Province.
- Open spaces, combined with other regional protection and preservation initiatives, create a multistate greenway corridor that preserves essential habitat for the sustained health of plant and animal communities, including potentially threatened species, in the region.
- DEWA has the most significant, intact concentration and diversity of known archeological resources in the northeastern United States, as well as outstanding examples of American Indian and European settlements dating from the Early Woodland through Late Colonial historic periods. The early European settlement of the Middle Delaware Valley is manifested in the park through unique cultural landscapes (NPS n.d.a; Puniello 1991; Kraft 1986). Additionally, the park has historic structures representative of eighteenth-century frontier farms, nineteenth-century rural farms and villages, and twentieth-century energy-efficient design (NPS 1996).

The park is significant due to the exceptional quality of the Delaware River; it is the last free-flowing river in the eastern United States, and provides outstanding recreational and scenic opportunities. The quality and quantity of river water remain in good condition and provide a stable ecological environment because approximately 40 miles of river within the boundaries of the park have been designated as MDSR, and the river is buffered by a combination of protected lands (federal, state, local, and other conservation lands) including the Upper Delaware Scenic and Recreational River.

DEWA is one of the largest public open spaces remaining in the northeastern metropolitan corridor and the second largest acreage NPS unit in the Northeast Region of the NPS. The national recreation area provides a broad diversity of exceptional and unique nearby natural resource–based recreational opportunities. The park is the eighth most visited area in the national park system, with over 5 million recreational visits each year. Visitation is growing at a steady rate. Much of this visitation is from the nearby, rapidly expanding, New York/northern New Jersey and Philadelphia suburban areas (NPS 2010c).

MIDDLE DELAWARE NATIONAL SCENIC AND RECREATIONAL RIVER

In 1968, the Delaware River within DEWA was designated as a scenic and recreational river under the Wild and Scenic Rivers Act. The provisions of the act stipulate that as a scenic and recreational river, the Middle Delaware shall be administered in such manner as to protect and enhance the values that caused it to be included in the wild and scenic rivers system without limiting other uses that do not substantially interfere with public use and enjoyment of these values. According to the act, the primary emphasis in the administration of MDSR should be on protecting the area's aesthetic, scenic, historic, archeological, and scientific features.

APPALACHIAN NATIONAL SCENIC TRAIL

Establishment: APPA was established in 1968 with the passage of the National Trails System Act (PL 90-543, October 2, 1968, 16 USC §1244). It is a unit of the national park system as well as a component of the national trails system. It is administered by the Secretary of Interior through the NPS, in

consultation with the Secretary of Agriculture. The NPS coordinates management of APPA through the park office Harpers Ferry, WV.

Purpose: APPA was established to provide for maximum outdoor recreation potential as an extended trail and for the conservation and enjoyment of the nationally significant scenic, historic, natural, and cultural resources of the areas through which the Appalachian Trail passes (NPS 2005a).

Significance: APPA is a way, continuous from Maine to Georgia, for travel on foot through the wild, scenic, wooded, pastoral, and culturally significant lands of the Appalachian Mountains. It is a means of sojourning among these lands, such that visitors may experience them by their own unaided efforts. The body of the Trail is provided by the lands it traverses, and its soul is in the living stewardship of the volunteers and partners of the Appalachian Trail Cooperative Management System (NPS 2005a).

LAWS, REGULATIONS, AND POLICIES RELEVANT TO THIS EIS

Various laws, regulations, and policies of the NPS and the federal government are described in this section to show the constraints within which this EIS will need to operate and the goals and policies it must meet. The NPS, in preparing this EIS, must conform to the federal laws, regulations, and policies listed in this section.

Table 1 lists the authorities potentially applicable to the proposed S-R Line. This list is not intended to be exhaustive and if a law is not listed it does not relieve the NPS or the applicant from compliance with that directive. Descriptions of these and other relevant laws, regulations, and planning documents are presented in appendix B.

TABLE 1: FEDERAL LAWS, REGULATIONS, EXECUTIVE ORDERS, AND SECRETARIAL ORDERS POTENTIALLY APPLICABLE TO THE S-R LINE

Laws and Regulations	Reference
Federal Noxious Weed Act of 1975, as amended	7 USC §§ 2801–2814
NPS Organic Act of 1916 (Organic Act)	16 USC §§ 1, 2–4
General Authorities Act of 1970	16 USC § 1a1 et seq.
Park System Resource Protection Act	16 USC § 19jj
NPS authorities governing issuance of rights-of-way for power transmission lines	16 USC § 5 36 CFR §§ 14.70–78
Antiquities Act of 1906	16 USC § 431 et seq.
National Historic Preservation Act of 1966, as amended (NHPA), and regulations implementing the act	16 USC § 470 et seq.
Archaeological Resources Protection Act of 1979, as amended	16 USC § 470aa et seq.
Bald and Golden Eagle Protection Act of 1940, as amended	16 USC §§ 668–668c
Migratory Bird Treaty Act of 1918	16 USC §§ 703–711
Wild and Scenic Rivers Act	16 USC §§ 1271–1287
Endangered Species Act of 1973, as amended	16 USC § 1531 et seq.
National Parks Omnibus Management Act of 1998	16 USC §§ 5901–6011
Native American Graves Protection and Repatriation Act of 1990	25 USC§§ 3001–3013 et seq.
Occupational Safety and Health Act of 1970	29 USC § 651 et seq.
Clean Water Act	33 USC § 1251 et seq.
American Indian Religious Freedom Act of 1978	42 USC § 1996

Laws and Regulations	Reference
Safe Drinking Water Act of 1974	42 USC § 3000f et seq.
National Environmental Policy Act of 1969, as amended (NEPA)	42 USC § 4371 et seq.
Noise Control Act of 1972, as amended	42 USC § 4901 et seq.
Pollution Prevention Act of 1990	42 USC § 13101 et seq.
Energy Policy Act of 2005	42 USC § 13201 et seq.
Title 36, Code of Federal Regulations (CFR)	36 CFR Chapter I
NPS regulations governing issuance of rights-of-way for power transmission lines	36 CFR Part 5
Environmental Protection Agency's Determining Conformity of Federal Actions to State or Federal Implementation Plans	40 CFR Part 93
Council on Environmental Quality (CEQ) general regulations implementing NEPA	40 CFR §§ 1500–1508
National Environmental Policy Act, Protection and Enhancement of Environmental Quality	Executive Order 11512
National Historic Preservation	Executive Order 11593
Floodplain Management	Executive Order 11988
Protection of Wetlands	Executive Order 11990
Federal Compliance with Pollution Control Standards	Executive Order 12088
Environmental Justice	Executive Order 12898
Indian Sacred Sites	Executive Order 13007
Invasive Species	Executive Order 13112
Responsibilities of Federal Agencies to Protect Migratory Birds	Executive Order 13186
Responsibilities, and the Endangered Species Act, June 5, 1997	Secretarial Order 3206
Department of the Interior NEPA regulations	43 CFR Part 46
Transmission Vegetation Management Program	NERC Standard FAC-003-01

OBJECTIVES IN TAKING ACTION

The NPS's objectives for preparing this EIS were developed in accordance with Director's Order 12 (NPS 2011g). An objective is a statement of park-management goals that the NPS has identified as relevant in responding to the applicant's request. The alternatives must achieve the NPS's objectives to a large degree for the action to be considered appropriate and resolve the purpose of and need for action. Objectives must be grounded in the parks' enabling legislation, purpose, significance, and mission goals, and must be compatible with direction and guidance provided in the parks' general management plan (GMP), comprehensive management plans, strategic plans, and/or other management guidance, including NPS policies.

All action alternatives selected for detailed analysis must meet S-R Line objectives to a large degree and resolve the purpose of and need for action.

During the internal scoping meeting the interdisciplinary team, composed of resource specialists from the NPS and consultant staff, developed and refined goals and objectives for the following topics.

Physical resources

- Avoid adverse effects on geologic resources (geology, paleontology, and rare and unique geologic features), soil resources (soils and prime and unique farmlands), and water resources (surface waters and groundwater).

Natural resources

- Avoid adverse effects on natural resources (vegetation, landscape connectivity and wildlife habitat, special-status species, and rare and unique communities).
- Protect existing functions and values of wetlands and floodplains by avoiding adverse impacts or limiting impacts to an insignificant level.
- Maintain the ecological integrity of rare and unique communities and prevent degradation of the communities from occurring.
- Protect threatened and endangered species by avoiding impacts. Complete consultation with federal agencies as required under the Endangered Species Act of 1973, as amended (16 USC 1531–1544), and coordinate with state agencies regarding state-listed species.
- Manage any construction and maintenance activities to avoid or reduce impacts on wildlife and plant species as much as possible.
- Manage any construction and maintenance activities to avoid or reduce the introduction and spread of invasive species.
- Avoid or minimize adverse effects on migratory birds in accordance with Migratory Bird Treaty Act and the 2010 *Memorandum of Understanding Between the U.S. Department of the Interior National Park Service and the U.S. Fish and Wildlife Service to Promote the Conservation of Migratory Birds*.
- Mitigate impacts on landscape connectivity.

Cultural resources

- Avoid, minimize, or mitigate adverse effects on identified archeological resources.
- Avoid, minimize, or mitigate adverse effects on identified historic structures.
- Avoid, minimize, or mitigate adverse effects on identified cultural landscapes.
- Protect the eligibility of cultural resources for National Register of Historic Places (National Register) nomination.

Socioeconomics

- Avoid impacts on surrounding land use; socioeconomics; and infrastructure, access, and circulation; or gateway communities.

Visitor use and experience

- Maintain visitor experience, including preservation of key qualities such as primitive, solitary, and pastoral experiences. If impacts are unavoidable, mitigate impacts as appropriate, including any lost use due to closures or diminished experience caused by construction.

Visual resources

- Avoid, minimize, or mitigate impacts to scenic viewsheds and landscapes.

Soundscapes

- Avoid, minimize, or mitigate impacts on soundscapes.

Wild and scenic rivers

- Avoid adverse effects on the esthetic, scenic, historic, archeological, and scientific features of MDSR.

Park operations

- Avoid adverse effects on the parks' fiscal and operating resources, including long-term management of resources and volunteer organizations.

Human health and safety

- Protect the safety of staff and visitors; measures taken to ensure human health and safety could include closures of roads, the river, trails, and airspace, as necessary.

SCOPING PROCESS AND PUBLIC PARTICIPATION

Scoping is an early and open process to determine the breadth of environmental issues and alternatives to be addressed in any planning document prepared in accordance with NEPA. Scoping includes obtaining early input about the planning project from the public, park staff, interested agencies, or any agencies with jurisdiction by law or expertise. Scoping activities for this proposed S-R Line EIS are summarized below. Additional information on the public involvement process and ongoing agency coordination is presented in "Chapter 5: Consultation and Coordination."

NEPA public involvement: a notice of intent to prepare an EIS was published in the Federal Register on January 21, 2010, to announce the beginning of the S-R Line EIS process. The NPS also released a public scoping newsletter for the S-R Line to the public for review and comment in January 2010. The newsletter included a description of the proposed S-R Line, the purpose of and need for the project, background information, project objectives, and a list of issues and impact topics.

During the scoping comment period, approximately 6,500 comments were received from over 29 states and 4 countries.

To determine the scope of issues to be analyzed in depth in this EIS, three public scoping meetings were held in Pennsylvania and New Jersey in February 2010. During the scoping comment period, approximately 6,500 comments were received from over 29 states and 4 countries (the United States, United Kingdom, France, and Serbia). Individuals living in the proposed area of the S-R Line submitted 6,343 letters. The NPS Planning, Environment, and Public Comment (PEPC) database was used for management of the comments. A summary of the comments can be found in the public scoping comment summary report dated April 2010, which is located on the NPS PEPC website http://parkplanning.nps.gov/ (NPS 2010e).

Additional public meetings were held in August 2010 and a public comment period was held from August to September 2010 to examine the range of preliminary alternatives and solicit input on alternative elements. During the comment period, approximately 1,700 separate pieces of correspondence were received and entered into the PEPC system. A public comment summary report was generated and made

available to the public in November 2010; this report can be found on the NPS PEPC website (NPS 2010f).

Following the release of the draft EIS, the public comment period extended from November 2011 to January 2012 and public meetings were held in January 2012. The NPS received more nearly 27,000 pieces of correspondence during the comment period, in addition to the 102 participants who spoke during the public meetings. A public comment analysis report was prepared and is included as appendix L; the report is also posted on the NPS PEPC website http://parkplanning.nps.gov/DEWA.

Chapter 5 of this EIS provides more details about the public scoping activities, including agency scoping and consultation that were an integral part of the EIS process.

ISSUES AND IMPACT TOPICS RETAINED FOR DETAILED ANALYSIS

To focus the environmental analysis, the issues identified during scoping were used to derive a number of impact topics. Impact topics are resources of concern that could be affected, either beneficially or adversely, by implementing any of the proposed alternatives. The issues and potential impacts associated with the applicant's proposed route and all the other action alternatives are discussed in the following sections. Details on the existing conditions for each resource topic are presented in "Chapter 3: Affected Environment," and the anticipated impacts are presented in "Chapter 4: Environmental Consequences."

NATURAL RESOURCES

Geologic Resources (Geology, Paleontology, and Rare and Unique Geologic Features)

Construction activities could impact geologic resources. The foundations for the new towers may extend below grade 40 feet or more, requiring extensive drilling[1], which could affect geological and paleontological resources. Construction activities could cause geohazards such as rockslides and limestone fracturing, which could alter wetland environments that provide rare and unique habitats for both plant and wildlife species.

Floodplains

Impacts on floodplains and their functionality could occur from the proposed Line. The construction of towers and access roads, displacement of floodwater by towers, and compaction of soil from crane pads could all affect floodplains and riparian buffers. An NPS floodplains statement of findings is required. The final statement of findings will be included in the record of decision, after the draft statement of findings has been distributed for public review and comment.

Wetlands

The proposed line could have impacts on wetlands and their functionality. Wetland delineations and assessments of functions and values for wetlands have been conducted. Access roads and towers, crane pads, and other construction activities could compact soils, involve vegetation removal, and alter surface hydrology, which could impact wetland functions and values. Vegetation maintenance could affect plant

[1] The draft EIS examined the effects of blasting and drilling, but after completing its analysis and hearing in public comment that the public and other agencies had concerns with blasting, and that the applicant considered it not necessary, NPS has determined not to allow blasting.

growth. An NPS wetlands statement of findings is required. The final statement of findings will be included in the record of decision, after the draft statement of findings has been distributed for public review and comment.

Vegetation

Impacts on vegetation in the ROW and along the routes of proposed access roads are expected. All action S-R Line alternatives would require significant trimming or clearing of some vegetation in their respective ROWs. The B-K Line ROW has not been maintained and would also require vegetation trimming. Access roads would require vegetation clearing. Areas needed for pulling and splicing of the wires may require some trimming and clearing, or use of these areas may result in trampling of vegetation. All action alternatives also have the potential to promote invasive species.

Landscape Connectivity, Wildlife Habitat, and Wildlife

The proposed transmission line expansion may contribute to habitat fragmentation by increasing the width of the ROW, clearing heavily forested areas in the ROW and along proposed access roads, and reducing large, contiguous blocks of habitat. Impacts on wildlife and their habitats in and adjacent to the ROW and proposed access roads may also occur. Construction noise may deter wildlife from using their normal home ranges. Road widening and clearing of trees along the roads would result in removal and alteration of wildlife habitat. The installation of taller towers with transmission lines above the current tree height could adversely affect migratory birds, and the Secretary of the Interior has been petitioned to designate a national raptor migration corridor in this area. Impacts such as illegal off-road vehicle (ORV) use, as unfortunately often occurs on other ROWs in the park, would compound habitat fragmentation.

Special-status Species (Aquatic and Terrestrial)

Federal and state-listed species and other species of conservation concern are located near and along the proposed alternative routes and could be affected by construction and maintenance of the S-R Line. The degradation of water quality and habitat alteration as a result of construction activities may affect special-status aquatic species.

Rare and Unique Communities

The proposed action alternatives for the Line could have impacts on many rare and unique ecological communities in DEWA. The hemlock forest community is a natural heritage site and a DEWA outstanding natural feature that supports rare species. Kittatinny talus slope, which is located just downslope of APPA, is in the Kittatinny Mountains, a New Jersey priority natural heritage site. Hogback Ridge is a unique ecosystem in DEWA. Van Campen Brook and its tributaries are important fish habitat (such as for wild native trout reproduction).

CULTURAL RESOURCES

The S-R Line action alternatives have the potential to affect cultural resources in DEWA and along MDSR. Pennsylvania and New Jersey have deemed the entire length of APPA eligible for nomination to the National Register, as have the other 12 states through which the trail passes. Currently, other sections of the trail are listed on the register. Scenic impacts on cultural landscapes are also possible.

Archeological Resources

Impacts on archeological resources are anticipated. The applicant has conducted surveys for archeological resources around existing and proposed tower structure, access road, and crane pad locations as well as "harvest impact areas" along their proposed route. River terraces along the Delaware River are prime locations for archeological sites, including sites containing prehistoric structural remains, and have the potential to be affected by the transmission line expansion.

Historic Structures

Surveys have identified historic structures in Pennsylvania and New Jersey and at DEWA. No physical impacts on historic structures are anticipated, but visual impacts would occur. The S-R Line would involve the regular placement of new towers and intervening electrical transmission lines within identified alternative alignments. Because these features are large in scale and readily visible from great distances, they would have visual impacts on historic structures within the valley.

Cultural Landscapes

According to NPS-28: *Cultural Resource Management Guideline*, a cultural landscape is a reflection of human adaptation and use of natural resources and is often expressed in the way land is organized and divided, patterns of settlement, land use, systems of circulation, and the types of structures that are built. The character of a cultural landscape is defined both by physical materials, such as roads, buildings, walls, and vegetation, and by use reflecting cultural values and traditions.

The parks themselves jointly form a man made cultural landscape that would be permanently altered by the action alternatives. Construction activities, the new transmission lines, and new access roads would all affect significant cultural landscape features and characteristics (natural systems and features, spatial organization, land use, cultural traditions, circulation, topography, vegetation, wild or domestic fauna, buildings and structures, cluster arrangements, small-scale features, constructed water features, views and vistas, and archeological sites). Impacts on cultural landscapes would be permanent. Any cultural landscapes that have been identified would be evaluated. Cultural landscapes studies would likely be necessary for several locations, including Van Campen Glen, APPA, Old Mine Road Historic District, Watergate Recreation Site, Delaware View, and Community Drive. Additional cultural landscapes that could be affected by alternatives would be identified through the viewshed analysis.

OTHER AGENCY LAND USE PLANS OR POLICIES

Federal, state, county, and municipality-based land use plans or policies related to the study area exist. The counties in the existing study area have comprehensive land use and zoning plans. Some of the municipalities (townships and boroughs) have zoning and land use plans, as well. Some of the proposed S-R Line activities may not be compatible with these agency land use plans.

SOCIOECONOMICS (SOCIOECONOMICS AND INFRASTRUCTURE, ACCESS, AND CIRCULATION)

The proposed action alternatives for the Line may change the way the parks, park resources, and park concessionaires' resources are used, resulting in economic impacts. The expanded ROW and new transmission lines could result in economic impacts due to changes in visitation or use of park resources. Employment for the local community and businesses may rise during construction activities. Tourism may also be affected by the Line. Transporting construction equipment and towers would have impacts on

public roads including increased traffic, road deterioration from heavy trucks, and reduced access from surrounding communities. The Line has the potential to negatively affect real estate values near the proposed transmission lines.

VISITOR USE AND EXPERIENCE

The existing visitor experience, including key elements such as primitiveness and solitude, may be affected by the action alternatives for the Line. In all three parks, construction activities and the visibility of the new towers above the existing tree line would have an impact on visitor experience. Construction activities (including drilling, clearing, and heavy equipment noise) and large visible towers would affect visitor experience at APPA. Effects on visitor experience due to changes or reduced access to scenic resources are also anticipated. Scenic resource protection is specified in the enabling legislation of APPA, DEWA, and MDSR. Temporary and permanent closures of roads, river, trails, and campsites would be implemented for safety and transport needs. Action alternatives would result in an adverse impact on the visitor experience.

VISUAL RESOURCES

The proposed Line and associated access roads may alter some viewsheds, which could adversely affect the visitors' appreciation of the parks' viewsheds and scenic resources. Separate viewshed analyses have been conducted for scenic and visual impacts in the three parks. DEWA and the surrounding lands are part of the scenic viewshed for APPA. Construction is expected to affect the visual and aesthetic resources of the parks for decades.

SOUNDSCAPES

Construction and maintenance activities would cause noise impacts. An increase in transmission line voltage may cause increases in corona effect noise (audible electric line noise), especially during periods of high aerial conductivity (such as times of high humidity). Visitors could be subjected to non-natural sounds as a result of construction activities and operation of the proposed line for the life of the line, not just during construction. More roads and more maintenance would result from selection of any action alternative.

WILD AND SCENIC RIVERS

All alternatives would cross the Delaware River and several would cross the Delaware River where the river is designated as the MDSR, a wild and scenic river. The Wild and Scenic Rivers Act defines scenic river areas as those rivers or sections of rivers that are free of impoundments, with shorelines or watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads. The proposed Line may have impacts on natural viewsheds along the Delaware River. The construction of new towers and expansion of the ROW would disrupt the character of the shoreline.

PARK OPERATIONS

Construction and operation of the proposed S-R Line is likely to negatively affect park operations such as law enforcement and resource management. The S-R Line would require park staff to monitor and oversee more frequent maintenance activities associated with the newly cleared areas. More time would be required for park staff to handle additional long-term resource management responsibilities, utility coordination, law enforcement, and maintenance. Volunteers may also be redirected from their usual activities to monitor vegetation, create ORV barriers, or address trail erosion problems.

HUMAN HEALTH AND SAFETY

The local roads and park roads are narrow, typically only rated for loads less than 10 tons, restricted to noncommercial traffic, and subject to constant maintenance issues. Large, heavy equipment use would be a potential problem due to traffic control issues, deterioration caused by excess loads, and exceedances of bridge and culvert weight capacities. Transporting large construction equipment and new towers on park and public roads would cause a safety concern, and the river would be closed to public use as necessary during installation of the power lines for visitor safety. In addition, electromagnetic field (EMF) exposure related to transmission lines was identified by the public during the scoping process as a topic of concern.

SUSTAINABILITY AND LONG-TERM MANAGEMENT

Impacts on natural resources from the proposed Line would be ongoing, and potential mitigation measures would necessitate long-term management and monitoring actions by the parks. In addition, a variety of ramifications are generally associated with power lines, such as illegal ORV use and forest cover fragmentation. Another long-term management consideration is that the conversion of this transmission corridor from a noncritical status to a critical corridor would affect the way this area is accessed and maintained in the future. It is reasonably foreseeable that the logic being applied to justify adding more lines to the existing B-K Line ROW would continue as future needs expand, and further transmission line expansion proposals may be forthcoming. Continued addition of ROW and roads would diminish the value and services provided by the existing natural and cultural resources.

ISSUES AND IMPACT TOPICS ELIMINATED FROM FURTHER CONSIDERATION

The following resources were analyzed in detail while drafting this EIS. The analysis determined that each of the alternatives would have minimal impacts on these resources in the study area, and either the impacts are similar across the action alternatives or impacts on the resource are thoroughly analyzed and described under another resource topic. The following resources were dismissed from further analysis in this EIS.

AIR QUALITY

Section 118 of the 1963 Clean Air Act (42 USC 7401 et seq.) requires park units to meet all federal, state, and local air pollution standards. Further, the Clean Air Act provides that the federal land manager has an affirmative responsibility to protect air quality related values (including visibility, plants, animals, soils, water quality, cultural resources, and visitor health) from adverse pollution impacts. NPS *Management Policies 2006* also requires parks to perpetuate the best possible air quality in parks to (1) preserve natural resources and systems, (2) preserve cultural resources, and (3) sustain visitor enjoyment, human health, and scenic vistas (NPS 2006a, 53). The construction and operation of the S-R Line under all action alternatives would comply with the NPS mandates. DEWA is not a federal Class I area afforded additional protection for air quality related values such as visibility. DEWA is a Class II area, which allows for a less stringent level of air quality protection than Class I areas. Warren and Sussex Counties in New Jersey are designated as non-attainment for ozone. A general conformity analysis was performed for the preferred alternative. The general conformity analysis and the carbon sequestration analysis are included in appendix G.

Impacts on air quality would be the same across all action alternatives inside and outside the study area. The amount of criteria pollutants emitted as a result of the action alternatives would include trace amounts of particulate matter, nitrogen oxides, and carbon monoxide and impacts on air quality would be no

greater than minimal. On a regional level, the amount of criteria pollutants emitted would not be substantial and the impacts on air quality would be the same for all action alternatives. Therefore, NPS has determined that this is not a significant issue and dismisses it in accordance with CEQ guidance. See 40 CFR § 1500.4.

Climate Change and Greenhouse Gas Emissions

The Environmental Quality Division of the NPS has released draft interim guidance on considering climate change in NPS NEPA analysis, one of the key questions that should be addressed is "What is the contribution of the proposed project to climate change, as indicated by greenhouse gas emissions associated with the project?" (NPS 2009a, 1). On February 18, 2010, the CEQ released a draft guidance memorandum on the consideration of greenhouse gas emissions and climate change impacts as part of compliance with NEPA (Sudley 2010, 1).

DEWA is involved in the Climate Friendly Parks Program, which is a collaboration of the NPS and the U.S. Environmental Protection Agency (USEPA) aimed at addressing climate change. The purpose of the program is to measure greenhouse gas emissions, develop sustainable strategies to mitigate these emissions and adapt to climate change impacts, and educate the public about these efforts (NPS 2005b, 6). DEWA has also developed "climate friendly" objectives and targets for DEWA employees for climate change mitigation and air pollution reduction (NPS 2005b, 6).

Climate change has had, and will continue to have, a marked impact on natural systems (NPS 2006b, 10). However, the responses of ecosystems to global warming have only been postulated and likely will vary among systems (Shaver et al. 2000). It is expected that one result of future climate change in the eastern United States will be an increase in the number of ice storms, which can disturb forest systems (National Assessment Synthesis Team 2001). There may also be changes in the number and intensity of extreme events such as hurricanes and northeasters (Groisman, Knight, and Karl 2000), all of which stress the natural systems of the Eastern Rivers and Mountains Network (NPS 2006b, 11).

Construction and maintenance activities associated with the S-R Line alternatives would result in fossil fuel consumption. However, the parks are in fact a carbon sink but the issue of the contribution of the alternatives to climate change through greenhouse gas emissions was dismissed from further analysis.

Climate change may contribute to the adverse impacts on natural resources expected from the proposed S-R Line. However, these adverse impacts are not expected to increase the intensity of the impacts identified for the alternatives and impacts from climate change are also similar across all action alternatives. In addition, ecosystems are currently under pressure from a number of stressors in addition to climate change, including habitat loss and degradation, development, pollution, toxic chemicals, overfishing, invasive species, pests, disease outbreaks, habitat fragmentation, and wildfires (NABCI 2010, 44). Due to these reasons and the impossibility of predicting the severity of future climate change or its impacts with certainty, this topic was dismissed from further consideration.

SOIL RESOURCES (SOILS AND PRIME AND UNIQUE FARMLANDS)

Soils

NPS *Management Policies 2006* requires the NPS "to understand and preserve the soil resources of parks, and to prevent, to the extent possible, the unnatural erosion, physical removal, or contamination of the soil or its contamination of other resources. … Management action will be taken by superintendents to prevent or at least minimize adverse, potentially irreversible impacts on soil" (NPS 2006a, 56).

The majority of soils in the study area formed as a result of glaciations that once covered the mountains of the park. Soils in DEWA are primarily composed of a poorly to excessively well-drained, fine to coarse, loamy mix formed in glacial material such glacial till, colluvium, or outwash derived from sandstone, siltstone, shale, conglomerate, and/or quartzite (USDA Natural Resources Conservation Service [NRCS] 2010a). Most of the adverse impacts on soils are due to soil compaction; this is similar across all action alternatives. Soil compaction results in loss of soil productivity and this is addressed and analyzed under the wetlands resource topic. Some soil loss from construction activities of towers and access would occur. The footprint of these structures is relatively small and thus the action would not cause significant impact to soils. Therefore, the soil resources topic is not carried forward in this EIS.

Prime and Unique Farmlands

The Farmland Protection Policy Act (7 USC § 4201 et seq.) was passed to address the effects of federal programs on the conversion of farmland to nonagricultural uses. In support of this legislation, the Department of the Interior issued several memoranda to guide its agencies in addressing prime and unique farmlands in the NEPA process. Prime farmlands are those lands that have the best combination of physical and chemical characteristics for producing food, feed, fiber, forage, oilseed, and other agricultural crops with minimum inputs of fertilizer, pesticides, and labor, and without intolerant soil erosion. Unique farmlands are those that are used for the production of specific high-value food and fiber crops.

The majority of prime and unique soil along the proposed alternative alignments is currently forested land and is not being actively farmed. Impacts on prime and unique farmlands would be no greater than minimal because it is likely that the agriculture land containing the prime soil would continue to be farmed. Other areas containing prime or unique farmlands are currently forested habitat. Therefore, the prime and unique farmlands topic is dismissed from further analysis.

WATER RESOURCES (SURFACE WATER AND WATER QUALITY, GROUNDWATER, AND AQUATIC RESOURCES)

The Clean Water Act requires the NPS to "comply with all Federal, State, interstate, and local requirements, administrative authority, and process and sanctions respecting the control and abatement of water pollution" (33 USC § 1251 et seq., section 313). NPS *Management Policies 2006* states that the NPS will "take all necessary actions to maintain or restore the quality of surface waters and ground waters in the parks consistent with the Clean Water Act and all other applicable federal, state, and local laws and regulations" (NPS 2006a). The NPS has also established general goals for water quality, and in accordance with these goals, the NPS works cooperatively with states to protect and enhance the quality of water in national park system units.

Water quality protection is one of the most important responsibilities of the Delaware River Basin Commission; its water quality standards designate the MDSR and the portion of the river and tributaries contained in DEWA as outstanding basin waters.

Surface Water and Water Quality

Within the boundaries of DEWA and MDSR, the Delaware River flows 40 miles from near Matamoras, Pennsylvania, to Slateford Creek, Pennsylvania (Horwitz et al. 2008, 1). The portion of the Delaware River Basin in DEWA is composed of 48 major tributaries and encompasses a drainage area of 69,000 acres in parts of Pennsylvania and New Jersey. In addition to the Delaware River and tributaries, approximately 200 lakes and ponds are within the boundaries of DEWA. These ponds and lakes vary in size, ranging from surface dimensions of less than an acre to 35 acres (NPS 2010g). The surface water

quality in the mainstem of the Delaware River in DEWA is considered high quality (NPS 2010h, 1). Within DEWA, all streams but one originate outside the park boundary. Water quality in these streams is generally high; however, nearby human development has resulted in increased nutrient, sediment, and fecal coliform levels in some streams (NPS 2010h). Other surface water bodies in DEWA, including lakes and ponds, generally have good water quality, although depressed dissolved oxygen concentrations have been observed in later summer when large quantities of aquatic plants die and decay (NPS 2010h).

Because no construction would be completed in any waterbodies and no discharge permit is being requested, impacts to water quality would primarily occur from increased sediment loads being introduced into the stream from construction activities (short term) and from increased erosion due to vegetation loss and new access roads (long term). Analysis of these impacts was conducted using the USFS WEPP model to estimate increased total suspended solids (TSS) concentrations. The WEPP model does not account for the installation of best management practices (BMPs) such as silt fence and straw bales therefore it represents the worst case scenario of 100% failure of required erosion and sedimentation controls. The WEPP model indicated minimal short term and long term increases in TSS for some tributaries and undetectable increases in TSS in the Delaware River. The model did not detect differences between the action alternatives. The likelihood of 100% failure of erosion and sedimentation controls is remote so it is unlikely that impacts to surface water quality would be detectable. Therefore, the topic of surface water and water quality is not carried forward in this EIS.

Groundwater

An aquifer is a geologic formation that yields water. The principal sources of groundwater (water beneath surface of the ground) in the Delaware River Basin are unconsolidated sand and gravel aquifers and fractured, consolidated bedrock aquifers (Sloto and Buxton 2006, 2). Unconsolidated aquifer systems are found underlying both valley and upland areas of DEWA, MDSR, and APPA and are generally composed of glacial materials such as coarse-grained sand and gravel with mixtures of clay and silts (Sloto and Buxton 2006, 2).

Due to the presence of limestone there is an increased potential of groundwater contamination during drilling activities; this is similar across all action alternatives. Impacts to groundwater from drilling activities are addressed and analyzed under the wetlands resource topic. Therefore, the topic of groundwater is not carried forward in this EIS.

Aquatic Resources

Aquatic resources include fish and aquatic macroinvertebrates. Most of the adverse impacts on aquatic resources are due to a measurable change in the water quality due to stream crossings and runoff; the loss of vegetation, which would alter habitat and food availability; the opening of tree canopies, which could also lead to changes in water temperature that could affect stream health and biodiversity; and the potential for drilling in limestone, which could alter flow or water availability. These issues are addressed and analyzed under the wildlife and wetlands resource topics. Therefore, the topic of aquatic resources is not carried forward in this EIS.

Tribal Resources (Including Sacred Sites and Indian Trust Resources)

The relevant Tribal Historic Preservation Officers have been consulted regarding tribal resource impacts and no tribes have identified tribal resources within the project area. Tribes have expressed interest and concern regarding potential impacts to existing archeological resources and cultural landscapes. Since no tribal resources were identified during consultation, a separate analysis is not necessary. The Delaware Nation has stated that they prefer routing the transmission line around the park.

Most tribes have expressed an interest in continued consultation on the project, although only a subset have provided input in person, on the phone, or in writing. The NPS conducted an on-site consultation at DEWA with the Delaware Nation, the Delaware Tribe of Indians, the Stockbridge-Munsee Community, the Eastern Shawnee Tribe of Oklahoma, and the Absentee Shawnee Tribe in January 2012 prior to the announcement of the NPS's preferred alternative. At that consultation, tribal representatives expressed serious concerns about impacts to archeological sites and cultural landscapes. After the consultation, the Stockbridge-Munsee Community, the Delaware Tribe, and the Eastern Shawnee Tribe of Oklahoma provided written Council Resolutions or tribal comments requesting that the NPS choose the "No-action Alternative." The parks have conducted additional Tribal consultations on the agency's preferred alternative (alternative 2) and are incorporating Tribal comments into mitigation measures. Therefore, this resource topic is eliminated from further analysis.

MUSEUM COLLECTIONS

Natural and cultural studies related to this EIS would generate collections of discipline-based museum objects (biological, physical, geological, and archeological). The NPS is required to curate these collections in perpetuity. An extensive administrative record (hard copy and digital) would be catalogued and archived in the parks for any resources discovered and evaluated. Cataloging and curating archives can cost between $1 and $10 per object. Archeological objects can cost between $2 and $10 per object to catalog and curate. These scientific records would be archived permanently. The proposed project would require the expansion of the parks' archival and museum collection operations to permanently maintain all museum collections (objects and archives). Mitigation measures for any permitted action alternative will include funds to catalog and curate museum collections resulting from the project. Therefore, this impact topic is eliminated from further analysis.

ENERGY RESOURCES AND CONSERVATION POTENTIAL

This topic involves assessing NPS energy requirements and the potential for energy conservation associated with the various alternatives, but it is most relevant to facility construction projects. The construction of the S-R Line would not affect any NPS facilities. Because there would be monitoring of the mitigation required under this EIS, some increased energy may be needed; however, there would only be negligible impacts on energy resources, because NPS fuel consumption would not change to a large degree as a result of the construction or because of the maintenance of resources impacted by this action. The parks would continue to operate under the wise energy–use guidelines and requirements stated in the NPS *Management Policies 2006* (NPS 2006a); Executive Order 13123, "Greening the Government through Effective Energy Management"; Executive Order 13031, "Federal Alternative Fueled Vehicle Leadership"; Executive Order 13149, "Greening the Government through Federal Fleet and Transportation Efficiency;" and the 1993 NPS *Guiding Principles of Sustainable Design* (NPS 1993a). Therefore, this resource topic is eliminated from further analysis.

ENVIRONMENTAL JUSTICE

Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," requires federal agencies to make achieving environmental justice part of their mission. Specifically, each agency must identify and address "disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations."

A compilation of statistics on population composition, median income, and poverty level has determined that no minority or low-income populations exist in the counties and townships in the study area (U.S. Census Bureau 2000a; 2000b). Therefore, no impacts would occur on minority or low-income

populations in the study area and any impacts on these groups outside the study area would not be disproportionate for any one group of people. Therefore, this topic is eliminated from further consideration. The lost use and other impacts would affect all citizens equally.

GATEWAY COMMUNITIES

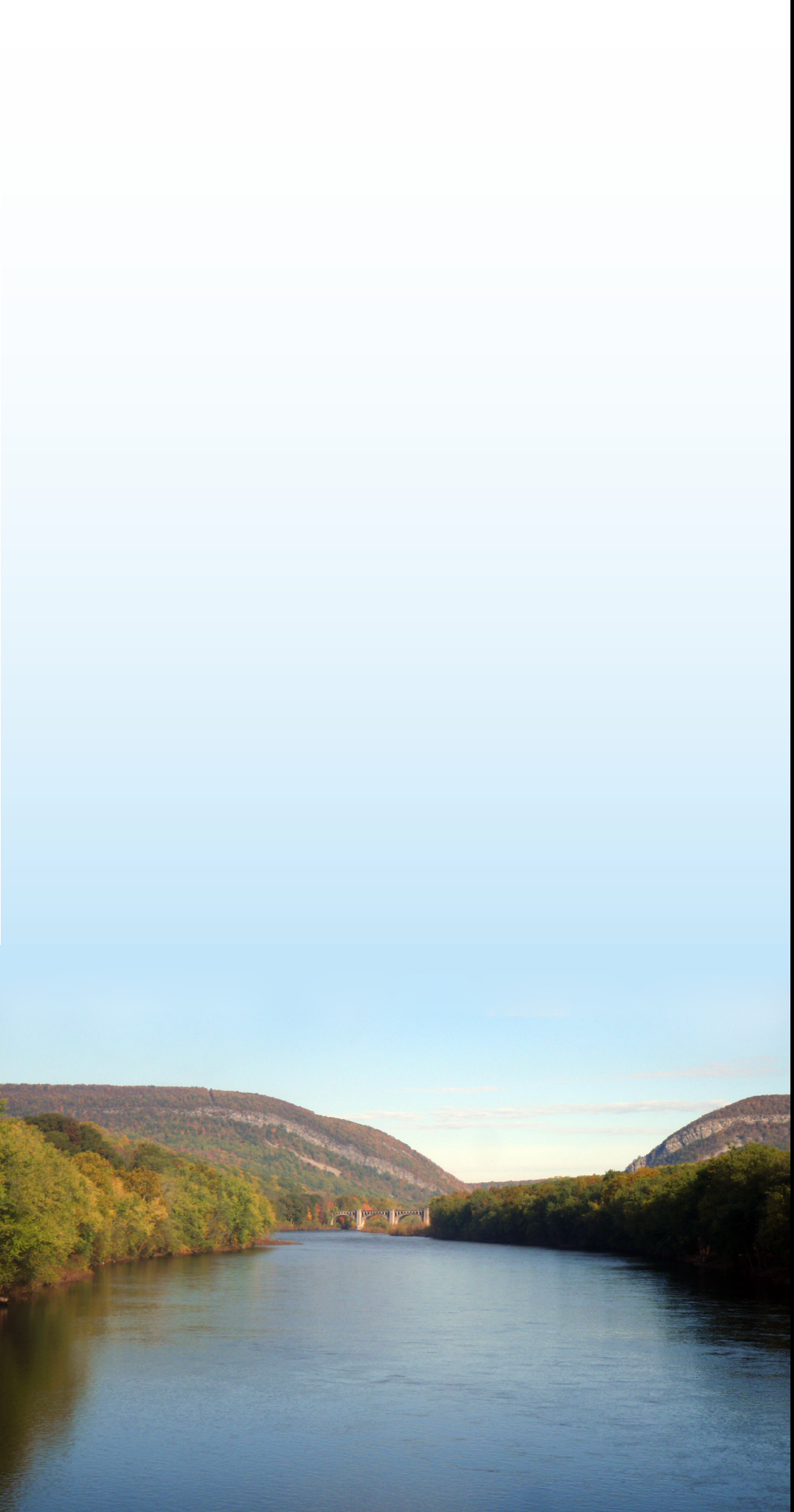
According to the NPS *Management Policies 2006* (2006a, 158), a gateway community is a community close to a unit of the national park system whose residents and elected officials are often affected by the decisions made in the course of managing the park, and whose decisions may affect the resources of the park. Gateway communities usually offer food, lodging, and other services to park visitors. They also provide opportunities for employee housing and a convenient location to purchase goods and services essential to park administration (NPS 2006a, 158).

To a limited degree, all action alternatives could have a small, temporary beneficial impact on local economies during construction due to construction employment (it is expected that workers specifically skilled in transmission line construction would be brought in from outside the area). Although not all communities would be affected under each alternative, where adverse impacts are expected, they would be similar and would minimally affect the quality of the human environment. Because similar impacts are expected under each alternative, they would not meaningfully contribute to decision making and the selection of a preferred alternative. Because impacts on gateway communities are not expected to affect decision making for this EIS, this topic was dismissed from further analysis.

LAND USE

The proposed alternatives have the potential to affect how land within park boundaries is used. NPS *Management Policies 2006* states, “appropriate land protection methods must be applied to protect park resources and values from incompatible land use” (NPS 2006a, 29). Similarly, section 3.1 of Director’s Order 25: *Land Protection* says, “The National Park Service will use all available authorities to protect lands and resources within NPS units” (NPS 2001b).

Though the applicant's project may impact certain values that land use plans seek to preserve (such as vegetation), it would not greatly change existing land use itself, nor land use plans. Therefore, the impact topic of Land Use has been dismissed from further detailed analysis.



Chapter 2
Alternatives

CHAPTER 2: ALTERNATIVES

INTRODUCTION

This chapter describes the proposed action and alternatives to it. Included is an overview of the transmission system, followed by a description of the alternatives development process and of the elements common to all alternatives. The remainder of the chapter addresses the following: details of the alternatives; alternatives that were eliminated from further study; impacts of the alternatives; the National Park Service (NPS)-preferred alternative; the environmentally preferable alternative; and consistency with sections 101(B) and 102(1) of the National Environmental Policy Act (NEPA).

NEPA requires that federal agencies explore a range of reasonable alternatives and provide an analysis of impacts the alternatives could have on the natural and human environment. "Chapter 4 Environmental Consequences," presents the results of the impact analyses.

The National Environmental Policy Act requires that federal agencies explore a range of reasonable alternatives and provide an analysis of impacts the alternatives could have on the natural and human environment.

Six alternatives are analyzed in this environmental impact statement (EIS). The alternatives under consideration include a no-action alternative, as prescribed by 40 CFR § 1502.14. Under the no-action alternative in this EIS, the Bushkill-to-Kittatinny Line (B-K Line) within the parks would remain in place without expansion or replacement. Five action alternatives for the Susquehanna-to-Roseland Line (S-R Line) were developed based on input and scoping activities conducted with the NPS, the applicant, stakeholders, and the public. The action alternatives were subsequently evaluated and determined to be technically feasible. Detailed design has been completed for alternative 2, the applicant's proposed route, and alternative 2b, the applicant's alternate proposal. A comparable level of planning has not been carried out for alternatives 3 through 5; however, these alternatives have been designed at a conceptual level, which is sufficient for analyzing impacts.

ALTERNATIVES OVERVIEW

Figure 2 presents the alternative routes from the Susquehanna Substation in Pennsylvania to the Roseland Substation in New Jersey. Alternatives 1, 2, and 2b follow the same alignment from Susquehanna to Roseland. Alternative 1 is identified as the no-action alternative. Alternative 2, the applicant's proposed route, is an expansion of the current transmission line with the addition of a second 500-kV line. Alternative 2b is the applicant's alternative route and is a modification of alternative 2. Alternatives 3, 4, and 5 follow routes different than the applicant's two proposed alternatives.

All of the action alternatives described in this section have alignments that would cross at least two units of the national park system and would therefore require NPS permits. Due to the geography of the Appalachian National Scenic Trail (APPA), no action alternative is possible that avoids all park units – any reasonable plan for a transmission line linking the Susquehanna and Roseland substations must cross the Appalachian Trail. The NPS cannot require the applicant to follow a certain route outside the boundaries of park lands; therefore, the portion of the route outside park lands is not discussed in detail in this chapter. Although the applicant could select any route outside of park lands, the NPS identified potential alternatives that could connect the Susquehanna and Roseland substations. These are described in detail in appendix C. The routes described in appendix C were developed by the NPS simply to determine whether construction on a route was possible and does not constitute an attempt to determine

the actual location in areas outside NPS jurisdiction. The NPS is not suggesting or endorsing the route of any alternative beyond its actual crossing of parklands.

The alignments for all alternatives would follow existing transmission or distribution line rights of way across NPS lands.

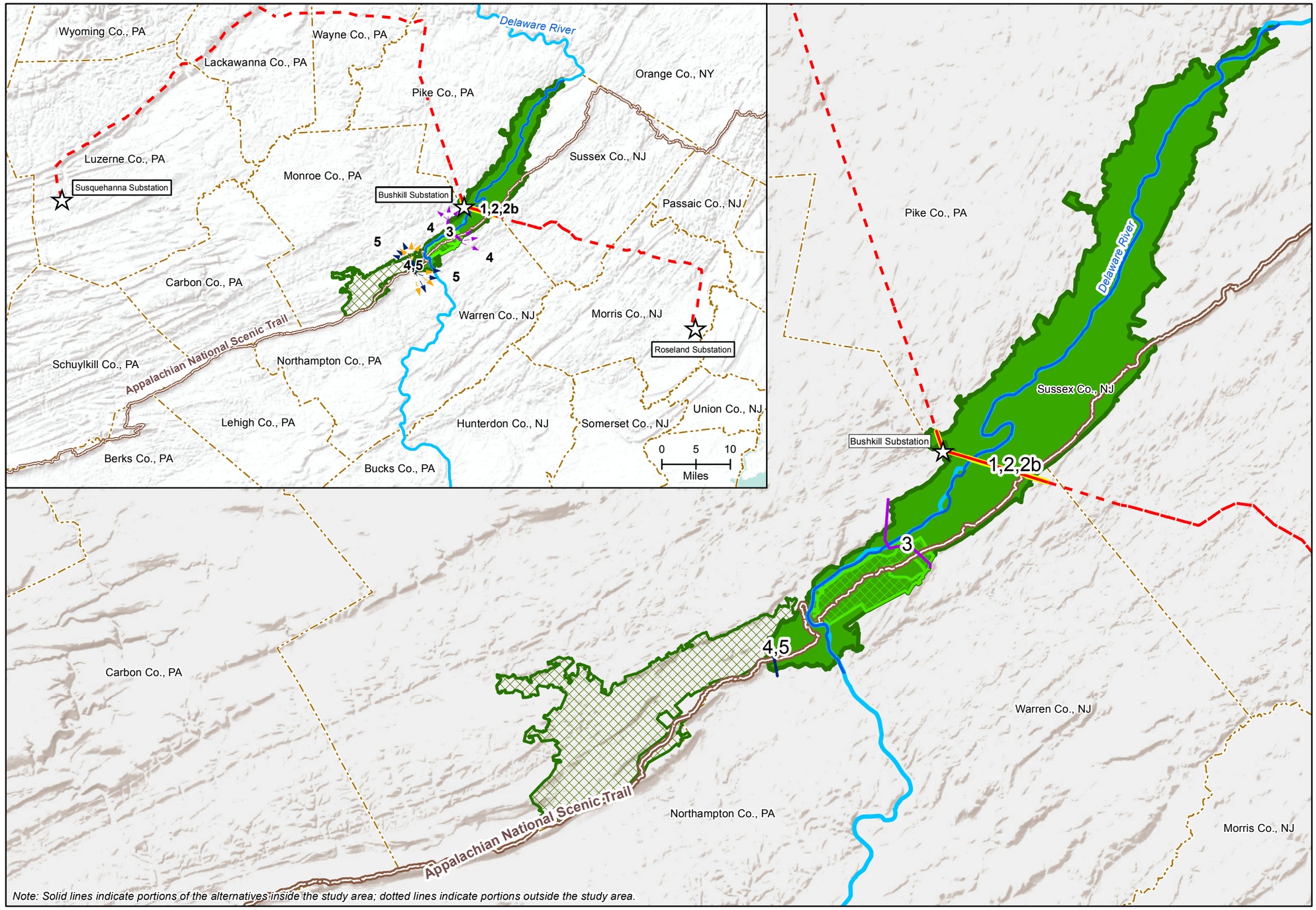
The alignments for all alternatives would follow existing transmission or distribution line right-of-ways (ROWs) across NPS lands. Alternatives 1, 2, 2b, and 3 would cross all three parks; alternatives 4 and 5 would cross Delaware Water Gap National Recreation Area (DEWA) and APPA but not Middle Delaware National Scenic and Recreational River (MDSR). Alternatives 1, 2, and 2b would use the B-K Line alignment across the parks, which would involve crossing approximately 4.3 miles of NPS land through DEWA, while crossing MDSR and APPA. Alternative 3 would traverse a total of 5.4 miles of NPS lands. This alternative would follow the same alignment as alternatives 1, 2, and 2b from the DEWA boundary eastward to the Bushkill Substation, crossing 0.6 mile of NPS lands before leaving NPS lands. The alternative would then reenter the parks and cross a 3.0-mile section, crossing MDSR and APPA within DEWA before again exiting NPS lands. Alternative 3 would then travel along the eastern boundary of DEWA for approximately 1.8 miles, approximately 0.2 mile east of and parallel to APPA. The alignments for alternatives 4 and 5 across the parks are similar to each other, moving through approximately 0.9 mile of NPS lands. Like alternative 3, the alternative 4 alignment would cross the 0.6-mile section of DEWA west of the Bushkill Substation.

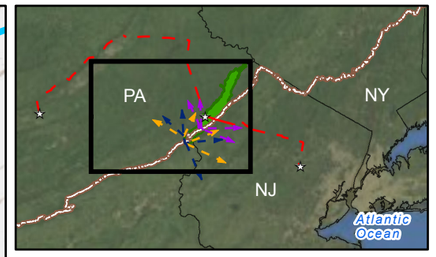
TRANSMISSION SYSTEM OVERVIEW

For the proposed project, power plants would supply electricity, which would flow through transformers and transmission lines to the Susquehanna Substation. From the Susquehanna Substation, electricity would flow through the proposed S-R Line to the Bushkill and Roseland substations to distribution lines, and then finally through the electrical grid to the consumer. Power plants generate three-phase alternating current (AC), which is transmitted through three wires, or conductors. Conductors are usually about an inch in diameter. There is also a smaller shield wire at the top of transmission structures, which is designed to protect the power line from lightning. The proposed double-circuited transmission line structures would carry two transmission lines, each with three conductors (PSC of WI 2010).

The electrical grid consists of two separate infrastructures: the high-voltage transmission system and the lower-voltage distribution system. High-voltage transmission lines, such as those proposed by the applicant, minimize electrical losses and are therefore used to carry electricity hundreds of miles. The Susquehanna, Bushkill, and Roseland substations act as interfaces between the project's transmission lines and the distribution system. The substations use transformers to step down voltages from the higher transmission-system voltages to the lower distribution-system voltages. Transformers located along distribution lines further step down the voltages for household use.

In areas where single-poled structures are preferred, weak or wet soils may require concrete foundations for support. Where a transmission line must change direction, large angle structures or guy wires may be required. Poles with guy wires impact a much larger area because they require foundations where the guy wires are anchored to the ground in addition to the concrete foundation for the structure. Angle structures without guy wires are made of steel and are usually 5 to 6 feet in diameter, more than double the diameter of other steel poles. These structures have a large concrete base, which may be buried 10 or more feet below the ground surface. The diameter of the pole and the depth to which the base is buried depend on the condition of the soils and the voltage of the line (PSC of WI 2010).





Legend

- Substation
- Alternative 1,2
- Alternative 2b
- Alternative 3
- Alternative 4
- Alternative 5
- Appalachian National Scenic Trail
- Middle Delaware National Scenic and Recreational River
- Delaware River
- Delaware Water Gap National Recreation Area
- Worthington State Forest
- CVNWR Boundary
- County Line

Note: Designated boundary of CVNWR is depicted, not all property is owned within the boundary

0 4 8
Miles

Note: Solid lines indicate portions of the alternatives inside the study area; dotted lines indicate portions outside the study area.

Susquehanna to Roseland
Transmission Line Proposal
and
Right-of-Way Request EIS

Figure 2
Alternatives within the Study Area

Source: ESRI Streetmap 2006, Penn State 2010, ESRI ArcGISonline Map Service 2010, PennDOT 2011, NJOIT 2010, USGS 2006, NJ DEP 2008,

Projection: NAD 83 UTM Zone 18N
Date: July 2012

ALTERNATIVES DEVELOPMENT PROCESS

METHODOLOGIES

The NPS-generated alternatives considered in this EIS (alternatives 3 through 5) were identified based on the resource goals and objectives described in chapter 1, results of the alternatives workshops conducted with NPS staff, applicant representatives, and public comments received during both the scoping period and alternatives workshops comment period. Using the criteria established, such as the design considerations described below and described publicly by the applicant, transmission line engineers under contract to the NPS developed alternatives 3 through 5 primarily by identifying existing linear corridors, via aerial satellite imagery, that could support the proposed 500-kV transmission lines. Existing corridors included electrical transmission lines, an underground pipeline, highways, and a railway.

The transmission engineers, as contracted by the NPS, first identified possible alternate routes through the parks, such as existing transmission lines, where the S-R Line could be co-aligned with the existing line. No new crossings through the parks were identified because new crossings are not compatible with NPS mandates; the NPS would only grant permits for one crossing by the applicant. After exhausting possibilities within DEWA, options were sought that would cross APPA outside the boundaries of DEWA. In all cases, options that would cross APPA at a perpendicular angle were preferred to those that paralleled the trail, to minimize impacts on trail visitors.

Potential routes were then refined by applying clearance distances defined by the National Electric Safety Code (NESC) to avoid sensitive areas, including residences, schools, businesses, and other protected resources, such as public lands. Adopted by law by the majority of states and public service commissions across the United States, NESC is a performance code that defines safeguards from hazards arising from the installation, operation, or maintenance of conductors and equipment in electrical supply stations and overhead and underground electrical supply and communication lines. NESC includes work rules for the construction, maintenance, and operation of electrical supply and communication lines and equipment. The standard is applicable to the systems and equipment operated by utilities; therefore, NESC guidelines were used to minimize impacts of new alternatives on landowners outside NPS boundaries. As a result, transmission engineers identified subalternatives for each alternative, which provided secondary options to a primary route.

These efforts resulted in identification of primary alternatives, each of which included multiple subalternatives. The alternatives and subalternatives were extensively discussed and reviewed during the alternatives workshop conducted on site during May 2010 and are described in more detail below. During this time, transmission engineers visited all the proposed alternative sites where the potential routes would cross DEWA, MDSR, and APPA, photographed the crossing locations, and noted the condition of the existing corridors.

Once the alternatives were developed, visual split locations (VSLs) were determined by the parks. Outside the boundaries of the parks, the applicant exercises its own discretion to determine the route of the line, independent of any NPS permit or other action. The geographical point outside the parks at which it becomes physically possible for the applicant to route the line as it sees fit is called a VSL point, a term created by NPS to describe this point in this EIS. For most resources, the study area for an alternative is defined as the area between the VSLs for that alternative. However, it is important to note that for some resources, the size of the study area may vary depending on the resource being discussed. For example, the study area that would be considered for landscape connectivity or visual impacts of an alternative may not be the same area that would be considered for another resource, such as geologic resources or vegetation, due to the area impacted for that resource.

The determination of the VSLs is important because while NPS can require the applicant to follow a specific route inside the VSLs, the NPS cannot require the applicant to follow a certain route beyond these points. Therefore the applicant and state authorities would ultimately be responsible for the line routing from the Susquehanna Substation to the Roseland Substation, excluding where it crosses DEWA, MDSR, and APPA inside the VSLs. The NPS looked at corridors outside the VSLs only to determine whether a route could be found from the line's endpoints (Susquehanna and Roseland substations) to each crossing. This should not be interpreted as endorsing or recommending any route outside the park boundaries or being able to determine whether this possible route would be the one used by the applicant.

Alternatives 3 and 4 reenter and cross NPS lands outside the VSLs (figure 2). Secondary VSLs were assigned to these sections and they are included in the study area. Thus, all impacts on resources within the parks will be fully analyzed.

CRITERIA

The following route selection criteria were used to select and analyze potential routes:

- Minimize crossing of designated natural resource lands such as state forests, national and state parks, wildlife management areas, designated gamelands, wildlife areas, and conservation areas.
- Avoid new crossings of large lakes.
- Minimize impacts on the natural and human environment.
- Maximize the use or paralleling of existing, cleared power line ROWs.
- When not following existing ROWs, maximize the distances from residences, schools, cemeteries, historical resources, recreation sites, and other important cultural sites.
- Minimize the removal of existing residences, barns, garages, and other structures.
- Minimize route length, circuitry, and cost.

ALTERNATIVES WORKSHOPS

NPS staff conducted an internal alternatives workshop May 4–7, 2010, to discuss the feasibility of potential alternatives. All alternatives proposed by the applicant and the NPS were evaluated based on the potential impacts on resources and residents. The alternatives dismissed as a result of the internal alternatives workshop are discussed in detail in the "Alternatives Eliminated from Further Study" section of this chapter.

Seven alternatives, including the no-action alternative, were retained and presented to the public at the public alternatives meetings August 17–19, 2010. Comments received at the meetings and during the public comment period were compiled in a comment analysis report, which was made available to the public in November 2010 and can be found on the NPS Planning, Environment, and Public Comment (PEPC) website (NPS 2010f [http://parkplanning.nps.gov/]). An additional internal meeting was held on November 5, 2010, to discuss the comments. The NPS concluded that no comments had been submitted that would cause any of the action alternatives to be eliminated or new alternatives to be added; therefore, the no-action alternative (alternative 1) and action alternatives 2 through 7 were retained for analysis in this EIS. During analysis of the alternatives in preparing this EIS, the NPS determined that action alternatives 6 and 7 would be dismissed based on the criteria previously listed. The rationale for dismissal of these two alternatives is presented in the "Alternatives Eliminated from Further Study" section of this chapter.

DEVELOPMENT OF THE APPLICANT'S ALTERNATE PROPOSAL

During the development of alternatives, the applicant examined the possibility of constructing the proposed line within their existing ROW for the B-K Line (alternative 2b), a variant of the applicant's proposal. The NPS conducted a preliminary examination of the applicant's property rights and determined that the easements for the existing ROW range from 100 feet to 380 feet. The NPS expressed concern about the feasibility of constructing the proposed line within a 100-foot ROW. The 100-foot-wide portion of the ROW is in Pennsylvania and extends approximately 0.8 mile.

Discussions between the applicant and the NPS over an 8-month period resulted in a difference of opinion on this issue. During public review of the proposed alternatives, the applicant formally requested that the NPS include alternative 2b in its analysis. In a letter dated August 26, 2010, the applicant stated that the proposed double 500-kV transmission line could be safely constructed within their existing ROW. Constructing within the existing easement rights would eliminate the applicant's need for a ROW permit. The NPS agreed to add the analysis of alternative 2b, the applicant's alternate proposal, to the EIS. Correspondence regarding the development of alternative 2b is presented in appendix D.

DESCRIPTION OF THE ALTERNATIVES

This section describes the portions of the alternatives within the study area. Table 2 presents the general elements of the alternatives, and table 3 presents the construction-specific elements of the alternatives. Outside the study area, the NPS cannot require the applicant to follow a certain route; therefore, that portion of the route is not described in detail in this chapter. The alternatives, as developed for this EIS, have been created based on the methodologies and criteria described previously. Possible scenarios for routes for the alternatives for those segments outside NPS jurisdiction are described in appendix C. They are not prescribed or endorsed by the NPS. Their only purpose is to determine the feasibility of the crossings being analyzed in this EIS.

ALTERNATIVE 1: NO ACTION

Under the no-action alternative, the NPS would deny the special use and construction permits to expand the B-K Line to a new double-circuit line through NPS lands.

Under the no-action alternative, the NPS would deny the applications for ROW and construction permits to expand the B-K Line to a new double-circuit line through NPS lands. The existing B-K Line traverses approximately 4.3 miles of DEWA. The line initiates at the Susquehanna Substation and enters DEWA in Pennsylvania approximately 0.25 mile east of Big Bushkill Creek. The line then exits the park, connects to the Bushkill Substation, travels through developed areas, including Fernwood Golf Course, and reenters DEWA south of the South Zone Ranger Station and north of DEWA Headquarters, crossing MDSR just north of Depew Island. The line continues southeast past the Watergate Recreation Site and across APPA to the eastern DEWA boundary. There are 22 existing transmission towers located within DEWA boundaries for the existing B-K Line, and there are no existing access roads to the ROW.

This alternative assumes that the existing line within the parks would remain in place without expansion or replacement. In essence, it assumes that current conditions on the ground will continue indefinitely into the future. However, the applicant could seek to expand or replace the existing utility lines within the existing easements through the parks. There are no proposals to do so at this time.

Subject to the foregoing qualification, however, the no-action alternative assumes the following:

- No additional ROW would be granted to the applicant.
- No additional transmission lines or increased voltage would be added.
- No new construction activity would take place; therefore, activities would only include operation and maintenance of the existing line.
- The existing towers would remain in place.

This action would have no effect on the existing transmission line outside NPS property. Though future construction could potentially occur within the existing ROW, for the purposes of the analysis, this alternative assumes that current conditions continue into the future and that no further construction occurs beyond the existing transmission line.

ELEMENTS COMMON TO ALL ACTION ALTERNATIVES

The application is for replacement of the B-K Line with a new line, initially energized at 230 kV but built to carry 500 kV, co-located with a new 500-kV line connecting the Susquehanna and Roseland substations (PPL and PSE&G 2008). Action alternatives 2 through 5 have many common elements related to the construction of the S-R Line. All alternatives would include a double-circuit 500-kV transmission line (consisting of new towers and conductors) and associated telecommunications infrastructure. Two static lightning and communications fiber lines would be installed on top of the structures; these lines, respectively, would protect the transmission lines from electrical interruptions and would serve as a communication link between existing substations. This telecommunications infrastructure would not be highly visible, and would not include cell towers. Telecommunications infrastructure would only be used for electrical transmission purposes and would not be sold to a third party.

The application is for replacement of the B-K Line with a new line, initially energized at 230 kV but built to carry 500 kV, co-located with a new 500-kV line connecting the Susquehanna and Roseland substations (PPL and PSE&G 2008).

Each alternative would be built in accordance with the relevant codes (e.g., NESC Uniform Building Code). In addition, all alternatives would comply with the Avian Power Line Interaction Committee (APLIC) *Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006* (APLIC 2006) or subsequent updates. The APLIC standards are described in the "Mitigation and Compensation Measures" section later in this chapter.

Removal and Disposal of Existing Structures

Removal of the B-K Line under alternatives 3, 4, and 5 is a mitigation measure proposed by the NPS. If one of these alternatives were chosen, the NPS would be granting construction and ROW permits to the applicant. Because the NPS would not allow two crossings for the applicant's transmission lines, the NPS would require that the applicant surrender the rights to the existing ROW between the Bushkill Substation and the eastern boundary of DEWA. The NPS would permit the relocation of the B-K Line to a replacement setting co-located with the S-R Line within areas under NPS jurisdiction. Additionally, the NPS would develop one consistent and uniform deeded ROW for the applicant at the crossing selected.

TABLE 2: ELEMENTS OF THE ALTERNATIVES

Alternative Element	Alternative 1	Alternative 2	Alternative 2b	Alternative 3	Alternative 4	Alternative 5
Route description inside the study area	The NPS would deny the special use and construction permits to expand the B-K Line and construct a new double 500-kV line through NPS lands. The alternative assumes the following: • No additional ROW would be granted to applicant. • No additional lines or increased voltage would be added. • No new construction activity would take place; therefore, there would not be any construction activities or tree/vegetation removal, only maintenance of existing line. • The existing towers would remain in place. • The ROW would remain a noncritical element of the electrical transmission grid.	The alternative 2 alignment would cross a total of 4.3 miles of NPS lands. The route would enter DEWA from Pennsylvania approximately 0.25 mile east of Big Bushkill Creek. The alignment would exit the park, travel through a developed area including Fernwood Golf Course, and reenter DEWA south of the South Zone Ranger Station and north of DEWA Headquarters, crossing MDSR just north of Depew Island. The route would continue southeast past the Watergate Recreation Site and across APPA to the eastern DEWA boundary.	The alignment is the same as alternative 2 with the exception of two additional towers in the study area to carry the line through a 100-ft ROW section.	The alternative 3 alignment would cross a total of 5.4 miles of NPS lands. In Pennsylvania, the primary VSL is located in Monroe County outside DEWA boundaries. On the west side of the MDSR, the route would cross River Road and the McDade Trail about 1.0 mile south of the Smithfield Beach Picnic Area and 0.75 mile north of the Hialeah Picnic Area. The route would cross approximately 1.7 miles of Worthington State Forest; the alignment would perpendicularly cross APPA within Worthington State Forest and MDSR within DEWA. The alternative 3 alignment would also cross 0.6 mile of the park west of US Route 209 along the B-K Line ROW from the Bushkill Substation to the Susquehanna Substation. The alignment would parallel APPA for approximately 1.8 miles in New Jersey.	The alternative 4 alignment would cross a total of 1.5 miles of NPS lands. Inside the primary VSLs, upon entering DEWA, the alternative 4 alignment would cross about 0.9 mile of DEWA land near its southern extent, roughly following the DEWA boundary, and would perpendicularly cross APPA near Totts Gap Road. The alternative 4 alignment would also cross 0.6 mile of the park west of US Route 209 along the B-K Line ROW from the Bushkill Substation to the Susquehanna Substation. This alignment would not cross MDSR.	The alternative 5 alignment would cross a total of 0.9 mile of NPS lands. Inside the primary VSLs, upon entering DEWA, the alternative 5 alignment would cross about 0.9 mile of DEWA land near its southern extent, roughly following the DEWA boundary, and would perpendicularly cross APPA near Totts Gap Road. This alignment would not cross MDSR.
Total ROW expansion	None	50–200 feet	None	50–200 feet	100–200 feet	100–200 feet
New crossing at APPA?	No	No	No	No	No	No
New crossing at MDSR?	No	No	No	No	No	No
Total conductor capacity	230 kV	2 new 500 kV	2 new 500 kV	Existing plus 2 new 500 kV	Existing plus 2 new 500 kV	Existing plus 2 new 500 kV
Removal of B-K Line from the Bushkill Substation to the eastern boundary of DEWA	No	No, but existing infrastructure would in fact be removed and replaced by the new proposed double 500-kV towers	No, but existing infrastructure would in fact be removed and replaced by the new proposed double 500-kV towers	Yes	Yes	Yes
Construction schedule	N/A	approximately 8 months	approximately 8 months	<8 months	<8 months	<8 months
Construction cost	N/A	$2.17 billion	$2.17 billion	$2.22 billion	$2.36 billion	$1.42 billion
Additional staffing needs for the NPS	Same as current	2–3 new DEWA/MDSR staff members	2–3 new DEWA/MDSR staff members	2–3 new DEWA/MDSR staff members	1 new DEWA/MDSR staff member	1 new DEWA/MDSR staff member

N/A = not applicable.

TABLE 3: DESCRIPTION AND NUMBERS OF CONSTRUCTION ELEMENTS OF THE ALTERNATIVES

Construction Element	Description	Alternative 1	Alternative 2	Alternative 2b	Alternative 3	Alternative 4	Alternative 5
Total miles[a]	N/A	147 miles	147 miles	147 miles	157 miles	162 miles	110 miles
Miles within the study area	N/A	5.6 miles, 4.3 miles of which would be on NPS lands	5.6 miles, 4.3 miles of which would be on NPS lands	5.6 miles, 4.3 miles of which would be on NPS lands	6.9 miles, 5.4 miles of which would be on NPS lands	2.3 miles, 1.5 miles of which would be on NPS lands	1.7 miles, 0.9 mile of which would be on NPS lands
Numbers of towers and tower foundations inside the study area	**Typically, the foundation depth will range between 15 and 30 feet with a diameter of 6 to 9 feet.** *6 new towers/tower foundations per mile.*	N/A	26	28	43[d]	16	10
Crane pads inside the study area	**Crane pads would be 100 feet × 100 feet, and would be used to set up a crane to erect the structures.** *Crane pads would be required at each tower location.*	N/A	23	25	43	16	10
Wire pulls inside the study area[b]	*Wire pulling locations would be 200 feet × 200 feet and placed approximately every mile along the ROW.*	N/A	5–6	5–6	7	2–3	1–2
Pulling and splicing sites inside the study area	*On average, pulling and splicing equipment setups require an area of 400 feet × 600 feet outside the ROW where angles occur; two sites are needed per angle.*	N/A	2	2	9	5	5
Staging area for the entire line[a]	**Staging of all equipment and material for work in DEWA would be located on the currently cleared ROW.**[c]	N/A	70 acres	70 acres	50 acres	50 acres	50 acres
Access roads inside the study area	**Access roads would be 20 feet wide during construction and would be reduced to and maintained at 15 feet after construction. The 15-foot-wide access roads would be permanent.**	N/A	Total: 5.3 miles Inside ROW: 3.4 miles Outside ROW: 1.9 miles **Construction phase** Total: 12.8 acres Inside ROW: 8.3 acres Outside ROW: 4.5 acres **Postconstruction phase** Total: 9.6 acres Inside ROW: 6.2 acres Outside ROW: 3.4 acres Time to return to present conditions: 50 years or perhaps never	Total: 5.3 miles Inside ROW: 2.7 miles Outside ROW: 2.6 miles **Construction Phase** Total: 12.8 acres Inside ROW: 6.5 acres Outside ROW: 6.3 acres **Postconstruction Phase** Total: 9.6 acres Inside ROW: 4.9 acres Outside ROW: 4.7 acres Time to return to present conditions: 50 years or perhaps never	Total: 3.5 miles Inside ROW: 2.6 miles Outside ROW: 0.9 mile **Construction phase** Total: 8.5 acres Inside ROW: 6.3 acres Outside ROW: 2.2 acres **Postconstruction phase** Total: 6.4 acres Inside ROW: 4.7 acres Outside ROW: 1.6 acres Time to return to present conditions: 50 years or perhaps never	Total: 1.6 miles Inside ROW: 1.1 miles Outside ROW: 0.5 mile **Construction phase** Total: 3.9 acres Inside ROW: 2.7 acres Outside ROW: 1.2 acres **Postconstruction phase** Total: 2.9 acres Inside ROW: 2.0 acres Outside ROW: 0.9 acre Time to return to present conditions: 50 years or perhaps never	Total: 0.94 mile Inside ROW: 0.78 mile Outside ROW: 0.16 mile **Construction phase** Total: 2.3 acres Inside ROW: 1.9 acres Outside ROW: 0.4 acre **Postconstruction phase** Total: 1.7 acres Inside ROW: 1.4 acres Outside ROW: 0.3 acre Time to return to present conditions: 50 years or perhaps never

Note: Items in **bold** are conditions presented in the applicant's proposed plan (PPL and PSE&G 2008). Items in *italics* are presented in this chapter. These elements were provided where details were absent from the applicant's proposed plan (PPL and PSE&G 2008) and were based on industry standards.

N/A = not applicable.

a. Total mileage and staging areas of the alternatives are used for comparison only. The data presented in this table represent the alternatives as plotted for this EIS. The NPS cannot require the applicant to follow a certain route; therefore, the length of the alternatives cannot be determined.

b. The number of wire pulls was estimated based on the assumption that helicopters would not be used to string the conductor. This presents the most conservative estimate; however, impacts would be reduced if helicopters were used for stringing the conductors.

c. The applicant's proposed plan states that all equipment and materials would be staged within the currently cleared ROW. The NPS does not agree. Where staging areas extend beyond the cleared ROW, the NPS would require the applicant to construct the staging areas outside NPS lands.

d. Although 43 towers are proposed for alternative 3, some of these towers, while in the study area, would not be on NPS land.

Construction of alternatives 2 and 2b and restoration of habitat along the B-K Line for alternatives 3, 4, and 5 would require removal of existing structures in the B-K Line ROW between the Bushkill Substation and the eastern boundary of DEWA. Foundations would remain in place below ground level to avoid additional ground disturbance. Above ground level, foundations would be mechanically chipped and removed and the area would be backfilled, allowing the applicant to revegetate the area.

For alternatives 3, 4, and 5, structures for the power lines that currently exist on each of these routes would be removed to allow the applicant to safely site and construct new lines in the expanded ROW. Existing lines removed prior to construction would be replaced with new lines during construction of the proposed S-R Line. Replacement power lines would be placed on new structures separate from but parallel to the new structures for the S-R Line within the expanded ROW along the alternative alignments.

Removal of existing lines for all action alternatives would require the following:

- **Spur roads**: Existing vegetation would be cleared to permit the construction of spur roads to allow equipment access. Spur roads are temporary construction roads used to access towers; stringing, tensioning, and staging areas; and splicing sites. These spur roads are different than the access roads used for maintenance, which are discussed in the "Project Construction" section in this chapter. Spur roads would be 20 feet wide and would be surfaced with compacted dirt or gravel. The applicant would need lands beyond the ROW for construction of spur roads outside the transmission line ROW. The location of these roads outside the ROW would require NPS approval. The applicant would be responsible for the restoration of these spur roads immediately following the conclusion of removal activities. However, based on the time taken to reach those existing conditions since the creation of DEWA in 1965, return to existing conditions could take more than 50 years or perhaps complete restoration would never occur.
- **Grading activities**: Grading would occur to backfill over the existing tower foundations, which would be left in place after aboveground structure removal, to create a natural cover. Grading would also occur to backfill disturbance caused by the removal of towers, counterpoises, and ground wires. A counterpoise is a conductor or system of conductors arranged beneath the line; located on, above, or (most frequently) below the surface of the earth; and connected to the grounding systems of the towers or poles supporting the transmission lines (Institute of Electrical and Electronics Engineers Standard 100).
- **Crane pads**: Crane pads would be constructed to provide a safe, level pad for large cranes to mobilize, set outriggers, and aid in the removal of transmission line towers. Crane pads must be large enough to safely level and set outriggers for stability; a typical crane pad is 200 feet by 200 feet, placed 60 feet from the centerline of the ROW. The applicant would be responsible for leveling and revegetating the crane pad site after the crane pad is removed.
- **Wire pulling locations**: At wire pulling locations, all grounding, counterpoises, anchors, and associated equipment listed under "Construction Equipment," below, would be removed. Wire pulling locations would be 200 feet by 200 feet and placed approximately every 2.8 miles along the ROW. The applicant would cut the old conductors in short lengths and remove them with minimal damage to the ground. The wire pulling locations would be used for coiling the sections of conductors after they have been cut.
- **Breakaway reels**: Breakaway reels would be used to coil, remove, and store the decommissioned conductors.
- **Steel removal**: Lattice towers would be disassembled at each tower location in sections and placed on a tractor-trailer or hoisted by an air crane and shipped to a staging area for eventual recycling.

- **Conductor disposal**: The conductors would be transported to a material and equipment yard where they would be prepared for recycling.
- **Helicopter use**: Helicopters may be used to remove towers in three to four sections, depending on the size and weight of the towers. Additional permits could be required governing aircraft use.

Recyclable or salvageable items would be processed into roll-off boxes. Salvageable items (i.e., conductor, steel, and hardware) would be received, sorted, baled off site, and then sold on the open market. Items to be recycled include 100% of the steel from lattice steel towers (i.e., towers, nuts, bolts, and washers), conductor wire (i.e., all 4/0 copper, 336 ACSR [aluminum conductor steel reinforced] overhead wire), and hardware (e.g., shackles, clevises, yoke plates, links, and other connectors used to support conductor).

Vegetation Clearing

All action alternatives would require clearing vegetation inside the ROW. Within the ROW, low-impact tree clearing is the preferred method. Low-impact tree clearing involves directional tree felling, both mechanically and by hand. A professionally created harvesting contract would provide specific regulations for clearing, which would aid in protection of cultural resources, wetland and stream areas, and overall residual quality of the site. A professional forester would be hired to oversee the project. Tree-clearing contractors experienced in low-impact tree clearing would be used. Equipment used would include forwarders, feller bunchers, cable and grapple skidders, high-flotation tires, portable bridges, and temporary culverts. Skidding of trees along the ground would be limited to areas with low erosion potential, and a forwarder would be used in sensitive soil conditions. Days of operation would be limited to those days with suitable ground conditions. Additionally, trees would be cut close to the ground, and stumps and root systems would be left in place to provide additional soil stability. A 50-foot buffer would be used near intermittent streams and wetlands and a 100-foot buffer near perennial streams. All vegetation would be removed from access roads and in work areas (wire pulling locations, vegetation disposal areas, and structure erection areas).

Clearing would be selective, and efforts to preserve native or compatible species would be made to the greatest extent possible. Species of trees recognized as being fast-growing species would be cut to ground level. Additionally, trees within the ROW that would violate the wire security zone either would be removed or would be pruned to create additional space for growth until scheduled maintenance. Cleared salable timber would be removed from the ROW and placed in neat piles at an NPS-designated site to be determined before construction. Timber would be the property of the United States. Other timber would be placed in tree-length piles away from preserved compatible vegetation. These piles would not be placed on access roads, streams, or trails, or in areas where piles would be highly visible from an improved road. Interspersed with these timber piles, slash piles would be stacked in flattened mounds on the edge of the ROW. Slash piles would also not be built where highly visible from improved roads or other locations with high visibility. Slash piles would not be placed near tower or pole sites. Cleared vegetation could also be chipped and scattered on the ROW. The NPS would not allow vegetation burning within the boundaries of the parks. Additionally, no vegetation disposal would occur within known or suspected wetland areas, and all timber piles, slash piles, and other cleared vegetation would be hauled away from APPA.

Project Construction

Proposed Transmission Facilities

Each action alternative includes construction of one new double-circuit 500-kV transmission line across NPS lands. The S-R Line would be a three-phase, double-circuit, three-bundled 1594 ACSR facility (each of the three-phase circuits consists of three 1594 ACSR conductors connected together). One circuit would operate at 500 kV, and the second circuit would initially operate at 230 kV, with capacity for future energizing to 500 kV. Construction of the new 500-kV towers, including civil work, steel assembly, and erection, would be completed in four steps, as defined below.

Step 1: Access Road Creation: Where necessary, access roads would be created for access to the ROW. Access roads would initially be 20 feet wide to accommodate large construction vehicles. Following construction, access roads would be narrowed to 15 feet wide and would continue to be used for maintenance and vegetation management for the line. Access roads would be composed of gravel or compacted dirt. The lengths of access roads would range from approximately 0.9 to 5.4 miles, depending on the alternative. Wetlands and water crossings by access roads have been avoided to the extent possible. If additional access or spur roads are required beyond those analyzed in this final EIS, the roads will have to be constructed so as to avoid wetlands and water crossings. Access roads are depicted on alternative maps as appropriate.

The applicant would need additional rights beyond the ROW for construction of access roads outside the transmission line ROW. Locations of these roads outside the ROW would require NPS approval. The applicant would be responsible for the long-term maintenance of access roads and the restoration of spur roads immediately following the conclusion of construction activities until existing conditions are restored. Restoration of spur roads would include removing all gravel, disposing of geotextile fabric, and seeding the area with an NPS-approved conservation seed mix.

Step 2: Creation of Level Pads for Crane Pads: Crane pads would be used for assembly and erection at each new tower location. Crane pad size and placement are discussed in the "Removal and Disposal of Existing Structures" section of this chapter.

Crane pad sites would be graded or cleared to provide a reasonably level pad free of any vegetation that could hinder tower construction. Some tower sites would require grading either to widen the pads from the existing structures or to create new pads, while other sites would be on relatively level areas that would only require some vegetation removal. At locations with steep topography, extensive excavation may be required to create a level pad. The graded pad would be capable of supporting heavy vehicular traffic.

Step 3: Foundation Construction: The types of towers that would be used in the construction of the S-R Line would be determined during planning. New towers would be constructed on a concrete foundation. Foundation dimensions would depend on topography, tower height, span length, and soil properties; however, tower foundations would generally extend below grade for 15 to 30 feet or more, with a diameter of 6 to 9 feet. On average, a typical concrete foundation would extend approximately 3 feet above ground level.

In response to public comment, the NPS has altered the method by which the applicant would be allowed to install tower foundations. The draft EIS stated that foundations would be installed using a combination of blasting and drilling. Because the impacts from blasting are largely unknown, the applicant would be limited to drilling to excavate to the depth needed for the tower foundations. In order to install tower foundations, extensive drilling of overburden soil and underlying rock would occur. A drill rig with a

coring auger would be used to advance a borehole into the ground, followed by periodic removal of the cored materials until the terminal depth is reached. Reinforcement steel and anchor bolts would be installed inside the borehole and the hole would be filled with concrete. Prior to any drilling along the proposed ROW, a drilling work plan will be prepared and submitted to the NPS for review and approval.

At the time of construction, elevations would be established, rebar cages set, spur angles and concrete placed, and survey positioning verified. Concrete samples would be drawn at the time of pour and tested to ensure that specified strengths would be achieved.

Step 4: Steel Work for Tower Construction: Several tractors with 40-foot floats (or open-bed trailers) and an on-site loader would haul and stack bundles of steel at each tower location. A combined erection and torqueing crew with a lattice boom crane would perform the steel work for lattice towers, which would include assembly of leg extensions, body panels, boxed sections, and bridges. During the steel work, the construction crew may opt to install insulators and wire rollers.

The analysis assumes monopole towers would be used except in locations where it is not possible. For dead-end and tangent towers, if monopoles are feasible, they will be used. If monopoles are not feasible for these structures, it may be necessary to use lattice towers. The following specifications would apply to both lattice and tubular steel towers:

- six new tower structures per mile
- 195 feet tall
- 1,200-foot ruling span
- 1,800-foot weight span

The following additional information is specific to tubular steel towers:

- single-, double-, and triple-shafted, tapered tubular core consisting of 10 steel structures hermetically sealed with davit and cross arms
- up to 7 feet in diameter
- steel single-shafted tangent towers
- steel single-shafted dead-end (terminating) towers

Helicopters could be used in the construction of the S-R Line; however, helicopters can only be used for construction of lattice towers, because monopole towers are too heavy. Helicopters are often used for tower installation to eliminate the land disturbance associated with crane pads, structure laydown areas, and damage from heavy truck use. If helicopters were to be used for tower erection, methods would be similar to those detailed in Institute of Electrical and Electronics Engineers Standard 951-1996, *Guide to the Assembly and Erection of Metal Transmission Structures*, section 9, "Helicopter Methods of Construction." Helicopters can also be used to string the conductor; this process is described below.

The operations area of the helicopters would be limited to helicopter staging areas and positions along the ROW that have previously been disturbed for other purposes and are considered safe locations for landing. Support trips may also be required to transport material and workers to the material and equipment staging areas. Staging areas would be located as close as possible to the operation area, and would be sited through a screening process involving the helicopter contractor, private landowners, and land management agencies. The NPS would require that any staging areas that would extend beyond the currently cleared ROW be sited outside the boundaries of the parks. Staging areas are discussed in detail

below. Helicopter fueling would occur at staging areas or at a local airport using the helicopter contractor's fuel truck and would be supervised by the helicopter fuel service provider. The helicopters and fuel truck would remain overnight at a local airport or at a staging area if adequate security is in place. Safety plans meeting all OSHA standards would be required. It is not anticipated that helicopters would be parked overnight on NPS lands. The applicant's proposed plan states that all equipment and materials would be staged within the currently cleared B-K Line ROW (PPL and PSE&G 2008, 11). The NPS has concerns that this would be inadequate, especially where the staging areas would be used by helicopters. If staging areas extend beyond the currently cleared ROW, the NPS would require that the applicant construct these staging areas outside NPS lands. During helicopter operations, public access would be restricted. Temporary river, trail, and road closures, traffic detours, and posted notices and signs would be used to block public access to restricted areas. NPS review and approval of aviation plans would be required.

For the impact analysis of the action alternatives in this EIS, it is assumed that helicopters could be used for conductor stringing but would not be used for tower construction.

Wire Installation

Wire installation includes all activities associated with the installation of conductor wire onto the new towers, such as the installation of primary conductor and ground wire, vibration dampeners, weights, spacers, and suspension and dead-end hardware assemblies. Insulators and wire rollers either would be attached as part of the wire-stringing activity or would be attached during the steel erection process.

Any continuous wire installation process between two selected points along a transmission line is termed a "wire pull." Wire pulling locations would be selected based on availability of dead-end towers at the ends of each pull and on the geometry of the line; locations are affected by inflection points, terrain, and suitability of pulling and splicing equipment setups. Wire pulling locations generally occur every 2.8 miles on flat terrain and every 1.7 miles on mountainous terrain and would be 200 feet by 200 feet. For each wire pull, a puller would be positioned at one end, while a tensioner and wire reel stand truck would be positioned at the other. Specialized support equipment such as skidders and wire crimping equipment would be strategically positioned to support the operations.

Wire-stringing activities would be conducted as described in Institute of Electrical and Electronics Engineers Standard 524-1992, *Guide to the Installation of Overhead Transmission Line Conductors*. A standard wire-stringing plan would include a sequenced program of events, beginning with determination of wire pulls and wire pull equipment setup positions. Advance planning would determine circuit outages, pulling times, and safety protocols required to ensure that safe and quick installation of wire is accomplished.

The following steps describe the proposed wire installation activities:

Step 1: Threading: A helicopter would fly a sock line (a small lightweight cable) from tower to tower, which would pull a pilot line (heavier cable) through all the structures and into the tensioner, which would pull the conductor through.

Step 2: Pulling: The pilot line would be attached to the conductor using a special swivel joint to prevent damage to the wire and to allow the wire to rotate freely, which would prevent complications from twisting as the conductor unwinds from the reel.

Step 3: Clipping In: Conductor clamps would be installed to feed the conductor into the roller properly, completing the wire installation phase.

Step 4: Spacers: Spacers would be used to mitigate the potential for code clearance issues or for conductors to touch or flash over and cause an outage. Spacers would be attached between the bundled conductors of each phase. For this purpose, a lineman would ride a small spacer cart between the wires, periodically stopping to attach the spacers.

Pulling and Splicing Sites

New pulling and splicing sites would be needed for each action alternative. For stringing equipment that cannot be positioned at either side of a dead-end transmission tower, anchoring and dead-end hardware would be temporarily installed to sag conductor wire to the correct tension. The pulling and splicing setup locations would be sited where existing spur roads or level pads are available, either near or between the existing towers. A few locations may require minor grading and vegetation removal. The setup locations would be used to remove temporary pulling splices and install permanent splices once the conductor is strung through the rollers located on each tower. This step is necessary because the permanent splices that join the conductor together cannot travel through the rollers. These areas would be restored following construction.

A typical pulling and splicing location would be 400 feet by 600 feet and would be located and positioned for inline cable pulling.

Construction Staging

Construction of transmission facilities would also consist of the establishment of staging yards for construction materials and equipment, completion of any roadwork, and removal of the B-K Line that currently crosses the parks. Staging yards for materials and equipment would be approximately 3 to 4 acres each. Efforts would be made to locate staging areas on previously disturbed property, abandoned excavations, or abandoned parking areas. As previously stated, the NPS would require that any staging areas extending beyond the currently cleared ROW be sited outside the boundaries of the parks. Exact locations would be based on biological and cultural resource studies.

Materials and equipment that would be staged include steel bundles, spur angles, palletized bolts, rebar, insulators and hardware, heavy equipment, light trucks, construction trailers, portable sanitation facilities, and trash and recycling bins. Material that would be removed from the B-K Line that crosses the parks (e.g., conductor, steel, concrete, and other debris) would also be temporarily stored at these sites or other similar sites depending on the proximity of the chosen alternative alignment to the staging sites. Staging areas would also be used for helicopters and helicopter fuel trucks, as previously discussed. The staging areas may include a construction trailer and an access road to the trailer.

Preparation of the staging areas would include the application of road base, installation of perimeter fencing, and implementation of stormwater pollution prevention plan conditions. Following construction, disturbed areas would be restored to predisturbance conditions.

Public and Worker Safety

To ensure public and worker safety, safety devices such as traveling grounds, guard structures, and radio-equipped roving public-safety vehicles and linemen would be in place before the initiation of wire-stringing activities. Guard poles or guard structures would be installed at all transportation, flood control, and utility crossings, and might be installed in the parks or near residences. Guard structures are temporary installations designed to stop the travel of the conductor should it drop below a conventional stringing height. Typical guard structures are standard wood poles, 60 to 80 feet tall; in some cases, structures may consist of specially equipped boom-type trucks with heavy outriggers. Guard poles would

be installed only where needed, such as near roads, residences, other utility crossings, or waterways. If required, temporary netting would also be installed to protect some types of infrastructure. In addition, traffic control and safety inspectors would be on the haul routes and construction sites for the duration of the construction period.

Construction Schedule

Construction activities for alternatives 2 and 2b in NPS lands would be expected to last approximately 8 months. Alternative 3 construction activities would be expected to last approximately 8 months, or slightly longer, because the distance inside the park is slightly longer than under alternatives 2 and 2b. Construction for alternatives 4 and 5 would be expected to take less than 8 months because these alignments occupy less mileage within park lands. Activities such as surveys and geotechnical investigations would occur before mobilization for construction and are not included in the construction period. Construction activities would be expected to occur 12 hours a day, 6 days a week, with additional overtime if necessary (PPL and PSE&G 2008).

Construction Workforce

Depending on construction activities, the construction workforce could range from 20 to 120 workers, with an average workforce of 50. In addition to construction workforce, NPS monitoring staff would be required for the project. Construction labor force and machinery requirements typically include the following:

- **ROW clearing**: Three three-person crews with two D9 dozers and five dump trucks, and four tree-trimmer personnel with truck and grinder
- **Foundations**: Drill rig, mixer trucks (two per hour), one truck, one foundation foreman, and three laborers
- **Tower erection**: Five four-person crews with one line truck and one general foreman truck per crew, and two Condor 200-foot boom trucks

Construction Equipment

Construction activities may include the use of the following equipment types:

- **Anchor**: Drills into the ground to stabilize pulling/tensioning equipment
- **Belly dump**: Places roadbed material efficiently
- **Boom crane**: Sets towers; 125 feet to 200 feet tall
- **Bullwheel puller**: Generates pulling or braking tension; 17 inches deep, 5 feet wide, and 14 feet tall
- **Concrete mixer truck**: Hauls concrete to the foundation sites for pouring the tower foundations
- **Concrete pump truck**: Provides efficient delivery of concrete to foundation holes that are not easily accessed
- **Crawler dozer**: Pulls line, applies tension, and clears ROW (heavy civil equipment)

- **Drum puller**: Reels out two or more conductors; includes its own engine, hoist, winch, and trigger
- **Dump truck**: Hauls material to and from the site
- **Excavator**: Performs medium excavations (heavy civil equipment)
- **Foreman truck**: Carries tools, equipment, and fuel (flatbed pickup)
- **Ground grid**: Protects construction areas against a fault current (lightning strike)
- **Guard structure**: Keeps conductor away from energized equipment, roads, and other obstructions the transmission line construction may encounter
- **Line truck**: Houses all construction equipment used by the line mechanic
- **Miscellaneous tractor trailer (equipment)**: Hauls equipment, materials, and tools to and from the construction site
- **Pilot line puller**: Puts tension on pilot line
- **Pilot line**: Follows sock line through travelers, then attaches to conductor and pulls conductor back through travelers
- **Reel puller**: Pulls line and applies tension (shaft driven)
- **Reel stand**: Acts as mount for brakes, stand, jacks, reel transport, and payout (six-axle skid, truck, or trailer)
- **Reel winder**: Recovers conductors
- **Road grader**: Performs final grading of access roads, crane pads, and wire tension and pulling sites
- **Running board**: Pulls multiple conductors with one pilot line
- **Scraper**: Performs large excavations (heavy civil equipment)
- **Service truck**: Lubricates, fuels, and maintains heavy equipment
- **Splice grounding**: Protects workers from an electric shock from induced voltage on the conductor while splicing conductor ends
- **Tensioner with bullwheel**: Holds tension on the pull line, arranged in tandem; places friction and tension on the conductor by the grooves
- **Tractor with lowboy**: Hauls heavy civil equipment and materials to and from the site
- **Traveler ground**: Protects tower and travelers against fault current
- **Traveler**: Provides frictionless rotation for stringing pilot line and conductor
- **Water truck**: Provides dust and fire control
- **Woven wire grip**: Pulls continuous conductor and guys

Construction Vehicle Trips

Construction crews would use public roads and existing access roads to reach the sites. This would include trips to the construction site from homes, hotels, or meeting sites. In general, vehicle trips and miles traveled would include the following:

- **Estimated daily one-way vehicle trips**: 7 vehicles/hour/mile
- **Estimated vehicle miles traveled**: 140 miles/day

Land Disturbance

Land disturbance is generally estimated at 350 feet in width, which is the maximum expected ROW, multiplied by the length of the line. Determining the exact area of land disturbance for alternative 2b is problematic because the ROW width ranges from 100 to 380 feet, as noted in the previous section, "Development of the Applicant's Alternate Proposal." Therefore, an approximate ROW width of 150 feet is used to estimate land disturbance for alternative 2b. Land disturbance would result from vegetation clearing, tower grading, construction of tower foundations, and new access roads. In some instances, the access roads, both permanent and temporary, occur outside the 350-foot ROW; land disturbance would be greater in these areas. ROW boundaries would be surveyed and trees and shrubs would be marked for removal with green survey tape. Access roads in the ROW would be surveyed and staked to avoid additional disturbance. NPS monitoring staff would ensure adherence to all permit requirements.

Construction Waste

Construction of the transmission line under any action alternative would result in the generation of various waste materials and would require the use of hazardous materials, including fuel, lubricants, and cleaning solvents. All hazardous materials would be stored, handled, and used in accordance with applicable regulations. All waste materials would be stored outside of the parks and disposed of in off-site landfills. Site cleanup would involve the removal of staging area fencing, construction trailers, construction fencing, temporary erosion control measures, temporary culverts and drainage systems, grounding, counterpoises, portable toilets, spur roads, splice sites, crane pads, and foundation spoils.

Restoration

The applicant would restore all spur roads, crane pads, staging areas, and pulling sites as soon as possible once removal of existing structures or construction is complete. Restoration would include removing gravel surfaces and geotextile fabric, seeding disturbed areas with an NPS-approved conservation seed mix, treating noxious weeds, and implementing other best management practice (BMP) treatments. Some disturbed areas may require shallow surface scarifying of severely compacted soils or recontouring of cut and fill areas to help control erosion and promote revegetation. Temporary culverts would be removed and self-maintaining drainage would be restored. All reclaimed areas would be monitored for noxious weeds for at least two years after project completion. For alternatives 3 through 5, mechanical and chemical treatments of native vegetation within the ROW would no longer occur to allow for natural recovery of vegetation and wildlife habitat.

Proposed Information Technology Facilities

Telecommunication infrastructure would be installed under all action alternatives for operation of the existing substations and to protect the new transmission lines from electrical interruptions. The types of circuits to be installed would include fault protection and optical ground wire.

Fault protection would consist of 4/0 copper wire, directly embedded throughout the entire transmission line ROW. This ground wire would be attached to the counterpoises and every tower. The counterpoises would consist of three to four 8-foot ground rods placed strategically around each structure to divert potential fault currents from lightning strikes or line surges. Optical ground wire would provide grounding or lightning protection and communications for the facilities.

Facility and Construction Locations

The applicant included details about specific facility and construction locations for alternative 2 in the application for the permit. That information will be used to describe alternatives 2 and 2b. However, the locations of tower sites, pulling and splicing areas, and construction staging yards have not been defined for alternatives 3, 4, and 5. Therefore, alternatives 3 through 5 assume the following general guidelines:

- ROW width would be 350 feet along the entire length.
- Crane pads (one per tower location) would measure 200 feet by 200 feet.
- Wire pulling locations would measure 200 feet by 200 feet and be situated every 2.8 miles on flat terrain and every 1.7 miles on mountainous terrain.
- Pulling and splicing sites would measure 400 feet by 600 feet and would require additional land outside the ROW or an easement every 4 to 5 miles or where the transmission line turns.
- Construction staging yards would each measure 2 acres when helicopters would not be used and 3 to 4 acres with helicopter use.

Facility Operations and Maintenance

Operation and maintenance of the S-R Line under all alternatives would involve periodic inspection via helicopter and truck. Maintenance of the S-R Line would be performed on an as-needed basis, but is expected to occur at least once annually, and would include maintenance of access roads and erosion/drainage control structures. The applicant would operate and maintain the S-R Line under all the proposed alternatives in accordance with existing procedures and personnel.

All telecommunications equipment associated with the proposed transmission line would be operated and maintained by the applicant's technicians. Preventive maintenance of telecommunications infrastructure, which would be located on the transmission line, would typically be scheduled every 6 months to ensure system reliability and performance.

Vegetation Maintenance

PPL and Public Service Electric and Gas Company (PSE&G) have separate vegetation management plans because they are distinct utility companies working in two different states. However, both companies must comply with the new regulations issued in April 2006 in North American Electric Reliability Corporation (NERC) Standard FAC-003-01. The NPS considers the applicant's current vegetation management plans, as described in the following paragraphs, to be insufficient, and the NPS will require an NPS-specific, NPS-approved vegetation management plan.

PPL has produced guidelines for vegetation management techniques in Pennsylvania, *Specification for Initial Clearing and Control Maintenance of Vegetation on or adjacent to Electric Line Right-of-Way through Use of Herbicides, Mechanical, and Hand-clearing Techniques* (PPL 2010a), which specifies the wire zone–border zone technique of vegetation management. The wire zone is defined as 10 feet out from the centerline to the conductors. Vegetation that is near the wire zone presents a greater threat to the line;

vegetation that grows into or falls onto the transmission lines could cause an outage. Within this zone, all native shrubs, grasses, herbaceous species, and low-growing shrubs would be preserved to the greatest extent possible. The border zone stretches from the edge of the wire zone to the edge of the ROW. Vegetation allowed in the border zone is more varied but is limited to grass, ferns, seasonal agricultural crops, shrubs, and small trees. Maintenance would include removal by cutting, pruning, and herbicide use. All vegetation would be removed from access roads. In addition, danger trees outside the proposed ROW would also be pruned or removed. Danger trees are those that, in falling, would either strike the conductor or pass within the minimum conductor clearance, which is 10 feet for 500-kV transmission lines (PPL 2010a, 6). Under PPLs vegetation management guidelines, vegetation would also be cleared within a 15-foot perimeter of towers, or adjacent to any structure.

The vegetation management practices employed in New Jersey by PSE&G are described in *Transmission Rights-of-Way Vegetation Management* (PSE&G 2011). The minimum clearance required between conductors and the nearest tree is 30 feet. Vegetation maintenance would be achieved by ground line maintenance and selective tree removal. Ground line maintenance requires all trees and shrubs to be cut to ground level or no more than 3 inches above ground level. Selective tree removal requires that all fast-growing tree species be cut to ground level; these species include white pine and tulip poplar, as well as species of ash and birch. Additionally, all dead, decayed, or dying trees would be removed. Herbicides would be used in vegetation maintenance. Herbaceous plants and grasses and low-growing shrubs would be allowed to remain (PSE&G 2011, 1–6). Vegetation management under PSE&G guidelines requires a 50-foot buffer beyond the structure foundation perimeter.

PPL contends that clearing of danger trees outside of the ROW would be required for their proposal and alternative (PPL 2010a; 2010b) and that they would not be limited to the constraints of the easement rights. Danger trees would be identified and removed or pruned. A transmission line with a larger footprint would require a larger danger tree zone outside the ROW. It is assumed that larger individual trees outside the ROW would be removed periodically.

Outside the study area, the applicant should follow their respective management plans for maintenance of vegetation; therefore, the conditions of the ROW should be the same inside and outside the study area. However, public comments received during the alternatives workshop indicate that this is not standard practice. Citizens have reported complete clearing of vegetation within the existing ROW to the point of bare ground. Due to this discrepancy, the impacts on resources outside the study area will be presented as a range, where applicable, to encompass all potential effects from vegetation maintenance.

Bushkill Substation

The Bushkill Substation is an integral part of the power supply grid and would remain in use under all alternatives. For alternatives 2, 2b, 3, and 4, the use of the Bushkill Substation is included as part of the S-R Line, where the route from the Susquehanna Substation to the Bushkill Substation would use the existing alignment. Alternative 5 was created without the direct use of Bushkill Substation. Regardless of the alternative chosen, the Susquehanna and Bushkill substations would need to remain connected.

Replacement of Existing Lines for Alternatives 3 through 5

The alignments for alternatives 3 through 5 contain transmission or distribution lines that are not related to the S-R Line, but that would be affected by construction of the S-R Line. Implementation of alternatives 3 through 5 would require the removal of the existing structures in the same fashion as described for removal of the B-K Line earlier in this chapter. The transmission and distribution lines would be replaced during construction and would be placed parallel to the S-R Line within the expanded ROW. The new structures for transmission lines would require a tower foundation approximately 6 feet in

diameter, with approximately 16 towers per mile. The distribution lines would be strung on wood poles, which would not be set in concrete. Wood poles would be placed approximately every 200 feet, resulting in approximately 26 poles per mile.

Cost of Implementation

Implementation of the action alternatives would not create any changes to the parks' budgets.

Implementation of the action alternatives would not create any changes to the parks' budgets because the NPS would require the applicant to be responsible for costs associated with NPS managing the permit under 16 USC § 3a, "Recovery of Costs Associated with Special Use Permits." Due to the length of the transmission line through the parks and the extensive access roads, it is anticipated that two to three new DEWA staff members would be hired under alternatives 2, 2b, and 3 to assist in park responsibilities associated with construction and post construction monitoring; one new DEWA staff member would be hired under alternatives 4 and 5. Under alternatives 2, 2b, 3, 4, and 5 DEWA staff would be responsible for monitoring actions along APPA. For a more detailed explanation of personnel responsibilities under the action alternatives, see the "Park Operations" section in chapter 4.

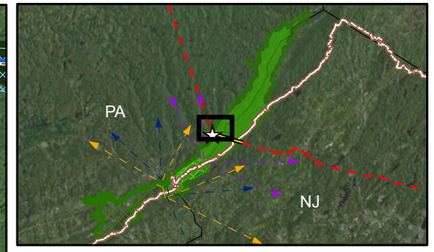
ALTERNATIVE 2: APPLICANT'S PROPOSED ROUTE

Route Description

The route identified by the applicant follows the corridor of the B-K Line that traverses approximately 4.3 miles of DEWA. This alternative would require clearing of vegetation for an additional 50 to 200 feet of ROW.

The route identified by the applicant follows the corridor of the B-K Line that traverses approximately 4.3 miles of DEWA. Within DEWA boundaries, the route crosses MDSR and APPA approximately perpendicularly. Figure 3 presents the location of the alternative 2 alignment inside DEWA, the access roads for alternative 2, and the study area and figure 4 presents the proposed tower locations for this alternative.

Within the study area, the alternative 2 alignment is approximately 5.6 miles long. The alignment would enter DEWA from the west at the VSL in Pennsylvania approximately 0.25 mile east of Big Bushkill Creek. The alignment would cross approximately 0.6 mile of DEWA land and then exit the park. In the next approximately 0.68-mile section of the study area, the alignment would travel to the Bushkill Substation, cross a small (0.06-mile) portion of DEWA, cross the Fernwood Golf Course, and then reenter DEWA south of the South Zone Ranger Station and north of DEWA Headquarters. The alignment would travel southeast within DEWA for approximately 0.85 mile, then cross 0.10 mile of MDSR just north of Depew Island. The route would continue southeast approximately 2.4 miles past the Watergate Recreation Site and cross APPA. The route would then traverse another 0.25 mile from APPA to the eastern DEWA boundary. Beyond the boundary, the alignment would travel southeast approximately 0.7 mile to the VSL. The width of the existing B-K Line ROW ranges from 100 to 380 feet in Pennsylvania and New Jersey; however, the ROW is only cleared to a width between approximately 80 and 150 feet. This alternative would require clearing of vegetation for an additional 50 to 200 feet of ROW.



Legend

- Substation
- Crane Pad for Proposed Tower*
- Crane Pad for Existing Tower Removal
- Inside Study Area
- Outside Study Area
- Delaware River
- Proposed Access Road
- Road
- Delaware Water Gap National Recreation Area
- Middle Delaware National Scenic and Recreational River
- County Line

** Crane pads for proposed towers will also be used for the removal of existing towers, where applicable*

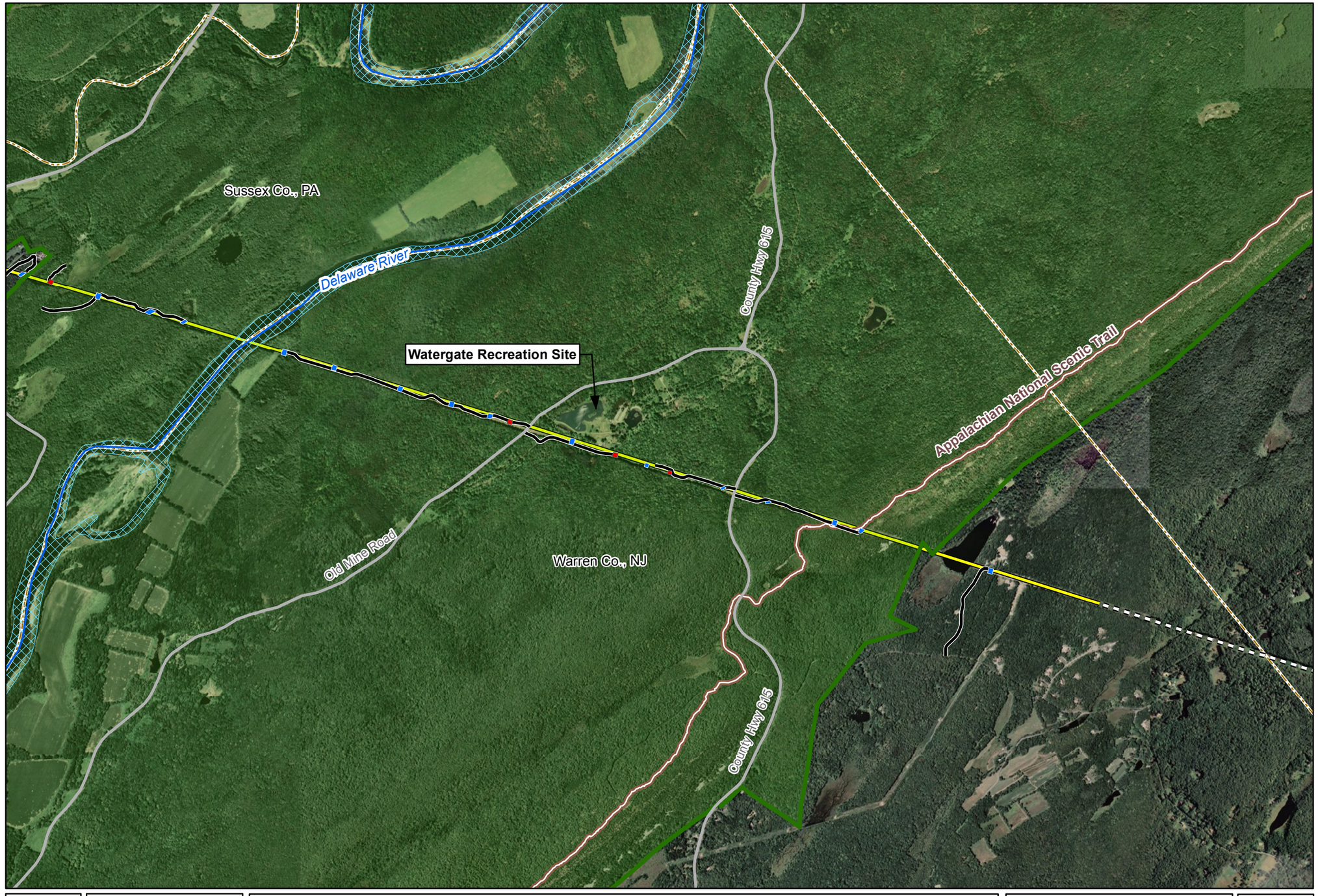
0 2,000 4,000
Feet

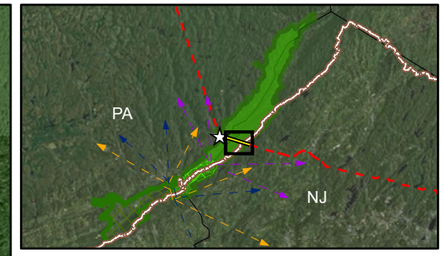
Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 3
Alternative 2 Pennsylvania Towers and Proposed Access Roads within the Study Area

Source: ESRI Streetmap 2006, Penn State 2010, ESRI ArcGISonline Map Service 2010, PennDOT 2011, USGS 2006, NJ DEP 2008,

Projection: NAD 83 UTM Zone 18N
Date: July 2012





Legend

- Crane Pad for Proposed Tower*
- Crane Pad for Existing Tower Removal
- Inside Study Area
- Outside Study Area
- Appalachian National Scenic Trail
- Delaware River
- Proposed Access Road
- Road
- Delaware Water Gap National Recreation Area
- Middle Delaware National Scenic and Recreational River
- County Line

** Crane pads for proposed towers will also be used for the removal of existing towers, where applicable*

0 2,000 4,000
Feet

Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 4
Alternative 2 New Jersey
Towers and Proposed Access Roads within the Study Area

Source: ESRI Streetmap 2006, Penn State 2010, ESRI ArcGISonline Map Service 2010, NJOIT 2010, USGS 2006, NJ DEP 2008,

Projection: NAD 83 UTM Zone 18N
Date: July 2012

Access and Spur Roads

Alternative 2 would require new access roads, because old trails and roadbeds on which the access roads are based are overgrown and would not allow access by large vehicles. Old trails and roadbeds would be cleared of vegetation; blade-graded to remove potholes, ruts, and other surface irregularities; and recompacted to provide a smooth and dense surface capable of supporting heavy equipment. Generally, access roads would fall within the transmission line ROW, but in some instances, it would be necessary for access roads to extend outside the ROW. In response to public comment, the NPS has altered the access roads for alternative 2 slightly from the description presented in the draft EIS. The change in access roads would result in reduced impacts to natural resources. Figure 3 presents the updated access roads. Alternative 2 would require a total of 5.3 miles of access roads, 1.9 miles of which would be outside the ROW (1.5 miles in Pennsylvania and 0.4 mile in New Jersey). The applicant would need additional rights beyond the ROW for construction of access roads outside the transmission line ROW. Locations of these roads outside the ROW would require NPS approval.

Access roads would be constructed at 20 feet wide initially to accommodate large construction vehicles. After construction, the roads would be narrowed to 15 feet and maintained permanently for future maintenance and vegetation management. The disturbed areas would be seeded with an NPS-approved conservation seed mix. Acreages of disturbance due to access roads during and after construction are shown in table 3. Drainage structures (e.g., wet crossings, water bars, overside drains, pipe culverts, energy dissipaters) would be installed along spur and access roads to allow for construction equipment use, as well as to prevent erosion from uncontrolled water flow. Slides, washouts, and other slope failures would be repaired and stabilized along roads by installing retaining walls or other means to prevent future failures. The type of mechanically stabilized earth-retaining structure used would be based on site-specific conditions. The applicant would be responsible for the long-term maintenance of access roads within the road and transmission line ROWs. Proposed access road locations are shown in figure 4.

New spur roads may be required for pulling and splicing sites along the ROW. To minimize land disturbance, previously disturbed areas would be used where feasible. Locations of spur roads are currently unknown and would be placed according to the applicant's internal policy, subject to approval from the NPS. The applicant would be responsible for the restoration of spur roads immediately following the conclusion of construction activities. Restoration of spur roads would include removing all gravel, disposing of geotextile fabric, and seeding the area with an NPS-approved conservation seed mix.

Cost of Construction

The total cost of constructing the alternative 2 alignment from Susquehanna to Roseland is estimated to be $2.17 billion. This estimate is based on factors including prices of materials and equipment, purchase and clearing of access roads and ROW, and labor costs. Detailed construction cost estimates can be found in appendix E.

The total cost of constructing the alternative 2 alignment from Susquehanna to Roseland is estimated to be $2.17 billion.

ALTERNATIVE 2b: APPLICANT'S ALTERNATE PROPOSAL

Route Description

The alignment for the applicant's alternate proposal would follow the same route as described for alternative 2, but alternative 2b would be constructed within the existing ROW.

The alignment for the applicant's alternate proposal would follow the same route as described for alternative 2 (figure 5). The difference between alternative 2 and alternative 2b is that the former would require widening the existing ROW, while the latter would be constructed within the existing ROW. The towers for alternative 2b would be the same height as those described for alternative 2, but alternative 2b would require two additional towers within NPS lands compared to alternative 2 (figure 6). These towers would be constructed within the 100-foot-wide portion of the alignment. Because the ROW under alternative 2b is narrow, the applicant's plans require these additional towers to protect against fire hazards presented by the risk of conductor blowout. As noted in the "Development of the Applicant's Alternate Proposal" section of this chapter, the minimum horizontal clearance to the edge of the ROW under high wind conditions to prevent conductor blowout was determined to be greater than 100 feet, and the NPS has expressed concern about the safety of constructing within the existing ROW. The applicant's proposal is based upon the controversial assumption that they have a right to clear danger trees on NPS property outside any deeded ROW (PPL 2010b). It is assumed that larger individual trees outside the ROW would be removed periodically.

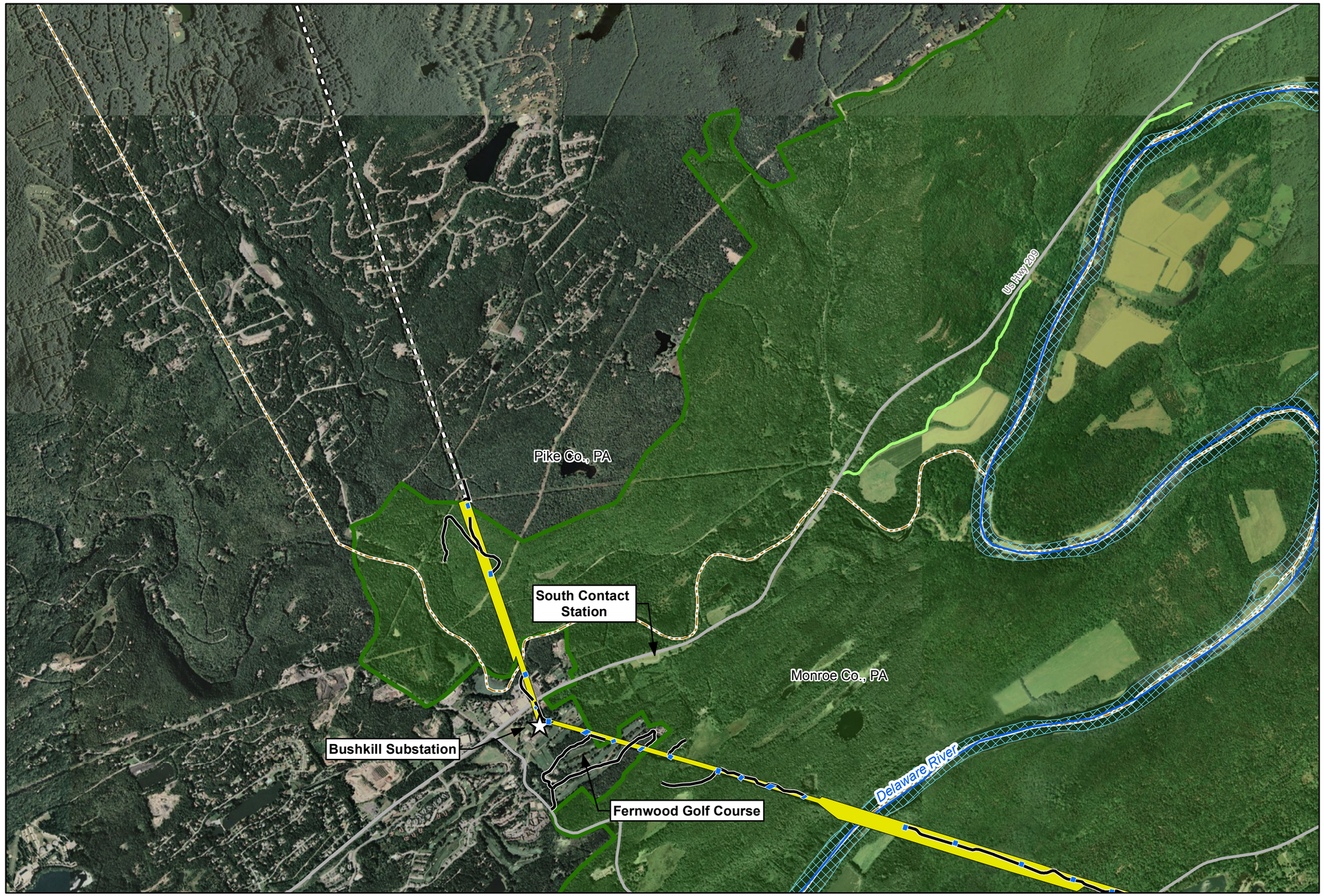
Access and Spur Roads

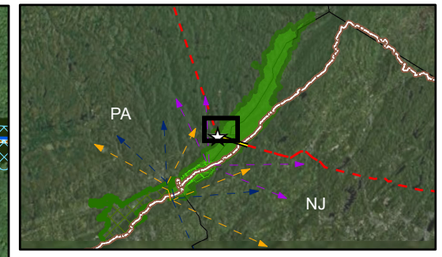
Access roads for alternative 2b are similar as those described for alternative 2, with a slight difference in Pennsylvania between the Bushkill Substation and the Delaware River (figure 5). Alternative 2b would require a total of 5.3 miles of access roads, of which 2.4 miles would occur outside the ROW. Roads would be used and maintained as described for alternative 2. The applicant would need additional rights beyond the ROW for construction of access roads outside the transmission line ROW. Locations of these roads outside the ROW would require NPS approval.

Cost of Construction

The total cost of constructing the alternative 2b alignment from Susquehanna to Roseland is estimated to be $2.17 billion. This estimate is based on factors including prices of materials and equipment, purchase and clearing of access roads and ROW, and labor costs. Detailed construction cost estimates can be found in appendix E.

The total cost of constructing the alternative 2b alignment from Susquehanna to Roseland is estimated to be $2.17 billion.





Legend

- Substation
- Crane Pad for Proposed Tower*
- Inside Study Area
- Outside Study Area
- McDadeTrail
- Delaware River
- Proposed Access Road
- Road
- Delaware Water Gap National Recreation Area
- Middle Delaware National Scenic and Recreational River
- County Line

** Crane pads for proposed towers will also be used for the removal of existing towers, where applicable*

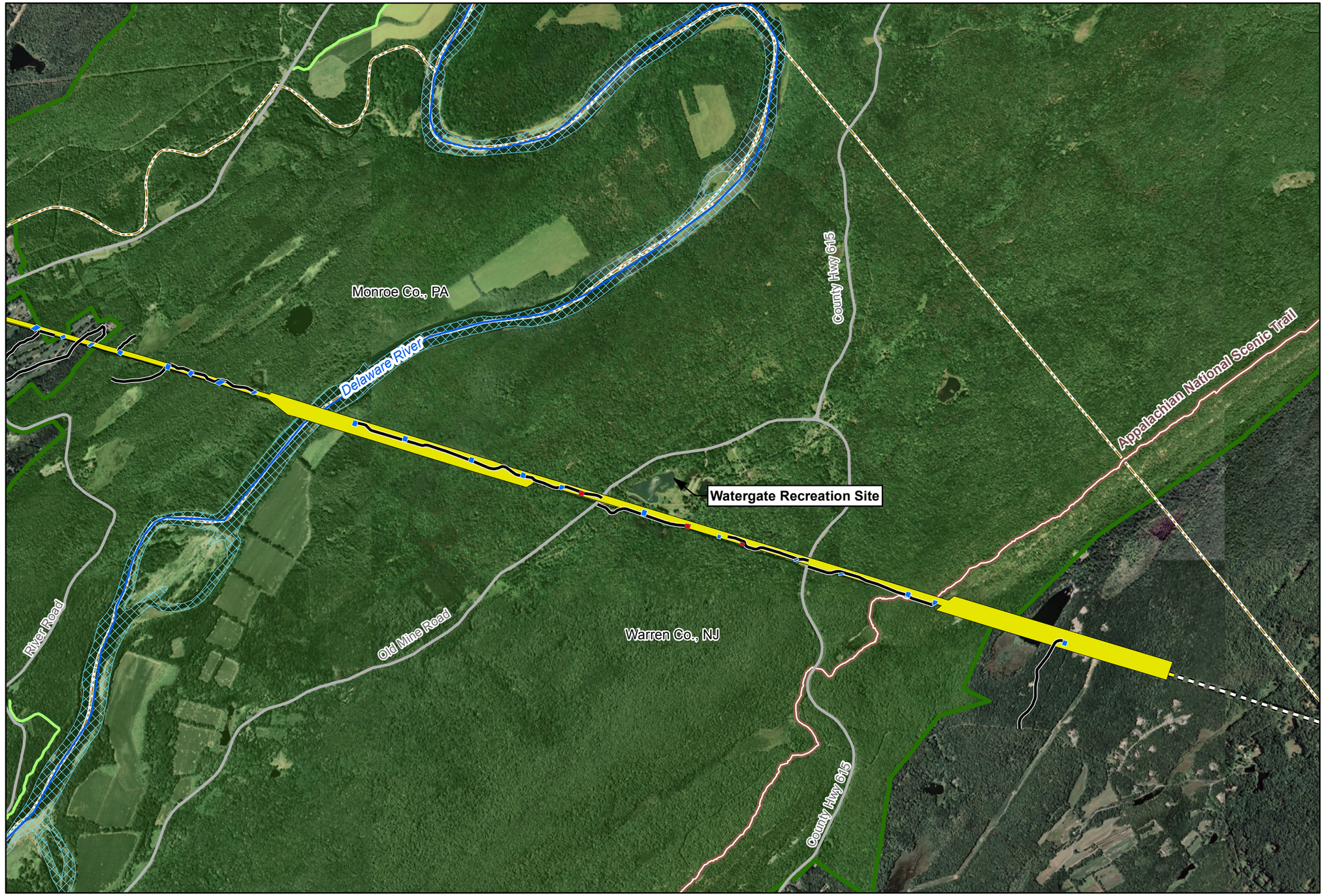
0 1,900 3,800
Feet

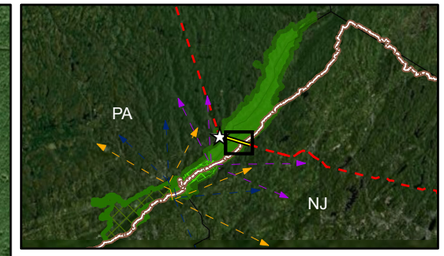
Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 5
Alternative 2b Pennsylvania
Towers and Proposed Access Roads within the Study Area

Source: ESRI Streetmap 2006, Penn State 2010, ESRI ArcGISonline Map Service 2010, PennDOT 2011, USGS 2006, NJ DEP 2008,

Projection: NAD 83 UTM Zone 18N
Date: July 2012





Legend

- Crane Pad for Proposed Tower*
- Crane Pad for Existing Tower Removal
- Inside Study Area
- Outside Study Area
- Appalachian National Scenic Trail
- Delaware River
- Proposed Access Road
- Road
- Delaware Water Gap National Recreation Area
- Middle Delaware National Scenic and Recreational River
- County Line

** Crane pads for proposed towers will also be used for the removal of existing towers, where applicable*

0 2,000 4,000
Feet

Susquehanna to Roseland
Transmission Line Proposal
and
Right-of-Way Request EIS

Figure 6
Alternative 2b New Jersey
Towers and Proposed Access Roads within the Study Area

Source: ESRI Streetmap 2006, Penn State 2010,
ESRI ArcGISonline Map Service 2010,
NJOIT 2010, USGS 2006,
NJ DEP 2008,

Projection: NAD 83 UTM Zone 18N
Date: July 2012

ALTERNATIVE 3

Route Description

The alternative 3 alignment would pass through DEWA along the right of way of existing transmission and distribution lines. This alternative would require clearing of vegetation for an additional 50 to 200 feet of ROW.

The alternative 3 alignment would pass through DEWA along the ROW of existing transmission and distribution lines (figure 7). The existing transmission and distribution lines would be removed prior to construction of the S-R Line. The existing transmission line ROW is 100 feet wide, and this alternative would require clearing of vegetation for an additional 50 to 200 feet of ROW. The structures of the transmission and distribution lines would be constructed so that these lines and the S-R Line would run parallel to one another within the expanded ROW. That is, two separate sets of structures would be constructed, one set for the proposed S-R Line and one set for the existing transmission and distribution lines along the alternative 3 alignment. Alternative 3 would cross a total of 5.4 miles within the DEWA boundary. The route would cross about 1.3 miles of DEWA within the study area and about 1.7 miles of the northern end of Worthington State Forest, which is located within DEWA's exterior boundaries. The alignment for this alternative also crosses MDSR within DEWA, and APPA within Worthington State Forest.

The alternative 3 alignment is approximately 6.9 miles long within the study area. The alternative 3 alignment would follow the alignment of the B-K Line for 0.6 mile from the western boundary of DEWA to the Bushkill Substation. The alignment would leave the study area and travel southwest to reenter the study area via the VSL point located in Monroe County, Pennsylvania, outside DEWA (figure 7). From the western VSL, the alignment would cross River Road and the McDade Trail about 1.0 mile southwest of the Smithfield Beach Picnic Area and 0.75 mile northeast of the Hialeah Picnic Area. The alignment would continue southeast within DEWA approximately 0.8 mile to MDSR. On the east side of MDSR, the route would travel northeast approximately 0.49 mile to the boundary of Worthington State Forest; the remainder of the alignment within DEWA boundaries would also be encompassed by Worthington State Forest's boundaries. The alignment would travel southeast approximately 1.69 miles to the eastern edge of DEWA, perpendicularly crossing APPA. The alignment would travel another 0.24 mile beyond the DEWA boundary to the VSL. The alternative 3 alignment would reenter DEWA beyond the eastern VSL as well. In the path to join the alignment of the B-K Line in New Jersey, alternative 3 could travel along the border of DEWA for 1.8 miles, paralleling APPA for this entire distance.

Access and Spur Roads

Alternative 3 would require new access roads. Access and spur roads would be cleared of vegetation; blade-graded to remove potholes, ruts, and other surface irregularities; and recompacted to provide a smooth and dense surface capable of supporting heavy equipment. Generally, access roads would fall within the transmission line ROW, but in some instances, it would be necessary for access roads to extend outside the ROW. Alternative 3 would require approximately 3.5 miles of access roads, of which 0.9 mile would occur outside the ROW. Acreages of disturbance due to access roads during and after construction are shown in table 3. Roads would be used and maintained as described for alternative 2. The applicant would need additional rights beyond the ROW for construction of access roads outside the transmission line ROW. Locations of these roads outside the ROW would require NPS approval.

Cost of Construction

The total cost of constructing the alternative 3 alignment from Susquehanna to Roseland is estimated to be $2.22 billion. This estimate is based on factors including prices of materials and equipment used; purchase and clearing of access roads and ROW; and labor costs. Detailed construction cost estimates can be found in appendix E.

The total cost of constructing the alternative 3 alignment from Susquehanna to Roseland is estimated to be $2.22 billion.

ALTERNATIVE 4

Route Description

Alternative 4 would pass through the southernmost portion of DEWA along the path of an existing distribution line right-of-way. The existing right of way is 100 feet wide, and this alternative would require permanent clearing and maintenance of vegetation for an additional 100 to 200 feet of ROW.

Alternative 4 would pass through three portions of DEWA; the section of the park from the western boundary along the B-K Line to the Bushkill substation; through the southwestern boundary of the park, where the alignment leaves the boundary of the park for 0.51 mile, then re-enters the park (figure 8). On the southernmost portion of DEWA, alternative 4 runs along the path of an existing distribution line ROW (figure 8), and would also pass through a section of the park along the alignment of the B-K Line. The existing ROW ranges from 100 to 200 feet wide, and this alternative would require permanent clearing of vegetation for an additional 100 to 200 feet of ROW. This line along alternative 4 would be removed prior to construction of the S-R Line. The structures of the existing distribution line would be replaced so that this line and the double-circuited S-R Line would run parallel to one another within the expanded ROW. The route would cross about 1.5 mile of NPS lands, including DEWA and APPA. This alternative would also cross the Lower Delaware River; however, the crossing of the Delaware River would occur outside DEWA and MDSR boundaries and outside the study area.

Alternative 4 would have a north–south orientation and would be approximately 2.3 miles long within the study area (figure 8). As with alternative 3, the alternative 4 alignment follows the alignment of the B-K Line for 0.6 mile from the western boundary of DEWA to the Bushkill Substation (figure 8, inset box 1). The alignment would leave the study area and travel southwest to reenter the study area via the VSL point at the edge of DEWA, near the southwestern boundary of the park. Upon entering DEWA from the north, the alternative 4 alignment would cross about 0.42 mile of DEWA land, roughly following the DEWA boundary, and would cross Mountain and Totts Gap roads. The alignment would then leave the boundary of DEWA for approximately 0.51 mile, before re-entering the park. Upon reentering DEWA, the alignment would immediately cross APPA, then extend approximately 0.50 mile south to the southern boundary of DEWA. South of DEWA, the alternative 4 alignment would extend another 0.24 mile before the southern VSL (figure 8). The designated boundary of Cherry Valley National Wildlife Refuge (NWR) borders the existing ROW of the alternative 4 alignment north of APPA for approximately 0.73 mile (figure 8). The alternative 4 alignment would also cross through portions of Cherry Valley NWR outside the study area; these portions of alternative 4 are discussed in appendix C.

Thus, under alternative 4 the applicant would have the option of a secondary crossing of NPS land west of Bushkill while under alternative 5 it would not. This is the only difference between 4 and 5 over which NPS exercises any discretion or control.

Monroe Co., PA

State Hwy 2023

Smithfield Beach

County Hwy 606

Delaware River

Warren Co., NJ

Hialeah Picnic Area

Appalachian National Scenic Trail

Inset Box 1

Pike Co., PA

Bushkill Substation

Monroe Co., PA

Inset Box 2: Eastern border of DEWA

Warren Co., NJ

Appalachian National Scenic Trail

PA

Box 1

Box 2

Main

NJ

Legend

- Substation
- Inside Study Area
- Outside Study Area
- Appalachian National Scenic Trail
- Delaware River
- Proposed Access Road
- Road
- Delaware Water Gap National Recreation Area
- Worthington State Forest
- Middle Delaware National Scenic and Recreational River
- County Line

0 2,000 4,000

Feet

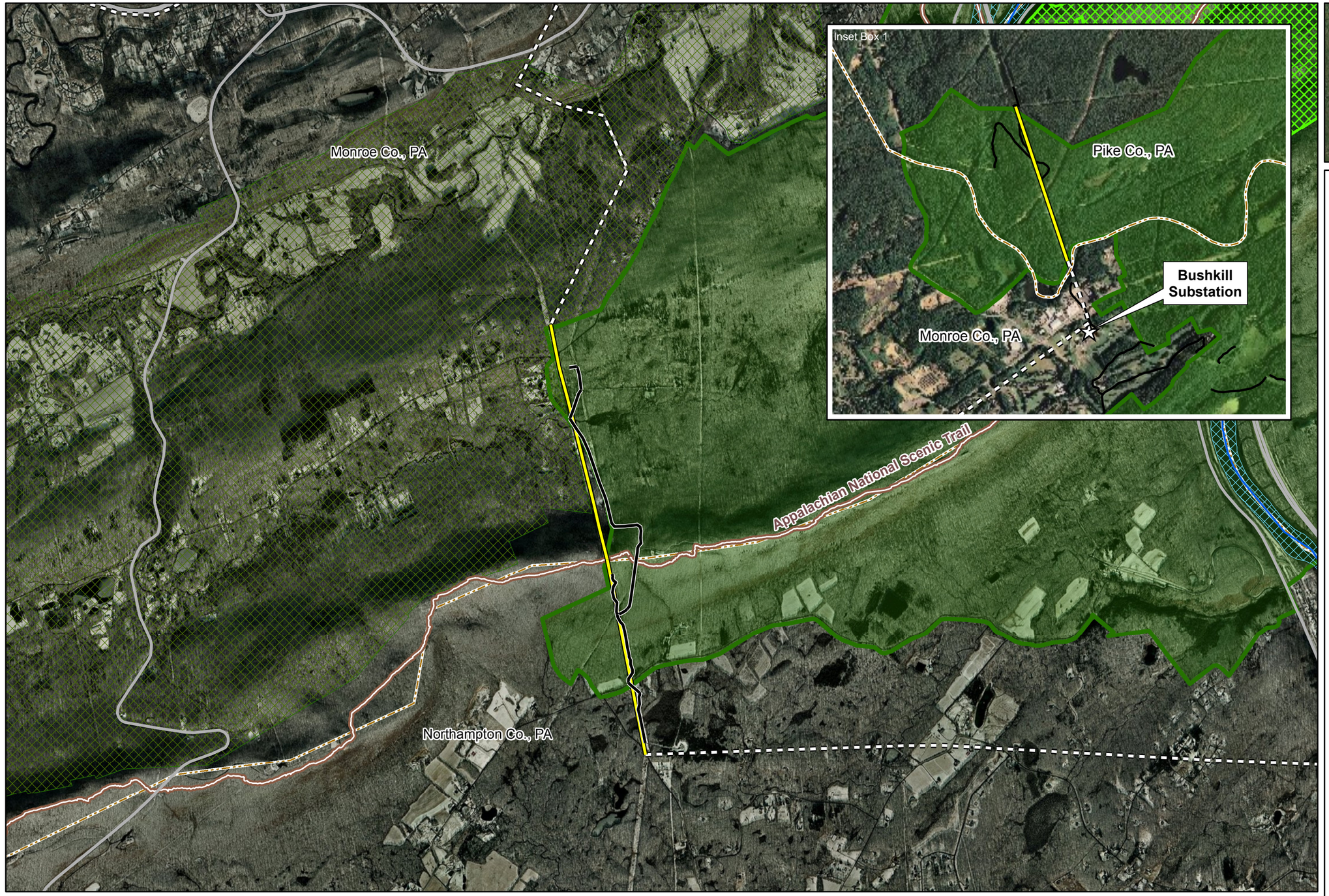
Scale applies to main frame and inset maps

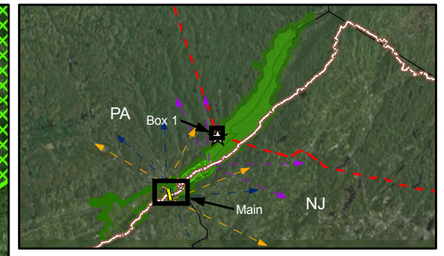
Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 7
Alternative 3
Proposed Access Roads within the Study Area

Source: ESRI Streetmap 2006, Penn State 2010, ESRI ArcGISonline Map Service 2010, PennDOT 2011, USGS 2006, NJ DEP 2008,

Projection: NAD 83 UTM Zone 18N
Date: July 2012





Legend

- Substation
- Inside Study Area
- Outside Study Area
- Appalachian National Scenic Trail
- Delaware River
- Proposed Access Road
- Road
- Delaware Water Gap National Recreation Area
- Worthington State Forest
- CVNWR Boundary
- Middle Delaware National Scenic and Recreational River
- County Line

Note:Designated boundary of CVNWR is depicted, not all property is owned within the boundary.

0 2,000 4,000
Feet

Scale applies to main frame and inset maps

Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 8
Alternative 4
Proposed Access Roads within the Study Area

Source: ESRI Streetmap 2006, Penn State 2010, ESRI ArcGISonline Map Service 2010, PennDOT 2011, USGS 2006, NJ DEP 2008,

Projection: NAD 83 UTM Zone 18N
Date: July 2012

Access and Spur Roads

Alternative 4 would require a total of approximately 2.5 miles of access roads, with approximately 1.6 miles within NPS boundaries. Alternative 4 would use 0.9 mile of existing roads as access roads and would require construction of 1.6 miles of new access roads, of which 0.5 mile would occur outside the ROW. Acreages of disturbance due to access roads during and after construction are shown in table 3. Roads would be created, used, and maintained as described for alternative 2. The access roads for alternative 4 would not enter Cherry Valley NWR. The applicant would need additional rights beyond the ROW for construction of access roads outside the transmission line ROW. Locations of these roads outside the ROW would require NPS approval.

Cost of Construction

The total cost of constructing the alternative 4 alignment from Susquehanna to Roseland is estimated to be $2.36 billion. This estimate is based on factors including prices of materials and equipment used, purchase and clearing of access roads and ROW, and labor costs. Detailed construction cost estimates can be found in appendix E.

The total cost of constructing the alternative 4 alignment from Susquehanna to Roseland is estimated to be $2.36 billion.

ALTERNATIVE 5

Route Description

At DEWA's southern border, alternatives 4 and 5 follow similar alignments. However, alternative 5 does not include the segment west of the Bushkill Substation, associated with the alternative 4 alignment.

Inside the study area, alternative 5 would follow a similar alignment as alternative 4 (described above); however, beyond the study area, alternatives 4 and 5 would split. The alternative 5 alignment would not cross the 0.6 mile portion west of the Bushkill Substation associated with alternative 4 (figure 9). Thus, under alternative 4 the applicant would have the option of a secondary crossing of NPS land west of Bushkill while under alternative 5 it would not. This is the only difference between 4 and 5 over which NPS exercises any discretion or control. Inside the study area, alternative 5 would be approximately 1.7 miles long, with approximately 0.9 mile within NPS lands. Appendix C contains descriptions of the alternatives outside the study area. Although not analyzed in the EIS, alternative 5 assumes a 230-kV transmission line will run from alternative 5 up to the Bushkill Substation on the west side of the park. In addition, alternative 5 also assumes that a 230-kV transmission line would run up to Kittatinny Substation on the east side of the park.

Access and Spur Roads

Alternative 5 would require a total of approximately 1.7 miles of access roads; however, 0.9 mile of existing road would be used. Alternative 5 would require construction of approximately 0.9 mile of new access roads, of which 0.16 mile would occur outside the ROW. Acreages of disturbance due to access roads during and after construction are shown in table 3. Roads would be created, used, and maintained as described for alternative 2. The applicant would need additional rights beyond the ROW for construction of access roads outside the transmission line ROW. Locations of these roads outside the ROW would require NPS approval.

Cost of Construction

The total cost of constructing the alternative 5 alignment from Susquehanna to Roseland is estimated to be $1.42 billion. This estimate is based on factors including prices of materials and equipment used, purchase and clearing of access roads and ROW, and labor costs. Detailed construction cost estimates can be found in appendix E.

ALTERNATIVES ELIMINATED FROM FURTHER STUDY

RATIONALE FOR DISMISSING ALTERNATIVES 6 AND 7

Alternatives 6 and 7, which would have crossed APPA well south of DEWA and MDSR, and for which comment from the public was invited, were dismissed from further analysis.

Both alternatives would unduly complicate and delay the relocation of the existing B-K Line. The permit application is for a double circuit configuration with capacity to carry two new 500-kV transmission lines, one of which would serve as a replacement for the B-K Line allowing that line to be moved to and collocated at a new permitted crossing of the S-R Line. However, the alternative 6 and 7 crossings are too distant from the existing B-K Line to allow for its relocation to either of those crossings at the same time that the new S-R Line would be constructed. Operational constraints would require that the existing B-K Line remain in place for an indefinite time until it could be relocated. This would also indefinitely delay the realization of a major beneficial effect that is integral to alternatives 3, 4, and 5.

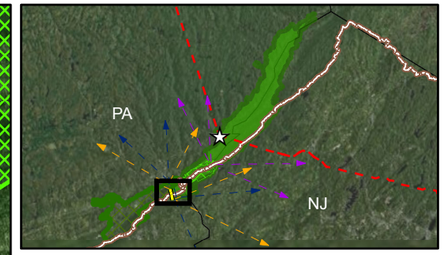
Each of these alternatives also suffers from its own unique flaws insofar as they do not sufficiently utilize existing, cleared power line ROWs—a critical criterion. Alternative 6 would require extensive new clearing across the middle of the Cherry Valley NWR, thus failing the "*cleared*" element of this criterion. The alternative 7 alignment follows a gas pipeline ROW, not a *power line* ROW, so it would effectively create a new power line crossing where none exists today (this is also contrary to APPA land management policy which discourages allowing a new type of impact where one does not currently exist). It would also require major additional clearing of vegetation to widen the ROW from 100 to 300 feet to safely accommodate both the gas pipeline and the high voltage electric transmission line within APPA and Cherry Valley NWR.

Because of these considerations, alternatives 6 and 7 were dismissed from further analysis in this EIS.

RATIONALE FOR DISMISSING OTHER POTENTIAL ALTERNATIVES

The following potential alternatives were also eliminated from full consideration in this EIS. A brief description of the alternatives and the reason for dismissal is provided.

- An underground 500-kV line was dismissed because its construction cost would be five to eight times the cost of conventional construction methods. Additionally, blasting the bedrock for an underground line could produce major irretrievable and irreversible impacts on geology.
- Superconductor lines (direct current) were dismissed because their construction would cost three to five times that of conventional transmission line construction. These lines would also require AC/DC (alternating current / direct current) converter stations at Susquehanna and Roseland, in addition to the existing substations at these locations.



Legend

- Substation
- Inside Study Area
- Outside Study Area
- Appalachian National Scenic Trail
- Delaware River
- Proposed Access Road
- Road
- Delaware Water Gap National Recreation Area
- Worthington State Forest
- CVNWR Boundary
- Middle Delaware National Scenic and Recreational River
- County Line

Note:Designated boundary of CVNWR is depicted, not all property is owned within the boundary.

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Feet

Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 9
Alternative 5
Proposed Access Roads within the Study Area

Source: ESRI Streetmap 2006, Penn State 2010, ESRI ArcGISonline Map Service 2010, PennDOT 2011, USGS 2006, NJ DEP 2008,

Projection: NAD 83 UTM Zone 18N
Date: July 2012

- Aluminum conductor composite core (ACCC) is a high-temperature conductor that was dismissed because the existing 230-kV towers would still have to be replaced with 500-kV towers to meet clearances required by NESC. ACCC conductor is still a potential conductor for the project because of the reduced sag on the line, as compared to the standard ACSR conductor. However, ACCC conductor is not a separate alternative by itself.
- The use of a smart grid was dismissed because it does not meet the reliability requirements put forth by PJM Interconnection (PMJ). Smart grids provide automated switching for transmission lines but do not provide the redundancy required to meet improved reliability requirements for the transmission grid.
- The use of distributed energy generation sites and localized renewable energy were both dismissed because they do not meet the purpose and need for federal action or that of the applicant. The application is for a permit for a transmission line, driven by a need for transmission capacity. The purpose and need for federal action involves consideration of this application with regard to the purposes and policies governing the national park system. Use of distributed energy generation sites and localized renewable energy is one of a number of possible reactions of PJM and the applicant (and others) if the NPS selects the no-action alternative, but ordering the adoption of such systems is beyond the authority of the NPS.
- An effort to refurbish the existing 230-kV line to meet energy needs was dismissed because energy demand is higher than a 230-kV line can provide. Additionally, the existing structures are only rated at 230 kV and would have to be replaced with new structures that meet the NESC-required clearances for 500-kV transmission lines. This alternative cannot meet either the applicant's needs or the federal purpose and need.
- The alternative identified as alternative 8 in the "Alternatives Considered but Dismissed" handout from the Public Alternatives Workshop in August 2010 (formerly applicant's alternative A) was dismissed because of its socioeconomic and environmental impacts. The alternative alignment would have crossed near High Point State Park, would have been near a known bald eagle nest, and would have had visual impacts on several recreation areas, including the High Point Monument, which is a 220-foot tower affording a large viewshed and is a popular recreation site.
- The alternative identified as alternative 9 in the "Alternatives Considered but Dismissed" handout from the Public Alternatives Workshop in August 2010 (formerly applicant's alternative C) was similar to alternatives 4 and 5 outside the study area. It was dismissed mainly due to its visual impact on APPA, because the line would have paralleled the trail for an extended distance.
- The alternative identified as alternative 10 in the "Alternatives Considered but Dismissed" handout from the Public Alternatives Workshop in August 2010 (formerly River Road alternative) was dismissed because of its impact on the scenic viewshed and surrounding ecosystem. This alternative alignment would have paralleled the Delaware River within DEWA and was therefore determined to have the most impact on visitors that use the river, and it did not meet all NPS objectives for the project.
- The alternative identified as alternative 11 in the "Alternatives Considered but Dismissed" handout from the Public Alternatives Workshop in August 2010 (formerly NPS alternative 2) was dismissed based on its similarities to alternative 4 and because the alignment would have passed through the geologic formation of the Delaware Water Gap.
- The alternative identified as alternative 12 in the "Alternatives Considered but Dismissed" handout from the Public Alternatives Workshop in August 2010 (formerly NPS alternative 6) was dismissed because the use of this route would not be advantageous to APPA or the applicant in reducing the cost of construction. In addition, it was similar to alternative 5 in this EIS and had no additional benefits.

- Leaving in place the existing 230-kV B-K Line that the applicant proposes to parallel while permitting an alternative crossing for the new 500-kV line was rejected because it would result in two, rather than one, ROWs crossing the parks while leaving in place a line that the applicant states is becoming, if not already, obsolete.

MITIGATION AND COMPENSATION MEASURES

Mitigation and compensation measures would be required to minimize the impacts on resources from the construction, operation, and maintenance activities. Mitigation, according to NEPA regulations (40 CFR § 1508.20), includes the following:

Mitigation and compensation measures would be required to minimize the impacts on resources from the construction, operation, and maintenance activities described for the action alternatives.

- avoiding the impact altogether by not taking a certain action or parts of an action;
- minimizing impacts by limiting the degree or magnitude of the action and its implementation;
- rectifying the impact by repairing, rehabilitating, or restoring the affected environment;
- reducing or eliminating the impact over time by implementing preservation and maintenance operations during the period of analysis; and
- compensating for the impact by replacing or providing substitute resources or environments.

Mitigation according to National Historic Preservation Act of 1966 (NHPA) regulations (36 CFR Part 800) – Protection of Historic Properties includes a Resolution of Adverse Effects. If adverse effects of state or federal projects are identified or appear to be likely, consultation continues to identify ways to achieve the project purpose to avoid, minimize, or mitigate adverse effects, taking into consideration the values of the historic property or district, the parts of the undertaking that are essential to achieving the purpose of the project, and the adequacy of planning and of funding to achieve both the project objectives to a satisfactory resolution of adverse effects. Mitigation may include avoidance, alternative treatments, redesign, relocation, data recovery, documentation, and public education initiatives or interpretive measures.

The NPS expects to conclude consultation by including in any ROD a binding commitment to the mitigation measures disclosed in this EIS, as required by 36 CFR § 1508.8.

Mitigation measures specific to the impact topics, where applicable, are presented in appendix F.

The NPS would also establish mechanisms to ensure that all mitigation obligations are met, mitigation measures are monitored for effectiveness, and unsuccessful mitigation is quickly remedied.

In instances where impacts cannot be avoided and mitigation is not feasible, compensation for resources lost or degraded through project construction, operation, and maintenance would be required. Examples of items that cannot be remedied through mitigation include impacts that degrade the scenic and other intrinsic values of the parks or impacts that result in the loss of recreational use and visitor enjoyment. Compensation would be used to help ensure the stewardship of natural, cultural, scenic, and recreational resources, thus allowing for

- acquisition in fee or easement of lands within or adjacent to APPA and DEWA, which would protect resources and create natural connecting corridors to other protected areas, especially the

newly forming Cherry Valley NWR and existing state protected lands in both Pennsylvania and New Jersey;

- implementation of the parks' existing natural, historic and recreational plans;
- continuation of stewardship, restoration, and enhancement of the parks' natural, historic, scenic, and recreational resources; and
- continuation of the parks' involvement in ongoing landscape-scale conservation connectivity initiatives, strategies, and resource monitoring.

DEWA, MDSR, and APPA are not found in isolation; rather they are important anchors within a larger system of connected lands and waters in Pennsylvania, New Jersey, and New York and play a key role in sustaining the health and values of the local and regional natural environment and economy. While ongoing planning efforts and initiatives continue to protect the natural, historic, scenic, and recreational resources of the area, ensuring their perpetuation is paramount in maintaining the character and vitality of these resources in perpetuity. While the NPS cannot require the applicant to implement mitigation and compensation measures outside NPS jurisdiction, the NPS encourages the applicant to reduce or eliminate, to the greatest extent possible, all potential adverse impacts by looking beyond boundaries and contributing to conservation initiatives and strategies so that resources are protected at all affected scales.

The applicant submitted a draft Mitigation Concept S-R Line Project to the NPS in May 2011. This draft mitigation plan is included in appendix F.

SUMMARY OF IMPACTS

Chapter 4 of this document describes the effects of each alternative on each resource topic. These impacts are summarized in table 4 at the end of this chapter.

NPS PREFERRED ALTERNATIVE

The Council on Environmental Quality (CEQ) regulations for implementing NEPA require that an agency identify its preferred alternative or alternatives in a final EIS [1502.14(e)]. The preferred alternative is the alternative "which the agency believes would fulfill its statutory mission and responsibilities, giving consideration to economic, environmental, technical and other factors" (Question 4a of the CEQ's "Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations" (CEQ 1981).).

Having considered all of the available information, the NPS has identified its preferred alternative as alternative 2, which is the applicant's proposed route, utilizing the existing transmission alignment with the additional requested ROW. Alternative 2 was identified as the preferred alternative for the following reasons.

The NPS has a responsibility to manage and protect the resources within the units of the national park system. The NPS also has a duty to respect the property rights of those who own lands or other property interests within the boundaries of units of the national park system and not to interfere unreasonably with the legitimate exercise of those property rights. In considering the applicant's proposal, the group considered the nature and extent of the existing property rights that the applicant claims it could exercise with no additional rights granted by the NPS (alternative 2b) and the impacts to park resources that would result; in some cases, selection and implementation of that alternative would cause more impacts than if the NPS granted the additional ROW that the applicant has requested (alternative 2). Other alternatives evaluated would have fewer impacts on park resources (alternatives 4 and 5) as long as the applicants

voluntarily exchange their existing easements for new easements or rights-of-way granted by the NPS; to date, the applicant has shown no inclination to do so. Thus, while these scenarios meet the NEPA mandate to consider reasonable alternatives and mitigation measures that may be outside the agency's authority, the NPS ultimately made its decision based on what it may legally require and implement. Therefore, the NPS has identified alternative 2 as the preferred alternative, with the incorporation of mitigation as explained below.

The NPS's mission is to protect and conserve the resources of the units of the national park system in accordance with the enabling legislation, purpose, and significance of each unit. As shown in the impact analysis presented in the draft EIS, alternative 2 has the potential to result in a very high level of impact on a variety of important resources found along the existing transmission corridor, higher than some of the other action alternatives evaluated and much higher than the environmentally preferable alternative (Alternative 1: No Action, i.e., no change in existing on-the-ground conditions). Thus, the identification of alternative 2 as the NPS preferred alternative is contingent on several revised assumptions, as stated in the applicant's comments, and the implementation of mitigation measures, as explained below.

The most critical mitigation measures to the NPS are those that avoid and minimize adverse impacts to park resources. The draft EIS analyzed the impacts of alternative 2 based on the information provided by the applicant in their permit application package. In their comments on the draft EIS, the applicant outlined additional measures to avoid and minimize impacts to park resources, which were not identified in the draft EIS. The applicant indicated they would be willing to implement these measures, which the NPS would require, most notably:

- Most of the access roads would be temporary and would be revegetated and/or restored to natural conditions after construction, rather than be maintained as permanent roads as described in the draft EIS (page 8 of applicant's comments, included in appendix L).
- The applicant would be required to implement necessary measures designed to eliminate the potential for off-road vehicle (ORV) use on temporary and permanent access roads (page 8 of applicant's comments).
- The applicant has conducted additional consultation with the U.S. Fish and Wildlife Service (USFWS) and agreed to implement necessary measures to avoid and minimize adverse impacts to federally listed bog turtles (pages 8–9 of applicant's comments). These measures would be required by the NPS as part of the permit.
- Installation of foundations for towers would be limited to drilling rather than blasting, which would minimize the potential for fracturing limestone formations, and geotechnical investigations would be performed prior to finalizing specific foundation design (page 11 of applicant's comments).
- Different design options, structure types, and construction methods would be utilized that would reduce or eliminate the need for access road construction near sensitive resources, assuming these different options do not increase impacts elsewhere (page 11 of applicant's comments).
- The access road originally proposed through Arnott Fen would no longer be constructed. An alternative road has been identified and would be used instead (pages 46–47 of applicant's comments).
- No access roads would be constructed within 200 feet of MDSR, as stated in the draft EIS (page 47 of applicant's comments).

- Additional archeological studies have identified specific sites and all effects can be eliminated by implementing avoidance and non-ground-disturbing construction techniques (page 48 of the applicant's comments).

A copy of the applicant's comments may be found in appendix L of this final EIS.

These proposed changes in project design, construction, and maintenance, including required mitigation measures, have been incorporated into the alternative 2 description and are an integral component of the preferred alternative.

In addition, the applicant would cover the cost of hiring monitoring staff, either NPS or contractors, to monitor all construction activities.

The preferred alternative also includes mitigation in the form of compensation for unavoidable adverse impacts. However, the NPS approach would be to first work with the applicant to incorporate all practicable measures to avoid or minimize adverse impacts through changes in project design, construction techniques, and restoration of affected resources. Compensation would only be considered for adverse impacts that cannot be completely avoided.

ENVIRONMENTALLY PREFERABLE ALTERNATIVE

The NPS has determined that alternative 1 (no action) is the environmentally preferable alternative. The NPS made this determination based on the analysis of the scientific data about the proposal and included mitigation provided by the applicant and collected by NPS contractors. The environmentally preferable alternative is the alternative that would promote the requirements of the national environmental policy expressed in section 101(b) of NEPA. It is the alternative that causes the least damage to the biological and physical environment and that best protects, preserves, and enhances historic, cultural, and natural resources (CEQ 1981, Q6a). Under the present circumstances, the no-action alternative clearly best meets these requirements.

Alternative 1 would result in the least amount of damage to the biological and physical environment. As the data show, all the alternatives would have some degree of direct and indirect adverse impact on the resources identified within the study area. No alternative would produce a net benefit or even keep conditions completely neutral; they would all be negative from an environmental point of view. However, overall, alternative 1 would result in the least damage among the alternatives. Alternative 1 would leave the existing B-K Line ROW in place, essentially maintaining conditions at status quo, with the exception of increased vegetation management, which would be likely to occur along the corridor of all the alternatives due to implementation of the newest NERC safety standards. Nonetheless, the relatively minor impacts of additional cutting and clearing in the existing ROW are outweighed by the more significant environmental damage that would certainly occur with the construction and operation of a larger transmission line within the parks along any of the other proposed alternatives, including the two proposed by the applicant.

Some of the action alternatives would have modestly beneficial environmental impacts on certain resources, but they are insufficient to offset the considerable environmental harm these same actions would also produce. Benefits would be marginal, and is not apparent from the analysis that any of them would necessarily counterbalance or outweigh the environmental damages caused by the proposed project. The benefits are not so great or widespread that they eclipse or significantly diminish the adverse impacts described by the data. Thus, they are not sufficiently persuasive to overcome the abundant evidence of the environmental damage that would occur if the project were to move forward.

For these reasons, the NPS finds that alternative 1 would cause the least damage to the biological and physical environment and would best protect and preserve the scenic, historic, cultural, and natural resources of the parks involved. Therefore, alternative 1 would best promote the national environmental policy of NEPA and must be selected as the environmentally preferable alternative.

SUMMARY—CONSISTENCY WITH SECTIONS 101(B) AND 102(1) OF NEPA

The CEQ regulations require that the EIS include an analysis of how each alternative meets or achieves the purposes of NEPA, as stated in sections 101(b) and 102(1) [40 CFR § 1502.2(d))]. Each alternative analyzed in a NEPA document must be assessed as to how it meets the following purposes:

1. Fulfill the responsibilities of each generation as trustee of the environment for succeeding generations.
2. Ensure for all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings.
3. Attain the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences.
4. Preserve important historic, cultural, and natural aspects of our national heritage and maintain, wherever possible, an environment that supports diversity and variety of individual choice.
5. Achieve a balance between population and resource use that would permit high standards of living and a wide sharing of life's amenities.
6. Enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.

The CEQ regulations further establish policy for federal agency implementation of NEPA, stating "federal agencies shall to the fullest extent possible interpret and administer policies, regulations, and public laws of the United States in accordance with the policies set forth in the Act and these regulations" [40 CFR § 1502.2(a)]; therefore, other acts and NPS policies are referenced as applicable in the following discussion.

1. *Fulfill the responsibilities of each generation as trustee of the environment for succeeding generations*.

   Alternative 1 would meet the purpose of fulfilling the responsibilities of each generation as trustee for the environment. Although some impacts would continue to occur to vegetation, wetlands, floodplains, landscape connectivity, special status species, rare and unique communities, cultural landscapes, and visual resources, none of the impacts would change the existing conditions of the resources. Impacts would not adversely affect population viability, overall habitat quality, or functions and values of unique communities.

   Alternative 2 would be less consistent than alternative 1 with the purpose of fulfilling the responsibilities of each generation as trustee for the environment due to the magnitude and severity of impacts to resources. Alternative 2 would result in permanent habitat loss and habitat fragmentation from the clearing and reduction of vegetation. Alternative 2 would also disturb or degrade habitat for wildlife and special status species including the federally endangered bog turtle and Indiana bat. Impacts to migratory birds would occur because alternative 2 bisects a major migratory bird flyway and an increase in bird collision is likely. In addition, the transmission line would be located next to one of only two known communal roosts for wintering

bald eagles and collision risk would be especially high as eagles move to and from the roost. Drilling activities associated with alternative 2 could damage or destroy unique geological formations. Overall, substantial impacts to geologic resources, wetlands, vegetation, landscape connectivity, wildlife, and rare and unique communities would occur.

Alternative 2b would be less consistent than alternative 1 with the purpose of fulfilling the responsibilities of each generation as trustee for the environment due to the magnitude and severity of impacts to resource. Alternative 2b would result in permanent habitat loss and habitat fragmentation from the clearing and reduction of vegetation. Alternative 2b would also disturb or degrade habitat for wildlife and special status species including the federally endangered bog turtle and Indiana bat. Impacts to migratory birds would occur because Alternative 2b bisects a major migratory bird flyway and an increase in bird collision is likely. In addition, the transmission line would be located next to one of only two known communal roosts for wintering bald eagles and collision risk would be especially high as eagles move to and from the roost. Drilling activities associated with alternative 2b would damage or destroy unique geological formations. Overall, substantial impacts to geologic resources, wetlands, vegetation, landscape connectivity, wildlife, and rare and unique communities would occur.

Alternative 3 would have substantial impacts on geologic resources, wetlands, vegetation, rare and unique communities, and special status species. Excavation and drilling activities would create impacts to geologic resources also affecting the function of wetlands and surface waters. Drilling and excavation also have the potential to destroy habitat for the state-listed timber rattlesnake. Vegetation clearing would impact mature forests, create additional edge habitat, and increase the risk of invasive species to establish. The transmission line would also bisect a major migratory flyway of the Kittatinny Ridge creating aerial hazards for migratory birds. The removal of the existing transmission line would create beneficial impacts through the rehabilitation of vegetation and reducing the risk of bald eagle collisions. For these reasons, alternative 3 would be less consistent than alternative 1 with the purpose of fulfilling the responsibilities of each generation as trustee to the environment.

Alternative 4 and 5 would have similar substantial impacts to special status species, wetlands, rare and unique communities, and landscape connectivity. A loss of wetlands would occur from the construction of permanent access roads. The clearing of vegetation would increase habitat fragmentation, impact wildlife, and rare and unique communities including Kittatinny Ridge and the Minsi Lake Corridor, which support migratory birds, and special status species. The removal of the existing transmission line would create beneficial impacts through the rehabilitation of vegetation and by reducing the risk of bald eagle collisions. For these reasons, alternatives 4 and 5 would be less consistent than alternative 1 with the purpose of fulfilling the responsibilities of each generation as trustee to the environment.

2. *Ensure for all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings*.

   Alternative 1 would meet the purpose of ensuring for all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings. Alternative 1 would not affect public health and safety as operation and maintenance of the existing transmission line would continue. Although alternative 1 would have some impacts to the cultural landscape and visual resources, there would be no change to the baseline or existing conditions. The existing line has been present at the parks since the parks were established and were thus part of the existing conditions.

   Alternative 2 would create temporary impacts to public health and safety during the construction activities associated with the transmission line. The installation of taller towers would degrade the wilderness viewshed and cultural landscape and create adverse impacts to the visitor experience.

The transmission line would also distract from the scenic values along the Delaware River. These visual impacts would occur over a relatively large area and would impact a number of park users. Therefore, alternative 2 would be less consistent than alternative 1 with the purpose of ensuring all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings.

Alternative 2b would have similar impacts to alternative 2. In addition to the temporary impacts to public health and safety associated with construction activities, alternative 2b would have an increased risk of live wires contacting nearby trees. Because the existing ROW would not be expanded, alternative 2b would not meet NERC standards and the potential for forest fires exists which would create substantial public health and safety impacts. In addition to the public health and safety impacts, alternative 2b would have similar impacts to the viewshed and cultural landscape described above. For these reasons, alternative 2b would be less consistent than alternative 1 with the purpose of ensuring all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings.

Alternative 3 would create temporary impacts to public health and safety during the construction period. The visibility of the new towers along alternative 3 would adversely impact the scenic nature of the parks. The towers would be clearly visible along the Kittatinny Ridge from the Delaware River, McDade Trail, and other popular park sites by numerous park visitors. In addition, the construction of the transmission line would severely degrade the cultural landscape. Therefore, alternative 3 would be less consistent than alternative 1 with the purpose of ensuring all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings.

Alternatives 4 and 5 would have temporary impacts to public health and safety during construction activities. In addition to impacts within the park, impacts to public health and safety would also occur within other federal lands, trails, private properties, and local roads. Impacts to the visual resources would occur along the portion of APPA where the transmission line would cross. The presence of the large tower would diminish the integrity of the viewshed and cultural landscape; however the area impacted would be relatively small when compared to other alternatives. Therefore, alternatives 4 and 5 would be less consistent than alternative 1 with the purpose of ensuring all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings.

3. *Attain the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences.*

Alternative 1 would meet the purpose of attaining the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequence. Although alternative 1 would have temporary impacts to public health and safety and visitor use and experience during the construction period, no changes to the visitor opportunities would occur in the long-term. The existing line has been present at the parks since the parks were established and were thus part of the existing conditions.

Alternatives 2, 2b, and 3 would be less consistent than alternative 1 with the purpose of attaining the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequence. As discussed above, temporary impacts to public health and safety would occur during construction activities. Additional impacts to public health and safety would occur under alternative 2b since the ROW would not comply with NERC standards. Although, the aesthetic resources and scenic vistas would be degraded, visitor opportunities throughout the park would continue to occur following the construction of the transmission line.

Alternatives 4 and 5 would meet the purpose of attaining the widest range of beneficial uses of the environment without degradation, risk of health and safety, or other undesirable and

unintended consequences. Temporary impacts to public health and safety would occur during the construction activities as discussed previously. The scenic viewshed would be impacted in the portion of APPA where the transmission line will cross; however, use of the trail would continue to occur. Other visitor activities within DEWA would not be impacted.

4. *Preserve important historic, cultural, and natural aspects of our national heritage and maintain, wherever possible, an environment that supports diversity and variety of individual choice.*

   Alternative 1 would meet the purpose of preserving important historic, cultural, and natural aspects of our natural heritage and maintain, wherever possible, an environment that supports diversity and variety of individual choice. Alternative 1 would continue maintenance of the existing ROW corridor in addition to implementing the new vegetation management standards. Although some impacts would continue to occur to vegetation, wetlands, floodplains, landscape connectivity, special status species, rare and unique communities, cultural landscapes, and visual resources, none of the impacts would change the existing conditions of the resources. The existing line has been present at the parks since the parks were established and were thus part of the existing conditions.

   Alternatives 2 and 2b would cross through the APPA and the center of DEWA, including MDSR, which includes large areas of mature forests, rare and unique communities including Arnott Fen, Hogback Ridge, Kittatinny Ridge, and Van Campen Brook riparian area. In addition, the transmission line would be located next to one of only two known communal roosts for wintering bald eagles and collision risk would be especially high as eagles move to and from the roost. The transmission line would cross areas with high concentrations of cultural resources including pre-Columbian fishing camps and 36 historic structures. The implementation of alternatives 2 and 2b would have an adverse effect on at least 17 historic structures, 18 cultural landscapes and 1 archeological sites from physical disturbance or the visual intrusion of the transmission line. Therefore, alternatives 2 and 2b would be less consistent than alternative 1 with the purpose of preserving important historic, cultural, and natural aspects of our natural heritage and maintain, wherever possible, an environment that supports diversity and variety of individual choice.

   Alternative 3 would bisect large areas of riparian forests, eastern hemlock forests, unique ecosystems, and the Kittatinny Ridge that provide habitat for wildlife such as migratory birds and rare plant and animal communities. In addition, alternative 3 would have an adverse effect on at least 7 historic structures, 6 cultural landscapes, and 1 archeological site. The construction of the transmission line would create adverse effects from the visual intrusion of the line and through the alteration of character defining features of the landscapes. For these reasons, alternative 3 would be less consistent than alternative 1 with the purpose of preserving important historic, cultural, and natural aspects of our natural heritage and maintain, wherever possible, an environment that supports diversity and variety of individual choice.

   Alternatives 4 and 5 would be less consistent than alternative 1 with the purpose of preserving important historic, cultural, and natural aspects of our natural heritage and maintain, wherever possible, an environment that supports diversity and variety of individual choice. The transmission line under these alternatives would bisect two unique ecosystems, including Kittatinny Ridge and the Minsi Lake Corridor. These areas provide high quality habitat for a variety of wildlife including migratory birds, forest-dependent wildlife, and vernal pool-dependent wildlife. In addition, the transmission line would traverse through two cultural landscapes including the Appalachian Trail and Totts Gap Farm. In addition, alternatives 4 and 5 would have an adverse effect on at least 4 historic structures, 4 cultural landscapes, and 1 archeological site. The cultural landscapes would be adversely impacted under alternatives 4 and 5 through the alteration of character-defining features.

5. *Achieve a balance between population and resource use that would permit high standards of living and a wide sharing of life's amenities.*

   As discussed above, alternative 1 would continue maintenance of the existing ROW corridor in addition to implementing the new vegetation management standards. Although alternative 1 would have some impacts to the natural and physical resources of the park, there would be no change to the baseline or existing conditions. The existing line has been present at the parks since the parks were established and were thus part of the existing conditions. Therefore, the resources would remain unimpaired for the enjoyment of present and future generations. Alternative 1 would meet the purpose of achieving a balance between population and resource use that would permit high standards of living and a wide sharing of life's amenities.

   Alternatives 2 and 2b would result in substantial impacts to geologic resources; wetlands; vegetation; landscape connectivity, wildlife habitat, and wildlife; special-status species; rare and unique communities; archeological resources; historic structures; cultural landscapes; socioeconomics; infrastructure, access and circulation; visual resources; visitor use and experience; wild and scenic rivers; and park operations. Alternative 2b would also have substantial impacts to human health and safety. Under the enabling legislation and Organic Act, the NPS is charged with protecting the scenic, natural, cultural, and archeological resources at each park. In addition, the enabling legislation for all three parks specifically identifies scenery as a park key resource. The permanent removal of vegetation and installation of visibly apparent towers would degrade the integrity of resources and the scenic landscape. These impacts would be widely distributed across the parks wherever the line is visible to visitors and have the potential to violate the Organic Act. For these reasons, there is potential for the resources to become unavailable for the enjoyment of future generations. Therefore, alternatives 2 and 2b would be less consistent than alternative 1 with the purpose of achieving a balance between population and resource use that would permit high standards of living and a wide sharing of life's amenities.

   Alternative 3 would have substantial impacts to geologic resources; vegetation; landscape connectivity, wildlife habitat, and wildlife; special-status species; rare and unique communities; archeological resources; historic structures; cultural landscapes; socioeconomics; infrastructure, access, and circulation; visual resources; visitor use and experience; wild and scenic rivers; and park operations. The expansion of the ROW and installation of towers would visibly change the scenic landscape of a relatively large area and for a large number of park users. The impacts to migratory birds along Kittatinny Ridge would violate NPS policies and mandates and would counter one of the underlying purposes of the establishment of the parks. Alternative 3 also violates the purpose and significance of the parks to preserve the natural, cultural, and scenic resources within them. Therefore, alternative 3 would be less consistent than alternative 1 with the purpose of achieving a balance between population and resource use that would permit high standards of living and a wide sharing of life's amenities.

   Alternatives 4 and 5 would have substantial impacts to geologic resources; wetlands; rare and unique communities; archeological resources; historic structures; cultural landscapes; socioeconomics; infrastructure, access and circulation; visual resources; visitor use and experience; and wild and scenic rivers. The scenic landscape along portions of the Appalachian Trail would be diminished due to the construction of 200 foot towers. Impacts to cultural resources would also be attributed to the visual impacts from the construction of the towers and ROW clearing. Because the impacted area would be relatively small, park resources would likely remain unimpaired for the enjoyment of present and future generations, alternatives 4 and 5 would be less consistent than alternative 1 with the purpose of not meet the purpose of achieving a balance between population and resource use that would permit high standards of living and a wide sharing of life's amenities.

6. *Enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.*

   None of the alternatives would meet the purpose of enhancing the quality of renewable resources and approach the maximum attainable recycling of depletable resources. Alternative 1 would continue to transport energy generated from fossil fuels. Alternatives 2, 2b, 3, 4, and 5 would include the construction of a double circuit 500-kV transmission line in order to transport more energy within the regional area. The action alternatives would result in the use and burning of additional non-renewable fossil fuels. In addition, the construction of the transmission line would require use and degradation of many non-renewable resources. During construction the use of fossil fuels for operation of construction equipment would be required. Some of the parks' natural, physical, and cultural resources impacted during construction are non-renewable which makes any impacts to them all the more serious as they cannot be replaced if lost.

TABLE 4: IMPACTS OF THE ALTERNATIVES

Resource	Alternative 1: No-Action Alternative	Alternative 2: The Applicant's Proposed Route	Alternative 2b	Alternative 3	Alternative 4	Alternative 5
Geologic Resources	No impacts from vegetation maintenance activities on geology and topography; vegetation maintenance could increase access to and visibility of paleontological specimens, particularly at previously identified sites. No significant impacts.	Impacts from tower construction and grading on geology, topography, and paleontology; the installation of **7 tower foundations/crane pads** in rare or unique features and in unstable geologic formations and **12** in areas with slopes greater than 10%, could impact geologic resources; drilling and excavation could disturb paleontological resources. Significant impacts.	Same as alternative 2.	Impacts on geology due to the drilling, and excavation activities; the installation of **at least 25 tower foundations/crane pads** in areas with slopes greater than 10% and **11 to 15 towers/crane pads** in unstable areas and in rare or unique geologic features; construction and clearing would impact paleontology through direct damage, collection, or vandalism of paleontological sites. Significant impacts.	Impacts from tower construction and grading on geology, topography, and paleontology; **the installation of 2 tower foundations/crane pads** in areas with slopes greater than 10% and in unstable areas; no towers would be constructed within rare or unique geology inside the study area; construction and clearing would impact paleontology through direct damage, collection, or vandalism of paleontological sites. Significant impacts.	Impacts from tower construction and grading on geology, topography, and paleontology; **the installation of 2 tower foundations/crane pads** in areas with unstable geologic formations and 1 in an area with slopes greater than 10%; no towers would be constructed within rare or unique geology inside the study area; construction and clearing would impact paleontology through direct damage, collection, or vandalism of paleontological sites. Significant impacts.
Floodplains	Impacts from vegetation maintenance in the floodplain; vegetation clearing would impact some floodplain functions and values, but is not likely to affect overall natural floodplain values. No significant impacts.	A maximum of **14.3 acres of vegetation in the floodplain** would be affected by vegetation management; access roads and crane pads would develop **0.14 acre of the floodplain**. No significant impacts.	A maximum of **8.4 acres of vegetation in the floodplain** would be affected by vegetation management; access roads and crane pads would develop **0.14 acre of the floodplain**. No significant impacts.	A maximum **of 7.9 acres of vegetation in the floodplain** would be affected by vegetation management; access roads and crane pads would develop **0.22 acre of the floodplain**. No significant impacts.	**No vegetation in the floodplain** would be cleared; access roads and crane pads would develop **0.16 acre of the floodplain**. No significant impacts.	**No vegetation in the floodplain** would be cleared and **no development in the floodplain** would occur. No significant impacts.
Wetlands	Impact from vegetation maintenance, resulting in **conversion of 8.64 acres of wetlands** to scrub shrub or emergent wetlands; 5.46 acres of rare and unique wetlands, which are also Exceptional Value Wetlands, would be affected. No significant impacts.	Impacts from clearing wetlands, resulting in **conversion of 20.28 acres of forested wetlands** to scrub shrub and/or emergent wetlands; construction of access roads and crane pads in wetlands (1.02 acres), and from drilling activities; **15.22 acres of Exceptional Value Wetlands and/or rare and unique wetlands** would be affected. Significant impacts.	Impacts from clearing wetlands, resulting in **conversion of 10.28 acres of forested wetlands** to scrub shrub and/or emergent wetlands; construction of access roads and crane pads in wetlands (1.01 acres), and from drilling activities; **6.35 acres of Exceptional Value Wetlands and/or rare and unique wetlands** would be affected. Significant impacts.	Impacts from clearing wetlands, resulting in **conversion of 1.93 acres of forested wetlands** to scrub shrub and/or emergent wetlands; construction of access roads in wetlands (0.02 acres) and from drilling activities; no permanent impacts on Exceptional Value Wetlands and/or rare and unique wetlands. No significant impacts.	Impacts from clearing wetlands, resulting in **conversion of 4.52 acres of forested wetlands** to scrub shrub and/or emergent wetlands; construction of access roads in wetlands (0.09 acres) and from drilling activities; no permanent impacts on Exceptional Value Wetlands and/or rare and unique wetlands. Significant impacts.	Impacts from clearing wetlands, resulting in **conversion of 4.31 acres of forested wetlands** to scrub shrub and/or emergent wetlands; construction of access roads in wetlands (0.09 acres) and from drilling activities; no permanent impacts on Exceptional Value Wetlands and/or rare and unique wetlands. Significant impacts.
Vegetation	Impacts would result from vegetation maintenance activities and maintenance of scrub shrub habitat in the ROW; functionality of the plant communities would not be affected. No significant impacts.	Approximately **240 acres of vegetation would be cleared** in the ROW, 129 acres of this which is mature forest; impacts would also result from spread of invasive species, vegetation maintenance activities, and vegetation clearing from other construction activities outside the ROW (25.4 acres); functionality of the plant communities would decline. Significant impacts.	Approximately **144 acres of vegetation would be cleared in the ROW**, 42 acres of this which is mature forest; impacts would also result from spread of invasive species, vegetation maintenance activities, and vegetation clearing from other construction activities outside the ROW (26.7 acres); functionality of the plant communities would decline. Significant impacts.	Approximately **313 acres of vegetation would be cleared in the ROW**, 204 acres of this which is mature forest; impacts would also result from spread of invasive species, vegetation maintenance activities, and vegetation clearing from other construction activities outside the ROW (100.6 acres); functionality of the plant communities would decline. Significant impacts.	Approximately **113 acres of vegetation would be cleared in the ROW**, 70 acres of this which is mature forest; impacts would also result from spread of invasive species, vegetation maintenance activities, and vegetation clearing from other construction activities outside the ROW (55.9 acres); functionality of the plant communities would decline. No significant impacts.	Approximately **74 acres of vegetation would be cleared in the ROW**, 44 acres of this which is mature forest; impacts would also result from spread of invasive species, vegetation maintenance activities, and vegetation clearing from other construction activities outside the ROW (55.3 acres); functionality of the plant communities would decline. No significant impacts.

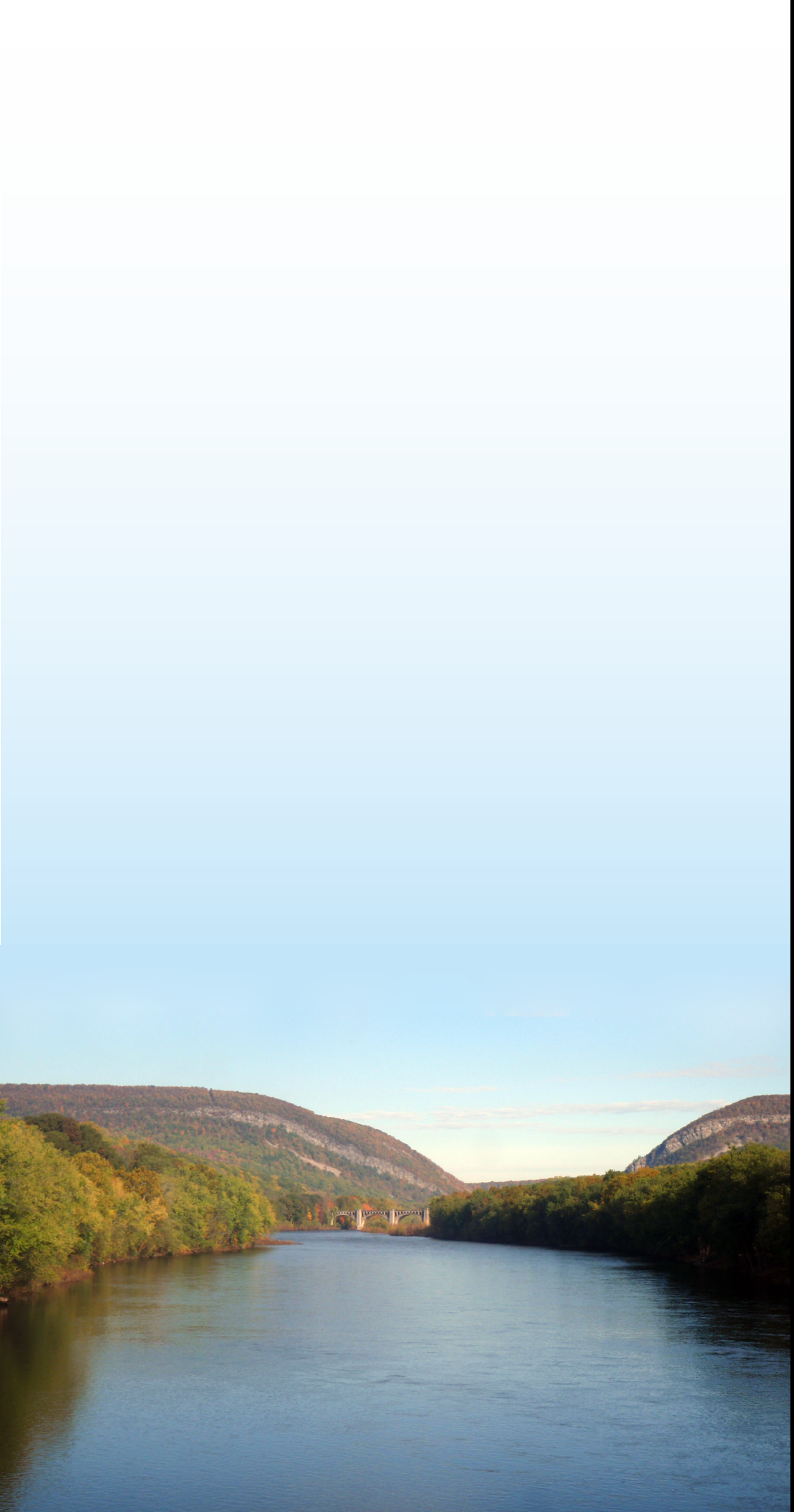
Resource	Alternative 1: No-Action Alternative	Alternative 2: The Applicant's Proposed Route	Alternative 2b	Alternative 3	Alternative 4	Alternative 5
Landscape Connectivity, Wildlife Habitat, and Wildlife	Impacts would result from the continued maintenance of the ROW, loss of habitat from removal of danger trees outside the ROW, and disturbance and direct mortality of wildlife. No significant impacts.	Impacts would result from habitat loss, habitat alteration, the continued maintenance of the ROW, the isolation of habitat patches, increased edge habitat, the disturbance and direct mortality of wildlife, and the isolation of some species. Significant impacts.	Same as alternative 2.	Impacts would result from habitat loss, habitat alteration, the continued maintenance of the ROW, the isolation of habitat patches, increased edge habitat, the disturbance and direct mortality of wildlife, and the isolation of some species. Benefit from restoration of the B-K Line, resulting in larger patches of contiguous habitat. Significant impacts.	Impacts would result from habitat loss, habitat alteration, the continued maintenance of the ROW, the isolation of habitat patches, increased edge habitat, the disturbance and direct mortality of wildlife, and the isolation of some species. Benefit from restoration of the B-K Line, resulting in larger patches of contiguous habitat, and moving the infrastructure to the edge of DEWA. No significant impacts.	Impacts would result from habitat loss, habitat alteration, the continued maintenance of the ROW, the isolation of habitat patches, increased edge habitat, the disturbance and direct mortality of wildlife, and the isolation of some species. Benefit from restoration of the B-K Line, resulting in larger patches of contiguous habitat, and moving the infrastructure to the edge of DEWA. No significant impacts.
Special-status Species Overall*	No significant impacts.	Significant impacts.	Significant impacts.	Significant impacts.	No significant impacts.	No significant impacts.
Special-status Species: Aquatic Species	Impacts from temporary changes to water quality during maintenance activities.	Impacts from direct mortality, habitat loss, and some changes to habitat during construction and maintenance activities.	Same as alternative 2.	Impacts from changes to habitat during construction and maintenance activities.	No impact because no aquatic species are likely to exist in the ROW.	Same as alternative 4.
Special-status Species: Terrestrial Invertebrate Species	Vegetation maintenance activity would maintain and could expand suitable habitat (herbaceous).	Same as alternative 1.	Same as alternative 1.	N/A	N/A	N/A
Special-status Species: Birds	Impacts from maintenance activities could destroy nesting habitat and disturb breeding/nesting activities; conversely maintenance could create additional scrub shrub habitat in ROW; electrocution/collision potential.	Impacts from construction of line resulting in habitat loss, from presence of line resulting in collision or electrocution, and from disturbance during construction and maintenance activities; could create additional scrub shrub habitat in ROW; this alternative would not be consistent with the Bald Eagle Guidelines.	Same as alternative 2.	Same as alternative 2.	Impacts from construction of line resulting in habitat loss, from presence of line resulting in collision or electrocution, and from disturbance during construction and maintenance activities; could create additional scrub shrub habitat in ROW; this alternative would be consistent with the Bald Eagle Guidelines.	Same as alternative 4.
Special-status Species: Reptiles and Amphibians	Impacts from maintenance and human activities from disturbance of denning, basking, foraging, nesting, and breeding activities as well as introduction of invasive species.	Impacts from direct mortality, destruction of nests and/or overwintering areas; impacts on habitat used for foraging and basking; habitat loss / fragmentation / degradation during construction and maintenance activities. Potential for illegal collection of special-status reptiles due to easier access from maintained access roads.	Same as alternative 2.	Same as alternative 2.	Same as alternative 2.	Same as alternative 2.
Special-status Species: Mammals	Impacts from disturbance during maintenance activities and from tree removal in areas with potential habitat.	Impacts from noise and disturbance during construction; loss of potential habitat, including roosting sites or maternity colonies.	Same as alternative 2.	Same as alternative 2.	Same as alternative 2.	Same as alternative 2.
Special-status Species: Plants	Impacts from maintenance activities, including some wetland areas that support listed plants; disturbance as well as introduction of invasive species would occur.	Impacts from forest clearing, construction in wetland areas from access roads and crane pads, and drilling, as well as from vegetation maintenance.	Same as alternative 2.	Same as alternative 2.	Same as alternative 2.	Same as alternative 2.

Resource	Alternative 1: No-Action Alternative	Alternative 2: The Applicant's Proposed Route	Alternative 2b	Alternative 3	Alternative 4	Alternative 5
Rare and Unique Communities	Impacts from artificially maintaining scrub shrub habitat in the park artificially maintaining scrub shrub habitat in the parks; soils and wildlife would be affected. No significant impacts.	Impacts from vegetation clearing, line construction, deconstruction of the existing line, and potential spread of invasive species, as well as artificial maintenance of scrub shrub habitat; six communities would be affected (Arnott Fen, Delaware River Riparian Corridor, eastern hemlock forests, Hogback Ridge, Kittatinny Ridge, Van Campen). Significant impacts.	Same as alternative 2.	Impacts from vegetation clearing, line construction, deconstruction of the existing line, and potential spread of invasive species, as well as artificial maintenance of scrub shrub habitat; three communities would be affected (Delaware River Riparian Corridor, eastern hemlock forests, Kittatinny Ridge). Significant impacts.	Impacts from vegetation clearing, line construction, deconstruction of the existing line, and potential spread of invasive species, as well as artificial maintenance of scrub shrub habitat; for communities would be affected (eastern hemlock forests, Kittatinny Ridge, Minsi Lake / Bear Swamp, Totts Gap). Significant impacts.	Same as alternative 5 but would not impact eastern hemlock forests. Significant impacts.
Archeological Resources	Impacts on archeological sites due to physical impacts from the maintenance of vegetation along the existing ROW. No significant impacts.	Impacts from physical impacts of construction and disturbance of archeological resources; **2 known archeological sites** could be directly affected by construction activities; impacts would depend on the nature and extent of physical disturbance to the archeological resources. **Adverse effects on one site** with prehistoric components Significant impacts.	Same as alternative 2.	Possible impacts from physical impacts of construction and disturbance of archeological resources; **1 potential archeological site** exists along this alternative; impacts would depend on the nature and extent of physical disturbance to the potential archeological resources. **Adverse effects on one site** with historic components. Significant impacts.	Possible impacts from physical impacts of construction and disturbance of archeological resources; **1 potential archeological site** exists along this alternative; impacts would depend on the nature and extent of physical disturbance to the potential archeological resources. **Adverse effects on one site** with prehistoric components. Significant impacts.	Same as alternative 4.
Historic Structures	Impacts from the visual impact of vegetation removal during maintenance activities. No significant impacts.	Impacts on historic structures from physical destruction and removal of vegetation and the visual impact of larger towers and lines, which would diminish the integrity of the setting, feeling, and association of numerous historic structures. **Adverse effects on at least 17 identified historic structures**, one through physical destruction and at least 16 through visual effects. Significant impacts.	Same as alternative 2.	Impacts on historic structures from removal of vegetation and the visual impact of larger towers and lines, which would diminish the integrity of the setting, feeling, and association of numerous historic structures; physical destruction of the B-K Line, an historic structure. **Adverse effects on at least 7 identified historic structures** through visual effects. Significant impacts.	Impacts on historic structure from removal of vegetation and the visual impact of larger towers and lines, which would diminish the integrity of the setting, feeling, and association of numerous historic structures; physical destruction of the B-K Line, an historic structure. **Adverse effects on at least 4 identified historic structures** through visual effects. Significant impacts.	Same as alternative 4.
Cultural Landscapes	Physical and visual impacts of the existing line and vegetation maintenance; would diminish the integrity of setting, feeling, and association of numerous cultural landscapes. No significant impacts.	Impacts on cultural landscapes from vegetation clearing and construction of new towers, altering character-defining features and resulting in measurable changes, thus diminishing the overall integrity of the resources, or producing noticeable changes or alterations to the character-defining features of the cultural landscapes. **Adverse effects on 18 cultural landscapes** through visual intrusions and physical impacts. Significant impacts.	Same as alternative 2.	Impacts on cultural landscapes from vegetation clearing and construction of new towers, altering character-defining features and resulting in measurable changes, thus diminishing the overall integrity of the resources. **Adverse effects on 6 cultural landscapes** through visual intrusions and physical impacts. Significant impacts.	Impacts on cultural landscapes from vegetation clearing and construction of new towers, altering character-defining features and resulting in measurable changes, thus diminishing the overall integrity of the resources. **Adverse effects on 4 cultural landscapes** through visual intrusions and physical impacts. Significant impacts.	Same as alternative 4.

Resource	Alternative 1: No-Action Alternative	Alternative 2: The Applicant's Proposed Route	Alternative 2b	Alternative 3	Alternative 4	Alternative 5
Socioeconomics	No impact on socioeconomics. No significant impacts.	Impacts to the local and regional economy due to changes in recreation, visitation, tourism, and agricultural revenue. Opportunity for job placement during the construction period. Significant impacts.	Same as alternative 2.	Same as alternative 2.	Same as alternative 2.	Same as alternative 2.
Infrastructure, Access, and Circulation	Temporary, brief road closures or detours during the maintenance periods. Hamilton Trail in New Jersey, the McDade Trail near Community Drive, and part of the Van Campen Glen Trail would be used for maintenance activities. No significant impacts.	Use of heavy construction equipment on historic River Road and 1.5 miles of Old Mine Road would result in impacts on infrastructure. Impacts on access and circulation would occur at specific locations during the construction period. Significant impacts.	Same as alternative 2.	Use of heavy construction equipment on approximately 4.5 miles of River Road and 6.5 miles of Old Mine Road would result in impacts to infrastructure. Impacts on access and circulation would occur at specific locations during the construction period. Benefit from removal of large infrastructure along the B-K Line under alternative 3. Significant impacts.	The use of heavy equipment on NPS Drive, Totts Gap Road, and Mountain Road would result in impacts to infrastructure. Impacts on access and circulation would occur during the construction period at specific locations. Benefit from removal of large infrastructure along the B-K Line under alternative 4. Significant impacts.	Same as alternative 4.
Visual Resources	The presence of the existing alignment would affect visual intactness from continued operation of the existing transmission line. No significant impacts.	Changes to visual resources from the deconstruction and construction activities would be most apparent along Millbrook Flatbrook Road and Old Mine Road in New Jersey. Affected sites in Pennsylvania potentially include Fernwood Resort, Pennsylvania Hwy 209 near Bushkill, McDade Trail, the cultural landscape related to the Schoonover house, and Community Drive. Affected sites in New Jersey potentially include Van Campen Glen, Hamilton, and Pioneer trails, Watergate Recreation Site, and Millbrook Village. The higher towers would also impact the viewshed at Walpack Bend, and the Appalachian Trail. Significant impacts.	Changes to visual resources from the deconstruction and construction activities would be similar to alternative 2. The impacts would be most apparent along McDade Trail near the Schoonover House and Community Drive, and MDSR. There would be two additional nearly 200-foot towers. Significant impacts.	Changes to visual resources from the deconstruction and construction activities would be most apparent along McDade Trail, Old Mine Road, MDSR, and APPA. Improved visual cohesiveness and unity resulting from the unobstructed natural forest cover within due to the removal of the existing B-K Line, but there would be greater visual impact along the alternative 3 ROW from two sets of structures. Line would also be visible from popular recreation sites, including Smithfield Beach and Hialeah Air Park Significant impacts.	Changes to visual resources from the deconstruction and construction activities would be most apparent where the line would be in proximity to APPA, but would also occur at Mount Tammany summit and the Karamac Trail. Improved visual cohesiveness and unity resulting from the unobstructed natural forest cover within due to the removal of the existing B-K Line, but there would be greater visual impact along the alternative 4 ROW from two sets of structures. Significant impacts.	Changes to visual resources from the deconstruction and construction activities would be most apparent where the transmission line would cross APPA because it would also be intersected by an access road. Improved visual cohesiveness and unity resulting from the unobstructed natural forest cover within due to the removal of the existing B-K Line, but there would be greater visual impact along the alternative 5 ROW from two sets of structures. Significant impacts.
Soundscapes	Intermittent impacts on soundscapes due to maintenance activities associated with continued operation of the existing transmission line. No significant impacts.	Impacts would result from disturbance during decommissioning, construction, and maintenance activities. Some readily detectable impacts would be expected within 350 feet of the alignment centerline from the operation of the line. No significant impacts.	Same as alternative 2.	Impacts would result from disturbance during decommissioning, construction, and maintenance activities. Some readily detectable impacts would be expected within 300 feet of the alignment centerline during operation and maintenance. No significant impacts.	Same as alternative 2.	Same as alternative 2.

Resource	Alternative 1: No-Action Alternative	Alternative 2: The Applicant's Proposed Route	Alternative 2b	Alternative 3	Alternative 4	Alternative 5
Visitor Use and Experience	Impacts would result primarily from the continued visual impacts of the existing transmission line. Noise and visual intrusions would result in slight impacts during maintenance activities. No significant impacts.	Impacts to visitor use and experience with the most intense impacts at Watergate Recreation Site. Visitors would experience impacts where the transmission line crosses APPA. Impacts related to deconstruction and construction would be localized, particularly related to noise. Significant impacts.	Same as alternative 2.	The 90-degree bend of the line would affect views from several vantage points, affecting many visitors. New visual intrusions would be created at Raccoon Ridge along APPA, and would be seen from other vantage points along the trail. Impacts at APPA would occur for 2.5 miles. Construction-related impacts would occur from impacts on soundscapes based on location. Significant impacts.	Impacts would occur at the Red Dot (Tammany) Trail and Karamac Trail. Construction-related impacts would occur from impacts on soundscapes based on location. Significant impacts.	Same as alternative 4.
Wild and Scenic Rivers	**No additional impact** on the values on which the river was designated from any maintenance activities. No significant impacts.	Many of the values for which the river was designated would be perceptibly changed and would result in visual changes that would affect a relatively large area, a large number of users, and would exist for the period of analysis. Significant impacts.	Same as alternative 2.	Many of the values for which the river was designated would be perceptibly changed and would result in visual changes that would affect a relatively large area, a large number of users, and would exist for the period of analysis. Enhancement of MDSR values from the decommissioning and restoration of the B-K alignment. Significant impacts.	Enhancement of MDSR values from the decommissioning and restoration of the B-K Line. Significant impacts.	Same as alternative 4.
Park Operations	Some adverse impacts from continued operation and maintenance of the existing B-K Line. Park staff would monitor vegetation maintenance activities, but the maintenance would not be conducted on a regular basis; there would be **no change in the number of park staff** and no change to the parks' budgets because it is assumed that the applicant would be responsible for the costs associated with the NPS managing the permit. No significant impacts.	Adverse impacts from need for park staff for patrolling, monitoring, and enforcement; Impacts on park operations would result from construction-related activities and monitoring activities; 2 to 3 new employees would be hired; there would be no change to the parks' or divisions' budgets because the applicant would be responsible for the parks' costs associated with the NPS managing the permit. Significant impacts.	Same as alternative 2.	Same as alternative 2.	Adverse impacts, but moderated by shorter construction period, shorter crossing of NPS lands and fewer sensitive resources present. Impacts on park operations would result from construction-related activities and monitoring activities (including actions along APPA); 1 new employee would be hired; there would be no change to the parks' or divisions' budgets because the applicant would be responsible for the parks' costs associated with the NPS managing the permit. No significant impacts.	Same as alternative 4, but impacts may be even less as route does not include section of DEWA west of the Bushkill Substation. No significant impacts.
Health and Safety	Adverse impacts from continuing operation and maintenance of the existing B-K Line. No significant impacts.	Impacts on visitors/staff at DEWA, MDSR, and APPA from potential safety hazards associated with construction, equipment related hazards, and transportation of materials. Impacts to safety would be minimized and temporary. No significant impacts.	Impacts to visitors and staff from potential safety hazards associated with construction activities. Impacts to safety would be minimized and temporary. Additional impacts to health and safety due to fire risk and potential power outages from failure to meet NERC clearance standards. Significant impacts.	Impacts on visitors/staff at DEWA, MDSR, and APPA from potential safety hazards associated with construction, equipment related hazards, and transportation of materials. Impacts for park staff and visitors at APPA slightly less severe than alternative 2 due to a smaller area affected by construction. Impacts to safety would be minimized and temporary. No significant impacts.	Same as alternatives 2 and 3, but area affected is smaller. No significant impacts.	Same as alternative 4, but the area affected is slightly smaller. No significant impacts.

*Significance criteria only evaluated on a resource level, not species specific.



Chapter 3
Affected Environment

CHAPTER 3: AFFECTED ENVIRONMENT

INTRODUCTION

The "Affected Environment" chapter describes the resources that could be affected as a result of implementation of any of the alternatives. The resource descriptions provided in this chapter serve as the baseline against which the potential effects of the proposed actions considered in this draft environmental impact statement (EIS) are compared. The resource topics presented in this chapter and the organization of the topics correspond to the resource impact discussions contained in chapter 4, "Environmental Consequences." The general project setting has been included to provide the background necessary to understanding the park resources and environment. The following resources are included in this chapter: geology (rare and unique geologic communities); floodplains; wetlands; vegetation; landscape connectivity, wildlife habitat (including aquatic habitat), and wildlife (including migratory birds); species of special concern; rare and unique communities; cultural resources; socioeconomics; visitor experience; scenic and aesthetic resources (i.e., viewsheds and soundscapes); wild and scenic rivers; long-term management of resources; park operations; and health and safety.

The resources within the parks are keystones in assuring the persistence of intact, healthy, and functional resources (natural, recreational, cultural, and scenic alike) in the region. The area surrounding the park units is rapidly experiencing development, and these park units were created for protecting these resources in perpetuity. Each resource is described in two different segments (inside the study area and outside the study area) using the endpoints of the Susquehanna-to-Roseland (S-R Line) and study area as described in chapter 2. A study area is delineated by the locations where the line transitions from a known alignment (the alternative described by the National Park Service (NPS) and evaluated in this EIS) to an unknown alignment (the applicant could use the route identified or other routes to reach the line end). The study area is bound by the visual split locations (VSLs), as described in chapter 2, and ranges from 100 to 350 feet wide, depending on the alternative. Information inside the study area is more detailed, because the exact location of the proposed S-R Line and other alternatives are known. "Outside the study area" is the area beyond the defined study area to the S-R Line endpoints (the Susquehanna and Roseland substations) in Pennsylvania and New Jersey.

GENERAL PROJECT SETTING

Each of the proposed alternatives crosses at least two of three units of the national park system: Delaware Water Gap National Recreation Area (DEWA), Middle Delaware National Scenic and Recreation River (MDSR), and Appalachian National Scenic Trail (APPA) (figure 2). MDSR is completely within DEWA. APPA is within DEWA where alternatives 1, 2, 2b, 3, 4, and 5 cross the trail. Table 5 presents the resources crossed by each alternative inside the study area.

DEWA encompasses approximately 67,000 acres of mountain ridge, forests, and floodplains on both sides of the Delaware River. MDSR is a 40-mile section of the Delaware River completely within DEWA that flows between low, forested mountains and cuts through the mountain ridge forming the Delaware Water Gap. The Delaware Water Gap is a mile wide from New Jersey's Mount Tammany (1,527 feet) to Pennsylvania's Mount Minsi (1,463 feet), and is about 1,200 feet deep from the tops of these mountains to the surface of the river, which is 290 feet above mean sea level (AMSL). The maximum depth of the river at the Delaware Water Gap is about 55 feet (NPS 2010i, 1).

TABLE 5: SUMMARY OF PHYSICAL AND NATURAL RESOURCES PRESENT ALONG THE ALTERNATIVES INSIDE THE STUDY AREA

Resource	Alternative 1	Alternative 2	Alternative 2b	Alternative 3	Alternative 4	Alternative 5
Acidic broadleaf swamp					X	X
Acidic cliff	X	X	X			
Agricultural land	X	X	X	X		
Calcareous fen	X	X	X			
Circumneutral broadleaf swamp						
Coldwater fishes	X	X	X		X	X
Coniferous forest	X	X	X	X		
Deciduous forest	X	X	X	X	X	X
Forested wetland	X	X	X	X	X	X
Hemlock forest	X	X	X	X		
Limestone bedrock	X	X	X	X	X	
Major migratory bird flyway	X	X	X	X	X	X
Migratory fishes	X	X	X	X	X	X
Mixed forest	X	X	X	X		
Palustrine emergent wetland	X	X	X	X		
Prime farmlands	X	X	X	X	X	X
Rocky summit outcrops					X	X
Scrub shrub	X	X	X	X	X	X
Scrub shrub wetland	X	X	X		X	X
Special-status species—aquatic[a]	X	X	X	X	X	X
Special-status species—plants[a]	X	X	X	X	X	X
Special-status species—terrestrial[a]	X	X	X	X	X	X
Surface waters	X	X	X	X	X	X
Talus	X	X	X	X	X	X
Unique farmland	X	X	X			
Vernal pools	X	X	X			
Warmwater fishes	X	X	X	X		
Within 100-year floodplain	X	X	X	X		

a. Special-status species that are present or could be found based on the presence of suitable habitat.

APPA extends from Georgia to Maine, with approximately 27 miles within DEWA atop the Kittatinny Ridge. Kittatinny Ridge, which includes Kittatinny Mountain in New Jersey and Blue Mountain in Pennsylvania, is a 185-mile ridge that winds through Western New Jersey and eastern and central Pennsylvania south to the Maryland state line.

Outside the study area, the S-R Line could cross through seven counties in Pennsylvania: Carbon, Lackawanna, Luzerne, Monroe, Northampton, Pike, and Wayne. Three counties in New Jersey could be crossed outside the study area: Morris, Sussex, and Warren. Outside the study area, the NPS cannot require the applicant to follow a certain route; therefore, the portion of the route outside the study area is not discussed in detail in this chapter.

GEOLOGIC RESOURCES

GEOLOGY

DEWA lies within the two physiographic provinces – the Appalachian Plateau and the Valley and Ridge. The Appalachian Plateau is known locally as the Pocono Plateau and is characterized by enlarged stream valleys and rounded hills. The Valley and Ridge includes the river lowlands or alluvium-filled basins and the low parallel ridges of the valley. The rocks within the park area aggregate more than 8,000 feet in thickness and primarily range in age from the Middle Ordovician to the Upper Devonian, approximately 440 to 380 million years ago. The structure in the rocks and the resulting landscape features trend northeastward. (Epstein 2001).

Appendix G-1 presents generalized stratigraphic column of the geologic units of DEWA. The major formations are presented to show the range of alternatives that cross inside the study area and the periods in which these formations occurred. Descriptions and properties, including drainage, ease of excavation, and foundation stability for each formation, are included in the table. Overall geology of DEWA is presented on figure 10 and supplemented for DEWA on figure 11. A generalized cross section of the DEWA area is included as figure 12. The locations of the geologic formations along each alternative are shown in figures 13 through 16. Figures 17 through 19 depict the slopes associated with the alternatives. The slopes were assessed in three categories (slopes less than 10%, slopes from 10 to 30%, and slopes greater than 30%) and were based on common slope stability designations.

In the northern two-thirds of DEWA, the Delaware River flows along the eastern edge of a Devonian formation of Mahantango shale, which is dissected by streams flowing from the Pocono Plateau. Waterfalls are frequent features of these tributary streams. The southern third of DEWA includes the project study area and has more complex geology. At Wallpack Bend, the river cuts through the Hogback Ridge, which is composed of Devonian Buttermilk Falls limestone, and then follows the southeastern edge of the Silurian Bossardsville limestone formation to where it cuts through the Shawangunk formation of the Kittatinny Mountains to form the water gap. The area was covered by ice during the last Wisconsin glaciations. The Delaware River valley and tributary streams are characterized by glaciofluvial deposits which comprise and outwash terrace. Kames and kame terraces occur intermittently at the base of the valley walls, which were formed as the ice front retreated north (NPS 1987, 105-106).

There is a database that was developed from the bedrock and surficial geologic mapping by the U.S. Geological Survey, New Jersey Geological Survey and the Pennsylvania Geological Survey which identifies three types of landslides within DEWA; two of these have recently occurred close and to the north of the project study area. A soil slip occurred near just south of Wallpack Bend following a heavy rain in 1995. Here bedding planes of the Bloomsburg Red Beds are covered with a thin veneer of soil and glacial till in a moderately dipping northwest limb of an anticline in the Valley and Ridge province. The combination of heavy rain and lack of anchoring of the soil by tree roots that did not penetrate the polished bedrock surface resulted in the landslide. A debris flow in rain-saturated glacial till developed along the steep bank of Brodhead Road in Pennsylvania in 1996. Glacial till is common throughout the area and landslides may be anticipated in areas where the bases of steep slopes are excavated. Two rockfalls occurred in New Jersey where Old Mine road parallels longitudinal joints near the crest of the anticline just north of Delaware Water Gap and on the northwest limb of an anticline opposite Tocks Island. These fractures are common in bedrock throughout DEWA. Additionally, stress measurements by the U.S. Army Corps of Engineers (USACE) on the northwest-dipping bedding-plane faults in New Jersey near Tocks Island imply the fact that there is potential for massive failure of rock above these structures should they be exposed by construction (Epstein 2001).

Groundwater: Groundwater is water located beneath the ground surface in soil pore spaces and in the fractures and conduits of rock formations. The overall thickness of most of the water bearing units in the DEWA area is approximately 800 feet; however, there is a lack of water bearing fractures and conduits below 500 feet. The water table is an expression of the overall topography of the area and can be found relatively close to the surface in low-lying areas, and deeper throughout the uplands. Wells in the area of Warren County, New Jersey have depths of water that range from 35 feet to 600 feet below ground surface (Carswell and Lloyd 1979).

Paleontology: Paleontological resources are defined as the fossils of plants, animals, or their traces, including both mineral and organic remains of either a body or a trace. Paleontological resources are studied in the context of the geological data associated with the fossil, providing clues as to the ancient environment, or paleogeological context.

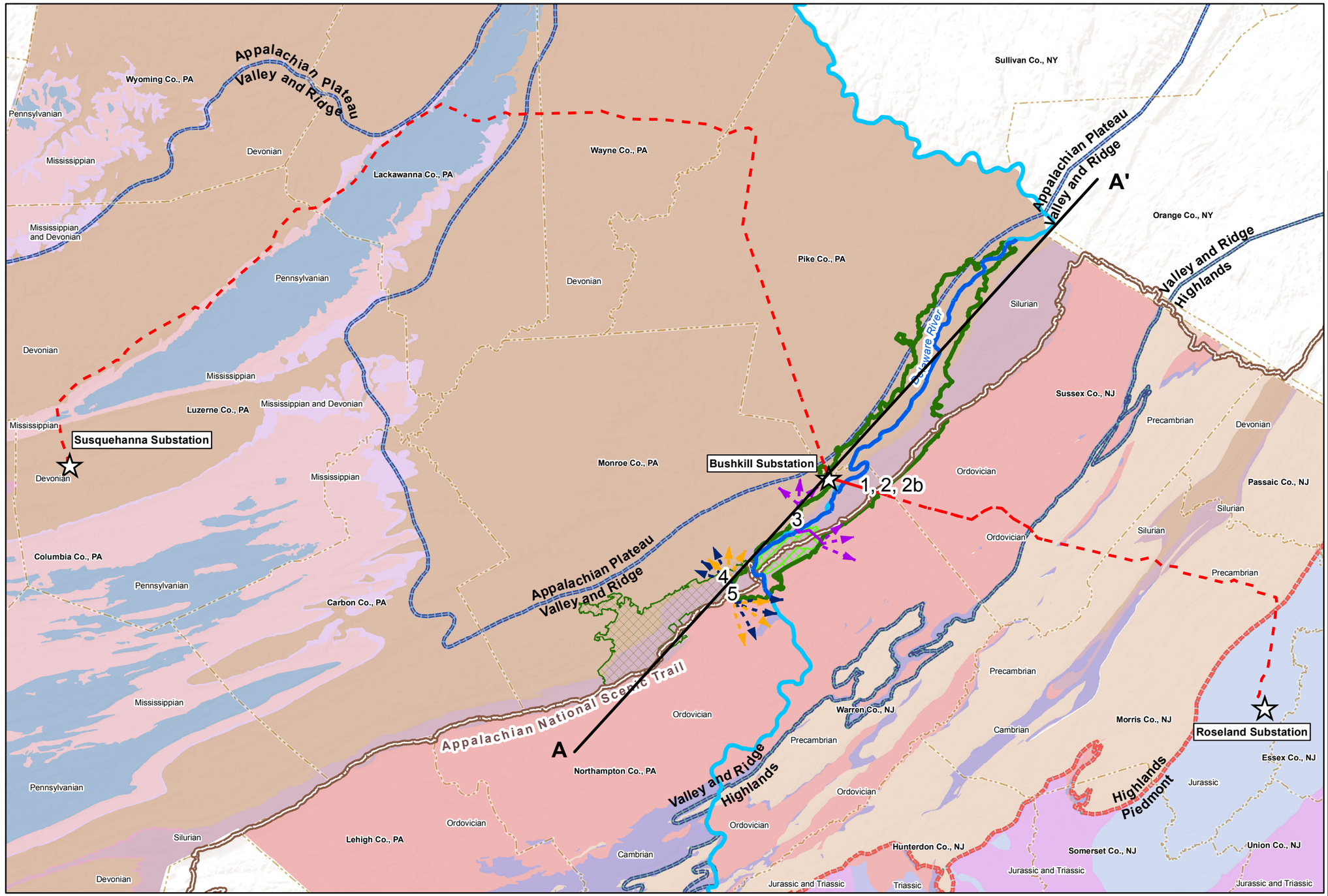
Certain geologic formations tend to contain higher numbers of paleontological specimens. Several of the geologic formations found within the study area are rich in fossils. There are also several known paleontological sites within the study area. Specimens have been collected within some of these sites, providing further knowledge of the paleontological resources found within the study area. Species collected from the study area indicate a rich Paleozoic fossil record, and a more sparse Pleistocene fossil record, though fossils from this era have been underexplored within DEWA (NPS 2004a, 19).

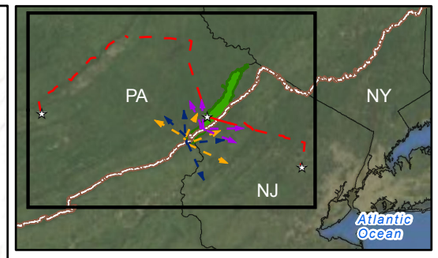
Fossiliferous formations include the Martinsburg, Bloomsburg, Decker, Coeymans, Buttermilk Falls Limestone, and Mahantango formations. All these formations are found along the alignments for alternatives 1, 2, 2b and 3. Four of these formations are found along the proposed corridor for alternative 4 and two along alternative 5 (appendix G-2). Additionally, known paleontological sites have been identified along alternatives 1, 2, and 2b, as well as in close proximity to alternative 3.

Rare or Unique Geologic Features: The New Jersey Geological Survey documents a large number of karst features found on the New Jersey side of DEWA. Karst features include sinkholes, sinking streams, spring and a few very small caves. Most of these are found in the middle section of Wallpack Ridge in Onondaga Formation. Onondaga limestone is susceptible to dissolution by water. It is approximately 270 feet thick and contains the Buttermilk Falls Limestone and the Onondaga Limestone. In addition to the Onondaga Formation, other Devonian formations containing limestone can also be present in the area, such as the Ridgeley Formation, and Silurian formations such as the Decker Formation (NJDEP 2006). The presence of limestone has contributed to the development of plant communities as discussed in the "Rare and Unique Communities" section of this chapter.

The mapped units considered rare or unique within the study area are the Buttermilk Falls Limestone through Esopus Formation, undivided, the Ridgeley Formation through Coeymans Formation, undivided, and the Decker Formation through Poxono Island Formation, undivided. Individual formations within these groups contain varying amounts of carbonate material. Descriptions of these formations are provided in appendix G-1.

Arnott Fen is a calcareous wetland within DEWA that is close to Bushkill, Pennsylvania and within the project study area. A calcareous fen arises out of the unique geological conditions that foster a unique biological community. The Hogback Ridge area of Pennsylvania and New Jersey is considered to be a unique and important habitat containing distinctive geology, which is dominated by limestone and exposed in many areas. Hogback Ridge occurs to the east of Arnott Fen and is also within the project study area.





Legend

- Substation
- Alternative 2, 2b
- Alternative 3
- Alternative 4
- Alternative 5
- Appalachian National Scenic Trail
- Middle Delaware National Scenic & Recreational River
- Delaware River
- Delaware Water Gap National Recreation Area
- Worthington State Forest
- CVNWR Boundary
- County Line

Physiographic Province

- Appalachian Plateau
- Valley and Ridge
- Highlands
- Piedmont

Geologic Age

- Cambrian
- Devonian
- Devonian into Silurian
- Jurassic
- Triassic into Jurassic
- Mississippian
- Mississippian into Devonian
- Ordovician
- Pennsylvanian
- Proterozoic
- Quaternary
- Silurian
- Triassic

A - A' Cross-section Line

Note: Designated boundary of CVNWR is depicted, not all property is owned within the boundary

0 8 16
Miles

Susquehanna to Roseland
Transmission Line Proposal
and
Right-of-Way Request EIS

Figure 10
Alternative Overview Geologic Map

Source: ESRI Streetmap 2006;
PASDA 2005, 2010;
ESRI ArcGISonline Map Service 2010;
USGS 1946, 2006; NJ DEP 2002, 2008

Projection: NAD 83 UTM Zone 18N
Date: July 2012

Geology

- Bloomsburg Red Beds= Sb
- Bossardville Limestone= Sbv
- Buttermilk Falls Limestone through Esopus Formation, undivided= Dbe
- Buttermilk Falls Limestone= Db
- Catskill Formation, Towamensing Member= Dct
- Catskill Formation, Walcksville Member= Dcw
- Decker Formation through Poxono Island Formation, undivided= Sdp
- Esopus Formation= De
- Kalkberg Limestone, Coeymans Limestone, Manlius Limestone, undivided= Dkc
- Mahantango Formation= Dmh
- Marcellus Shale= Dm
- Martinsburg Formation, Graywacke and shale= Omgs
- Martinsburg Formation= Om
- Minisink Limestone and New Scotland Formation, undivided= Dmn
- Oriskany Group= Do
- Port Ewen Shale= Dp
- Poxono Island Formation= Sp
- Ramseyburg Member= Omr
- Ridgeley Formation through Coeymans Formation, undivided= Drc
- Rondout and Decker Formations, undivided= DSrd
- Schoharie Formation= Ds
- Shawangunk Formation= Ss
- Trimmers Rock Formation= Dtr

Sullivan Co., NY

Orange Co., NY

Monroe Co., PA

Carbon Co., PA

Sussex Co., NJ

Warren Co., NJ

Northampton Co., PA

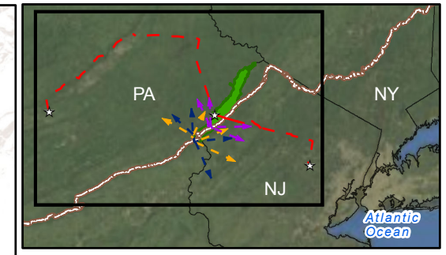
Passaic Co., NJ

Appalachian National Scenic Trail

1, 2, 2b

3

4,5



Legend

- Substation
- Alternative 1, 2, 2b
- Alternative 3
- Alternative 4
- Alternative 5
- Appalachian National Scenic Trail
- Delaware Water Gap National Recreation Area
- Worthington State Forest
- CVNWR Boundary
- County Line

Note: Designated boundary of CVNWR is depicted, not all property is owned within the boundary

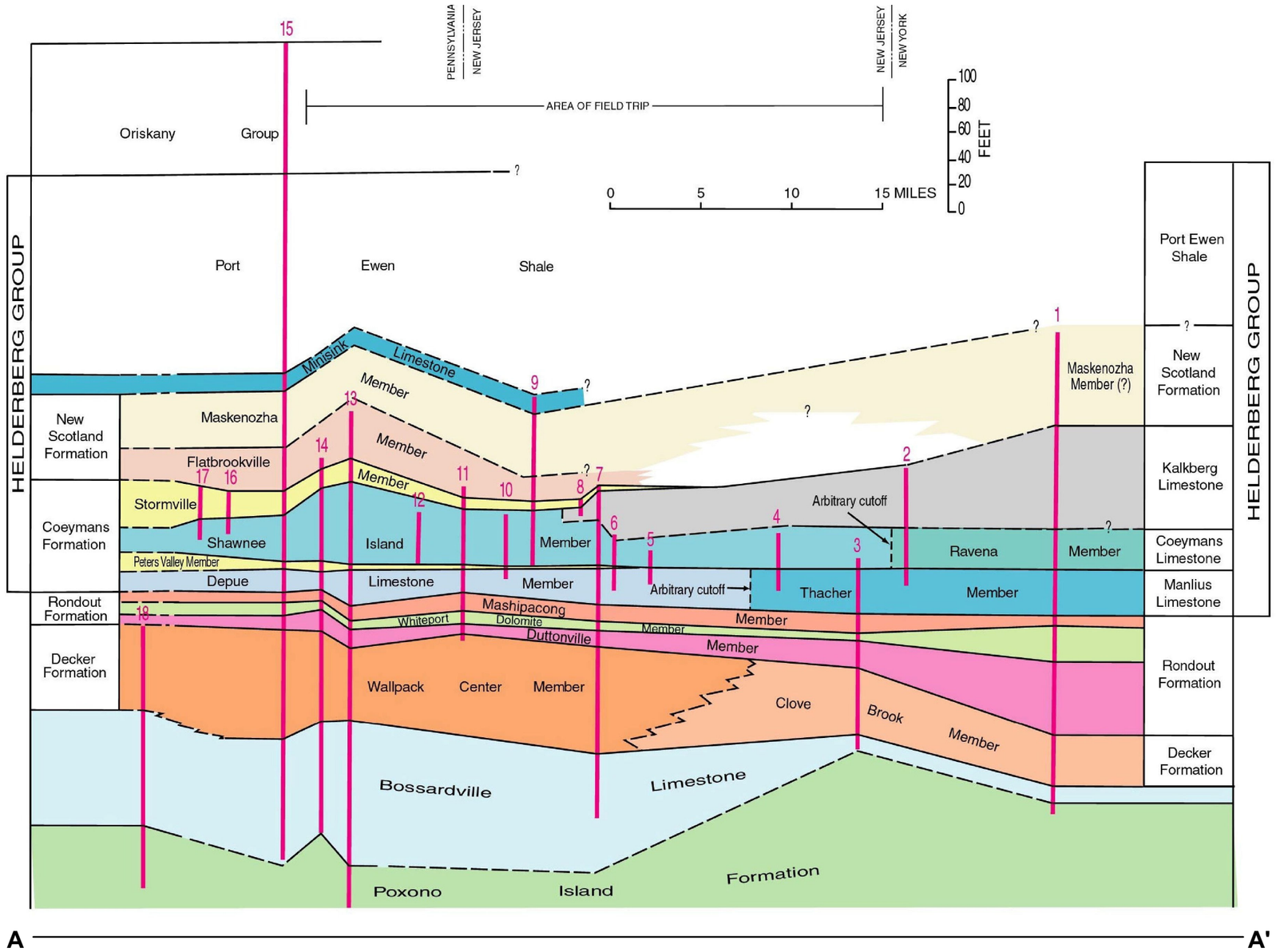
0 4 8
Miles

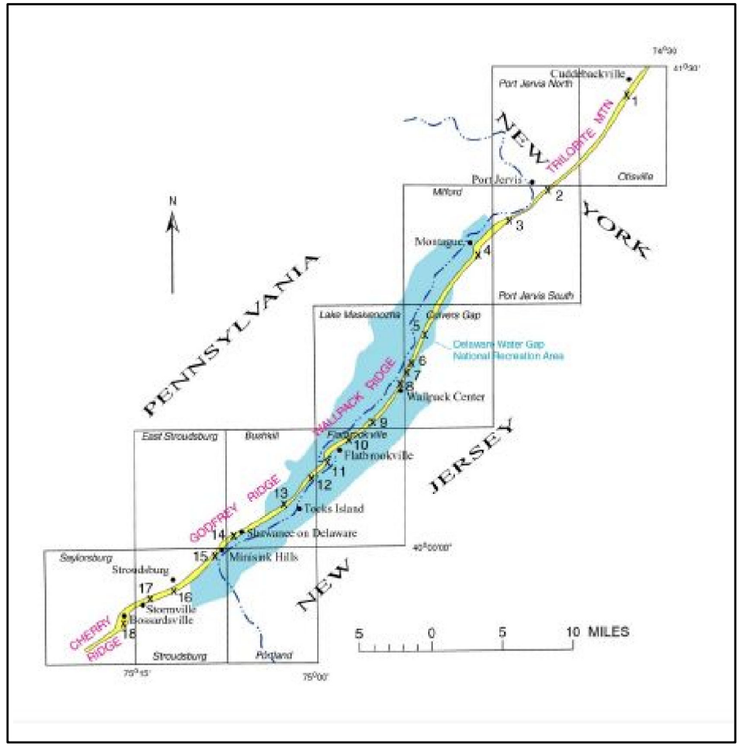
Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 11
Geologic Map of DEWA

Source: ESRI Streetmap 2006;
PASDA 2005, 2010;
ESRI ArcGISonline Map Service 2010;
USGS 1946, 2006; NJ DEP 2002, 2008

Projection: NAD 83 UTM Zone 18N
Date: July 2012



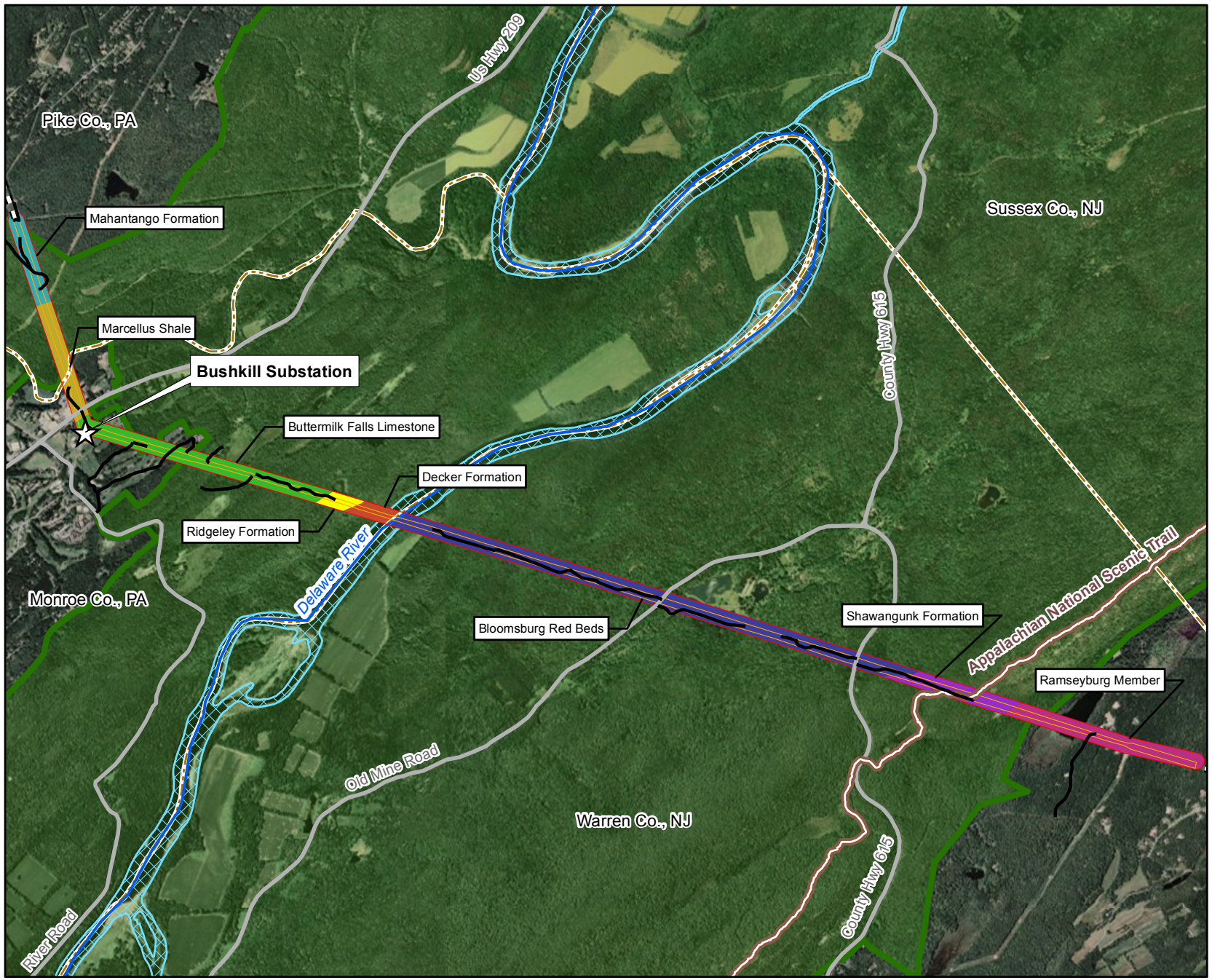


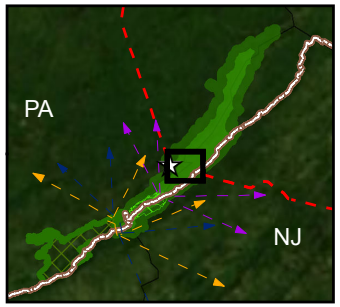
Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 12
Regional Geological Cross-Section

Source: 66th Annual Conference of Pennsylvania Geologist Field Guide, Figure 3A, 3B

Date: July 2012





Legend

- Substation
- Outside Study Area
- Existing ROW in Study Area
- 350 ft Corridor
- Appalachian National Scenic Trail
- Delaware River
- Road
- Delaware Water Gap National Recreation Area
- Middle Delaware National Scenic and Recreational River
- County Line

Geology

- Bloomsburg Red Beds
- Buttermilk Falls Limestone
- Decker Formation
- Mahantango Formation
- Marcellus Shale
- Ramseyburg Member
- Ridgeley Formation
- Shawangunk Formation

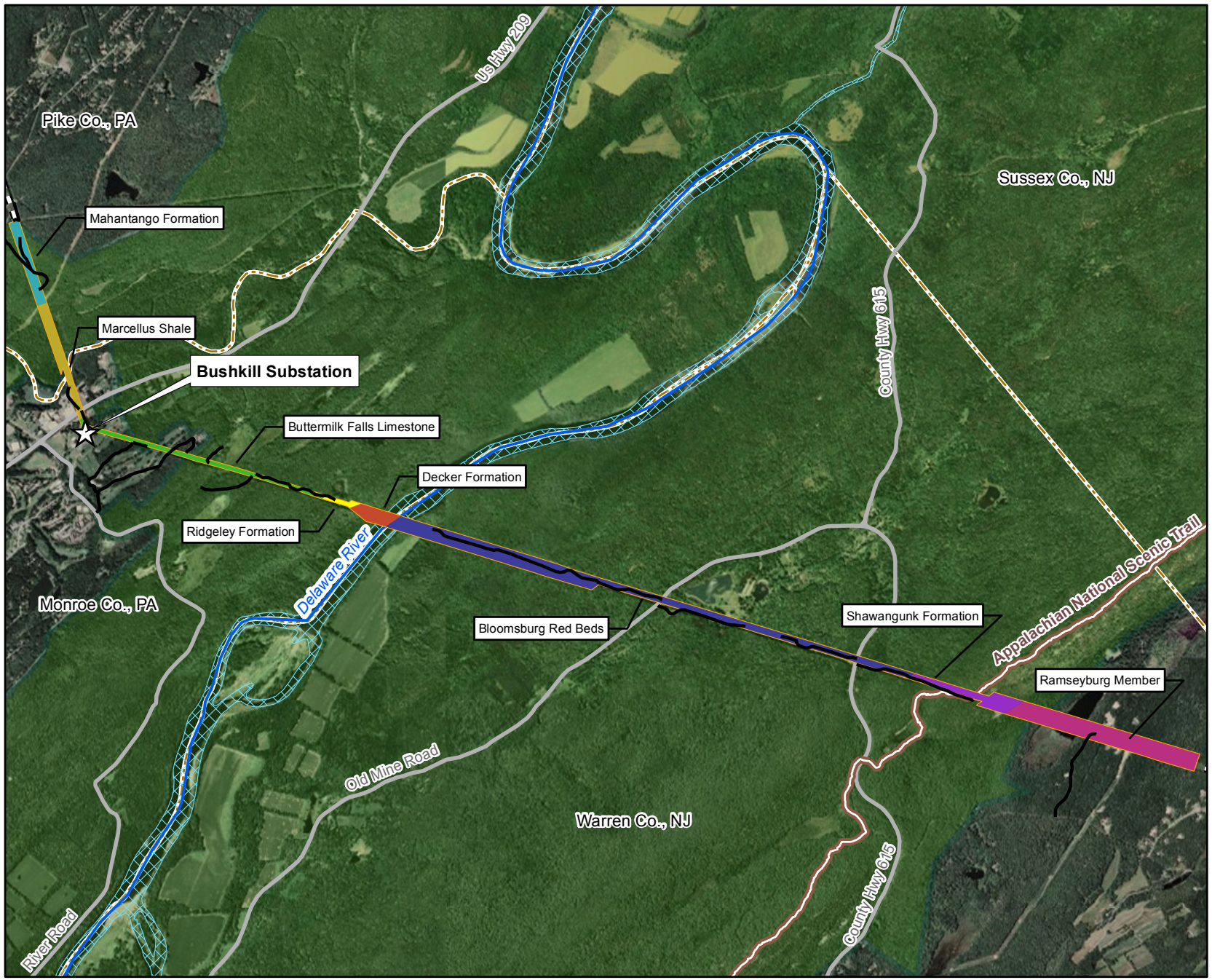
0 1,500 3,000
Feet

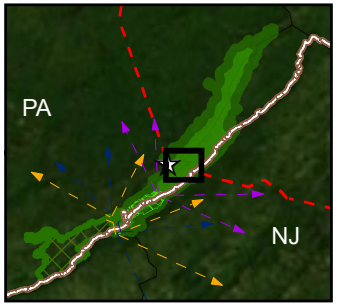
Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 13
Alternative 2 Geology

Source: ESRI Streetmap 2006, Penn State 2010, ESRI ArcGISonline Map Service 2010, NJOIT 2010, USGS 2006, NJ DEP 2008,

Projection: NAD 83 UTM Zone 18N
Date: July 2012





Legend

- Substation
- Outside Study Area
- Alternative 2b Corridor
- Appalachian National Scenic Trail
- Delaware River
- Proposed Access Road
- Road
- Delaware Water Gap National Recreation Area
- Middle Delaware National Scenic and Recreational River
- County Line

Geology

- Bloomsburg Red Beds
- Buttermilk Falls Limestone
- Decker Formation
- Mahantango Formation
- Marcellus Shale
- Ramseyburg Member
- Ridgeley Formation
- Shawangunk Formation

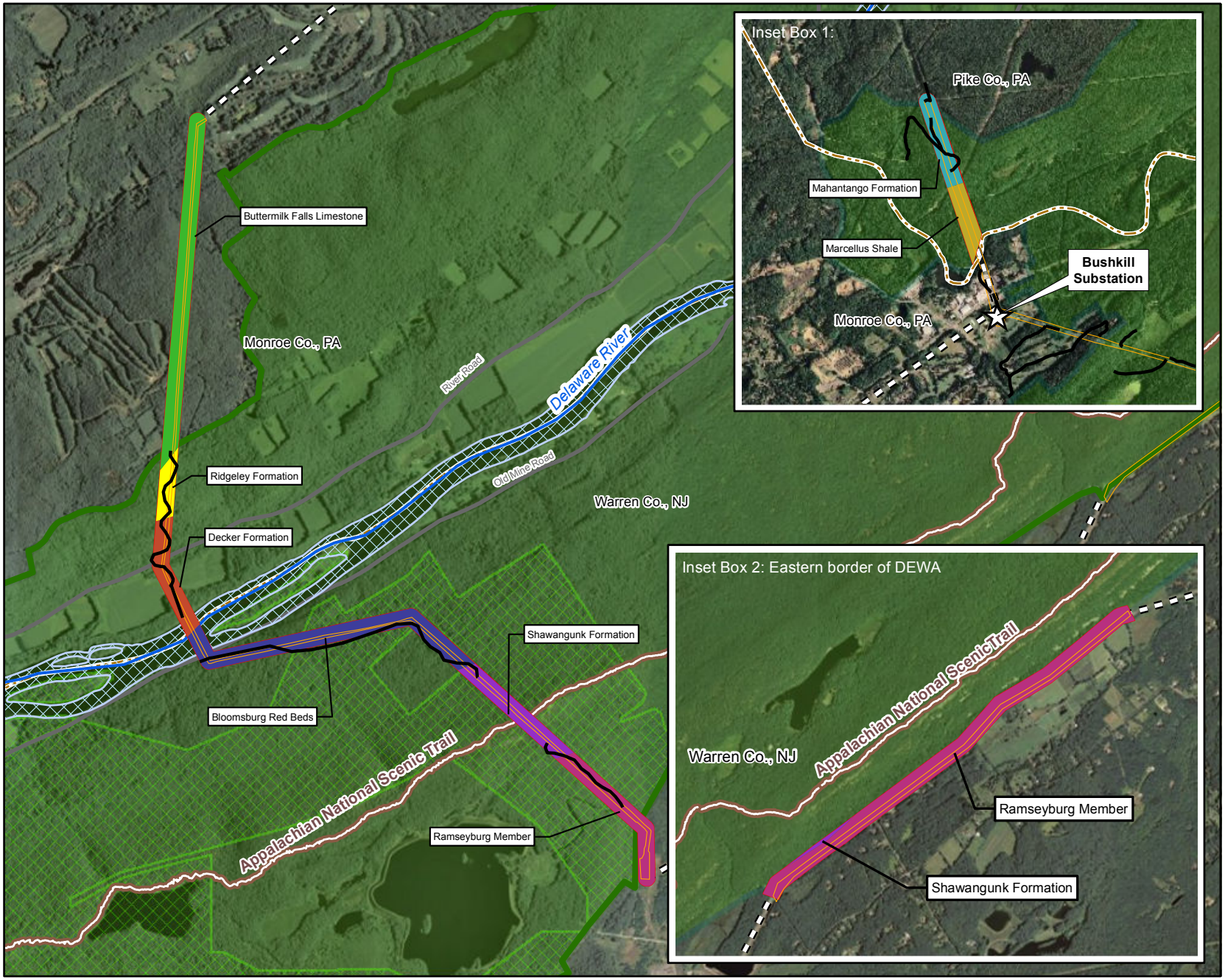
0 1,500 3,000
Feet

Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 14
Alternative 2b Geology

Source: ESRI Streetmap 2006, Penn State 2010, ESRI ArcGISonline Map Service 2010, PennDOT 2011, USGS 2006, NJ DEP 2008,

Projection: NAD 83 UTM Zone 18N
Date: July 2012

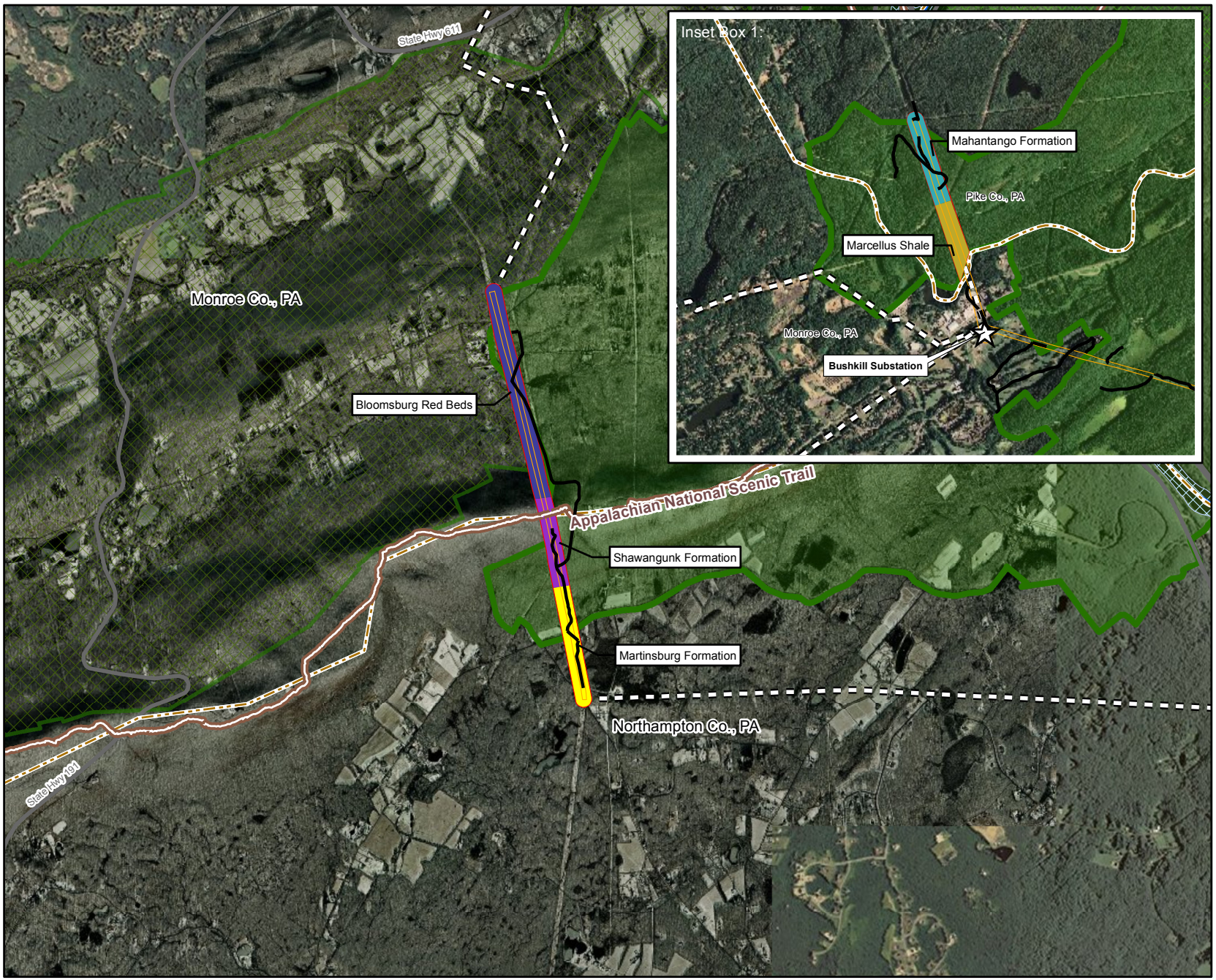


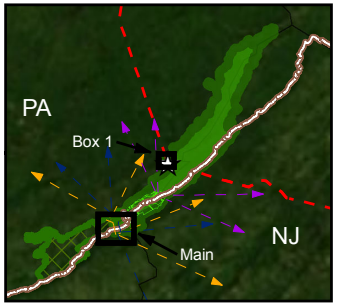
Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 15
Alternative 3 Geology

Source: ESRI Streetmap 2006, Penn State 2010, ESRI ArcGISonline Map Service 2010, PennDOT 2011,NJOIT 2010, USGS 2006, NJ DEP 2008,

Projection: NAD 83 UTM Zone 18N
Date: July, 2012





Legend

- Substation
- Outside Study Area
- Existing ROW in Study Area
- 350 ft Corridor
- Appalachian National Scenic Trail
- Delaware River
- Proposed Access Road
- Delaware Water Gap National Recreation Area
- CVNWR Boundary
- County Line

Geology

- Bloomsburg Red Beds
- Martinsburg Formation
- Shawangunk Formation
- Mahantango Formation
- Marcellus Shale

Note:Designated boundary of CVNWR is depicted, not all property is owned within the boundary.

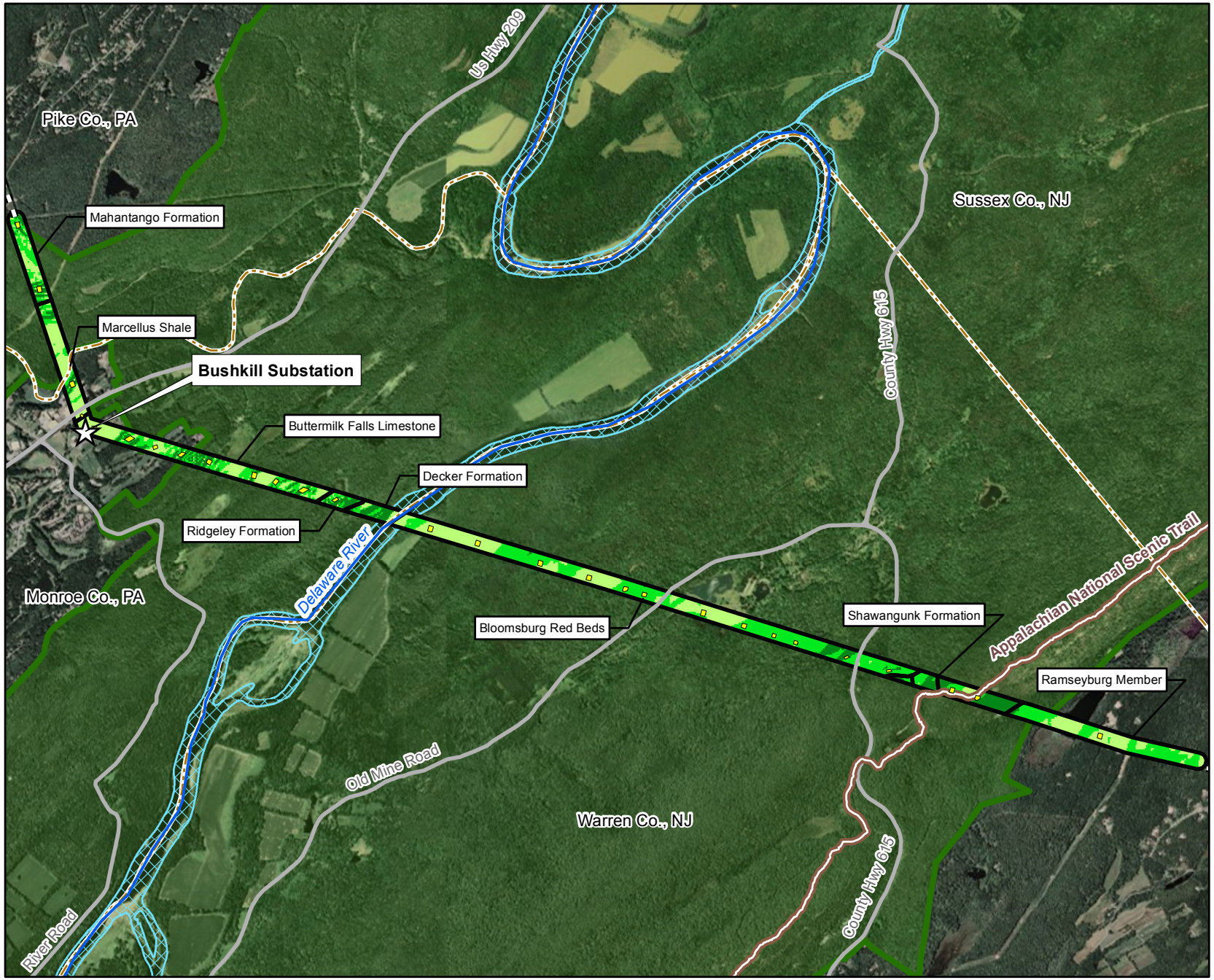
0 1,500 3,000
Feet
Scale applies to main frame and inset maps

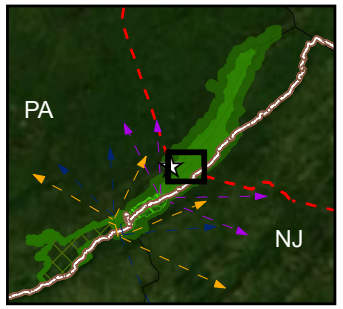
Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 16
Alternative 4/5 Geology

Source: ESRI Streetmap 2006, Penn State 2010, ESRI ArcGISonline Map Service 2010, PennDOT 2011,NJOIT 2010, USGS 2006, NJ DEP 2008,

Projection: NAD 83 UTM Zone 18N
Date: July 2012





Legend

- Substation
- Crane Pad/ Tower Location
- Outside Study Area
- Appalachian National Scenic Trail
- Delaware River
- Road
- Geological Formations
- Delaware Water Gap National Recreation Area
- Middle Delaware National Scenic and Recreational River
- County Line

Slope Percentages

- 0 - 10%
- 11 - 30%
- 31 - 100%

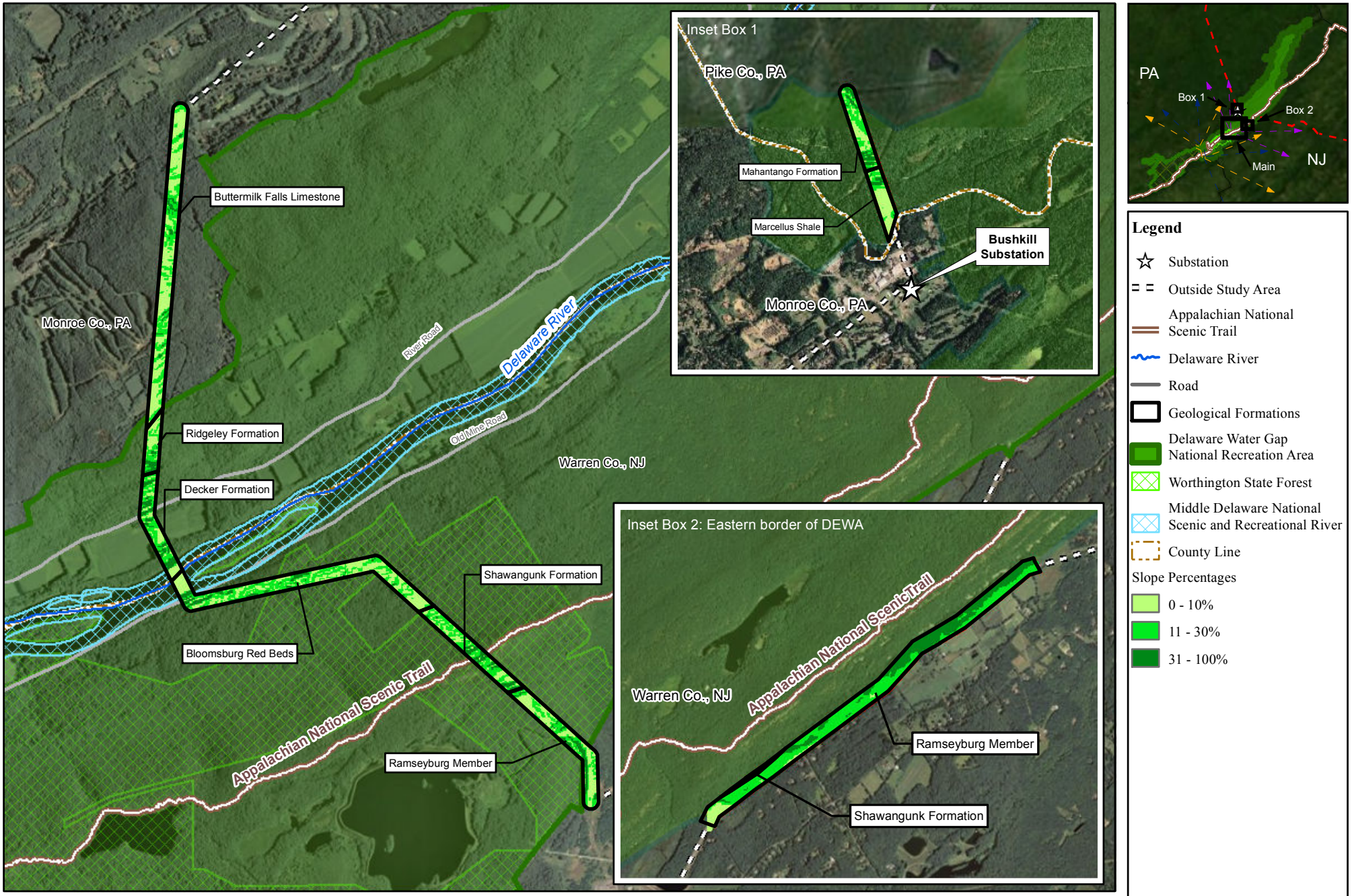
0 1,500 3,000
Feet

Susquehanna to Roseland
Transmission Line Proposal
and
Right-of-Way Request EIS

Figure 17
Alternative 2/2b Geology and Slopes

Source: ESRI Streetmap 2006, Penn State 2010,
ESRI ArcGISonline Map Service 2010,
NJOIT 2010, USGS 2006,
NJ DEP 2008,

Projection: NAD 83 UTM Zone 18N
Date: July 2012

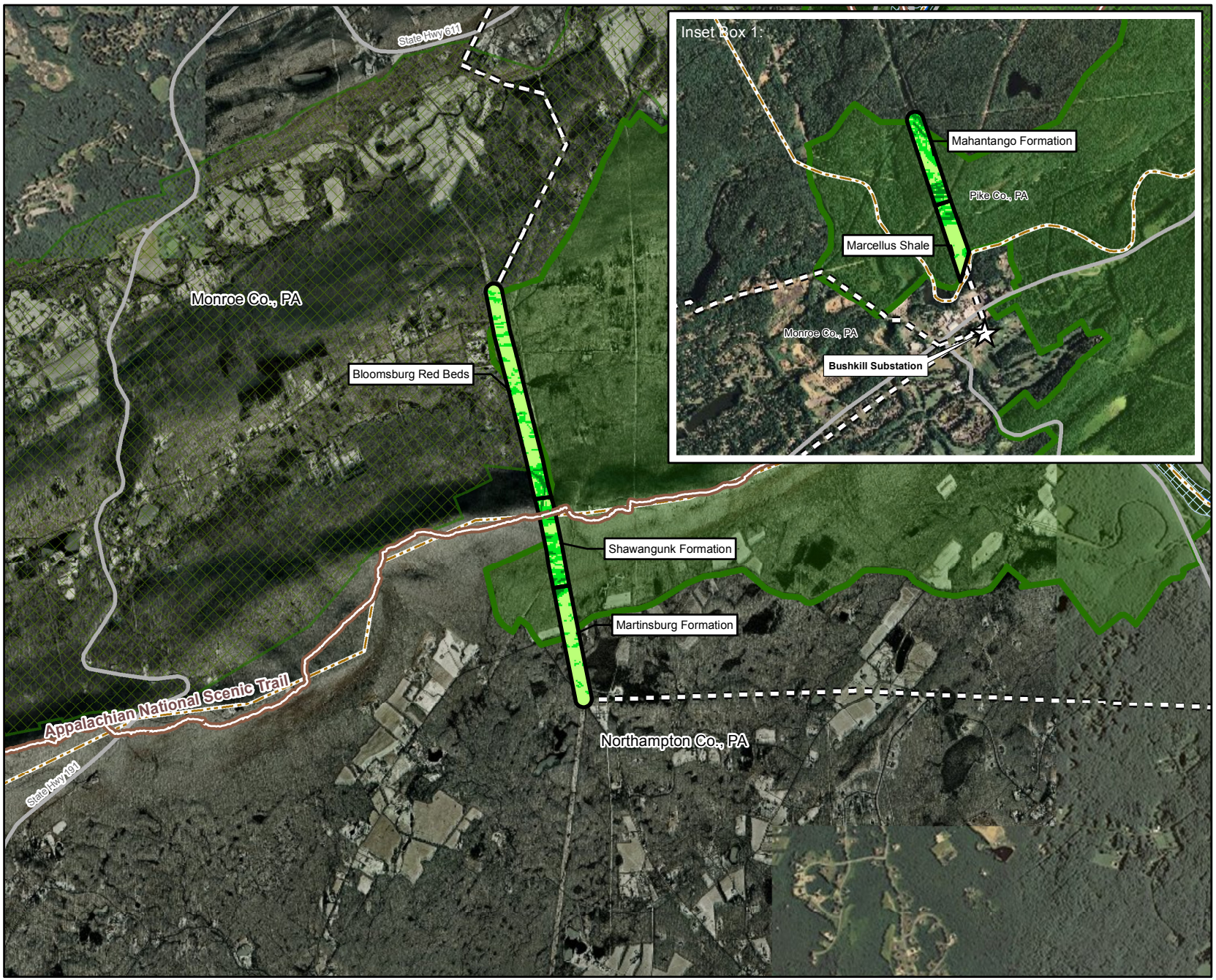


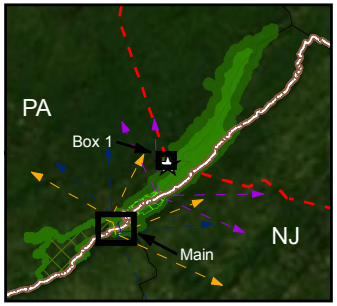
Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 18
Alternative 3 Geology and Slopes

Source: ESRI Streetmap 2006, Penn State 2010, ESRI ArcGISonline Map Service 2010, NJOIT 2010, USGS 2006, NJ DEP 2008,

Projection: NAD 83 UTM Zone 18N
Date: July, 2012





Legend

- Substation
- Outside Study Area
- Appalachian National Scenic Trail
- Road
- Geological Formations
- Delaware Water Gap National Recreation Area
- CVNWR Boundary
- County Line

Slope Percentages

- 0 - 10%
- 11 - 30%
- 31 - 100%

Note:Designated boundary of CVNWR is depicted, not all property is owned within the boundary.

0 1,500 3,000
Feet
Scale applies to main frame and inset maps

Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 19
Alternative 4/5 Geology and Slopes

Source: ESRI Streetmap 2006, Penn State 2010, ESRI ArcGISonline Map Service 2010, NJOIT 2010, USGS 2006, NJ DEP 2008,

Projection: NAD 83 UTM Zone 18N
Date: July 2012

OUTSIDE THE STUDY AREA

Appendix G-3 presents the major geologic formations/rock types that the alternatives could cross outside the study area. Descriptions and properties for the formations/rock types are included. Outside the study area to Susquehanna, a range of formations could be crossed by the S-R Line. Geological formations likely to be encountered outside the study area to Susquehanna are those of the Cambrian, Devonian, Mississippian, Ordovician, Pennsylvanian, Precambrian, Quaternary, Silurian, and Triassic ages (figure 10). Geological formations likely to be encountered outside the study area to Roseland are those of the Cambrian, Devonian, Jurassic, Ordovician, Precambrian, Quaternary, Silurian, and Triassic ages (figure 10). Formations outside the study area may contain limestone; therefore, this type of unique geological feature may be crossed by the alternatives outside the study area. None of the major geologic formations listed on in appendix G-3 are considered rare or unique formations; however, appendix G-4 lists the geologic formations containing limestone that may be crossed outside the study area for each alternative. In general, these rare or unique formations occur in less than 5% of the overall counties.

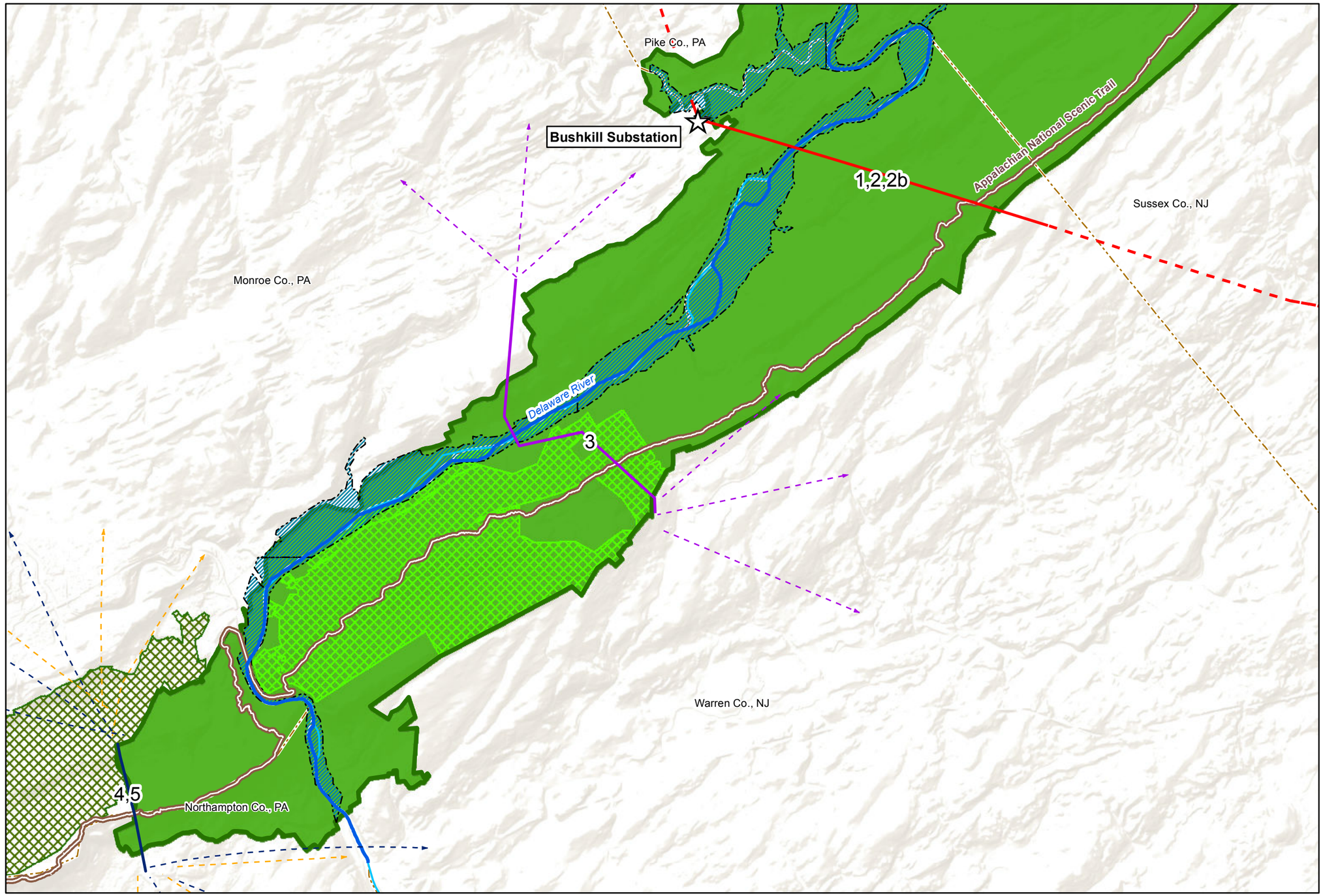
FLOODPLAINS

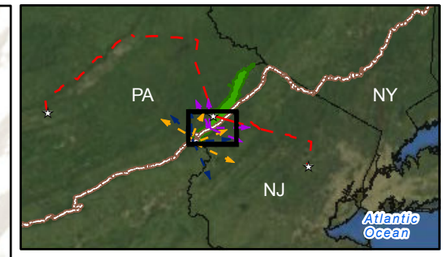
Executive Order 11988, "Floodplain Management," issued May 24, 1977, defines floodplains as "the lowland and relatively flat areas adjoining inland and coastal waters including floodprone areas of offshore islands, including at a minimum, that area subject to a 1% greater chance of flooding in any given year." This floodplain is often called the 100-year floodplain or, more accurately, the 1% annual chance floodplain. The executive order directs all federal agencies to avoid both long- and short-term adverse impacts associated with occupancy, modification, and development in the 1% annual chance floodplain, when possible. This is the flood risk zone regulated through federal, state, and local land use laws. The NPS manages floodplains to preserve floodplain values, minimize potential hazards of flooding, and comply with law (NPS 2006a). Discussions of floodplains in this document refer to the 1% annual chance flood level.

The Pennsylvania Department of Environmental Protection (PADEP) is the regulating agency responsible for floodplain activities throughout the Commonwealth of Pennsylvania. Pennsylvania state legislation that protects floodplains includes the Dam Safety and Encroachment Act (PL 1375-325), Clean Streams Law (PL 1987-3941) and the Floodplain Management Act (PL 851-166). The New Jersey Department of Environmental Protection (NJDEP) is the governing body that regulates floodplain activities in the State of New Jersey. New Jersey's floodplains are protected by state acts including the Flood Hazard Control Act (NJAC 7.13). State and local communities that participate in the National Flood Insurance Program are required to follow the minimum federal regulations but may also enact stricter local ordinances.

In general, naturally functioning floodplains provide habitat for vegetation and wildlife, provide flood and sedimentation control, support the maintenance of water quality, and aid in transport and deposition of sediment and nutrients within riverine systems. In DEWA, floodplains serve to slow and store water during flooding. Because water on floodplains is slowed significantly, it generally does not cause tree removal or erosion unless ice is present in the flow. Additionally, sediments from floodwater are deposited in floodplains, which keep riverbed habitat (gravels) healthy (NPS 2008a, 1).

Floodplains within the parks were identified using a combination of Federal Emergency Management Agency Flood Insurance Rate Maps and NPS data layers. The floodplain within DEWA and MDSR lies along the entire length of the Delaware River and the confluences of larger tributaries to the Delaware River within the parks in New Jersey and Pennsylvania (figure 20). No floodplains exist within APPA inside the study area. The floodplain zones within the parks support riparian vegetation communities and wetlands. The paragraphs below describe the location of floodplains within the right-of-ways (ROWs) for alternatives 1 through 5 and outside the study area.





Legend

- Substation
- Alternative 1, 2, 2b
- Alternative 3
- Alternative 4
- Alternative 5
- Appalachian National Scenic Trail
- Middle Delaware National Scenic and Recreational River
- Delaware River
- Delaware Water Gap National Recreation Area
- Worthington State Forest
- CVNWR Boundary
- Floodplain
- County Line

Note: Designated boundary of CVNWR is depicted, not all property is owned within the boundary

0 1 2
Miles

Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 20
Alternative Overview Map
Floodplains

Source: ESRI Streetmap 2006, Penn State 2010, ESRI ArcGISonline Map Service 2010, NJOIT 2010, USGS 2006, NJ DEP 2008, NWI 1977

Projection: NAD 83 UTM Zone 18N
Date: July, 2012

ALTERNATIVE 1 (NO ACTION), ALTERNATIVE 2, AND ALTERNATIVE 2b

Within the study area, the alignment for alternatives 1, 2, and 2b would be within the floodplain zone of Big Bushkill and Sand Hill creeks within DEWA and the floodplain zone of the Delaware River within DEWA and MDSR (figures 21 through 24). The ROW for alternatives 1, 2, and 2b would span approximately 700 feet of the floodplain for each watercourse. One tower for the existing Bushkill-to-Kittatinny Line (B-K Line) is currently within a floodplain zone within the ROW for alternatives 1, 2, and 2b.

ALTERNATIVE 3

Within the study area, the proposed transmission line expansion route under alternative 3, within DEWA and MDSR, would be constructed within the floodplain zone of the Delaware River (figure 25). The proposed alignment would span approximately 1,320 feet of the floodplain zone just south of Tocks Island, New Jersey. Where the alternative 3 alignment follows the B-K Line, it would cross the floodplain zone of Big Bushkill and Sand Hill creeks.

ALTERNATIVE 4

Within the study area, where the alternative 4 alignment follows the B-K Line, the transmission line would be constructed within the floodplain zone of Big Bushkill and Sand Hill creeks (figure 26).

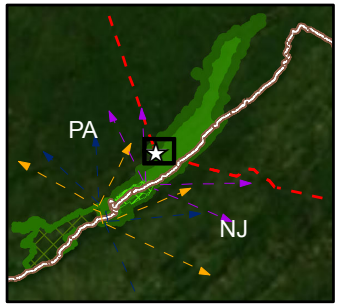
ALTERNATIVE 5

Within the study area, the proposed transmission line expansion route for alternative 5 would not be constructed within any floodplain zones within the boundaries of DEWA and MDSR (figure 26).

OUTSIDE THE STUDY AREA

The Pennsylvania counties outside the study area, Carbon, Lackawanna, Luzerne, Northampton, Monroe, Pike, and Wayne, are rich with surface waters and have floodplains associated with these water bodies. Within these counties, the S-R Line could cross major tributaries of the Delaware River Basin, the Susquehanna River Basin, and the Lehigh River Basin. Some of these tributaries include Bushkill Creek, Cherry Creek, Lackawaxen River, and Marshall Creek in the Delaware River Basin; Big Wapwallopen Creek, Lackawanna River, and the mainstem Susquehanna River in the Susquehanna River Basin; and Jonas Creek, Pond Creek, and Stony Creek in the Lehigh River Basin.

Outside the study area in New Jersey, the S-R Line could cross Morris, Sussex, and Warren counties. In these counties, the route could cross the major tributaries of the Delaware River Basin, the Passaic River Basin, and the Raritan River Basin. Some of these tributaries include Paulins Kill, Pohatcong Creek, Musconetcong River, and Martins Creek in the Delaware River Basin; Rockaway River, Delawanna Creek, and Whippany River in the Passaic River Basin; and South Branch Raritan River and Lamington River in the Raritan River Basin. The majority of these surface waters have associated floodplains.



Legend

- Substation
- Crane Pad for Proposed Tower*
- Crane Pad for Existing Tower Removal
- Outside Study Area
- Existing ROW in Study Area
- 350 ft Corridor
- Delaware River
- Proposed Access Road
- Road
- Delaware Water Gap National Recreation Area
- Floodplain
- County Line

** Crane pads for proposed towers will also be used for the removal of existing towers, where applicable*

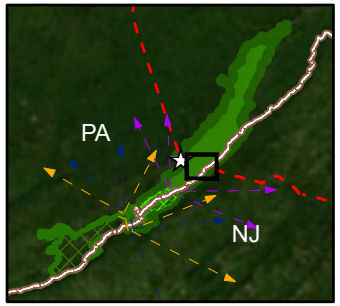
0 1,250 2,500
Feet

Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 21
Alternative 2 Floodplains in Pennsylvania

Source: ESRI Streetmap 2006, Penn State 2010, ESRI ArcGISonline Map Service 2010, PennDOT 2011, USGS 2006, NJ DEP 2008, NWI 1977

Projection: NAD 83 UTM Zone 18N
Date: July 2012



Legend

- Substation
- Crane Pad for Proposed Tower*
- Crane Pad for Existing Tower Removal
- Outside Study Area
- Existing ROW in Study Area
- 350 ft Corridor
- Appalachian National Scenic Trail
- Delaware River
- Proposed Access Road
- Road
- Delaware Water Gap National Recreation Area
- Floodplain
- County Line

** Crane pads for proposed towers will also be used for the removal of existing towers, where applicable*

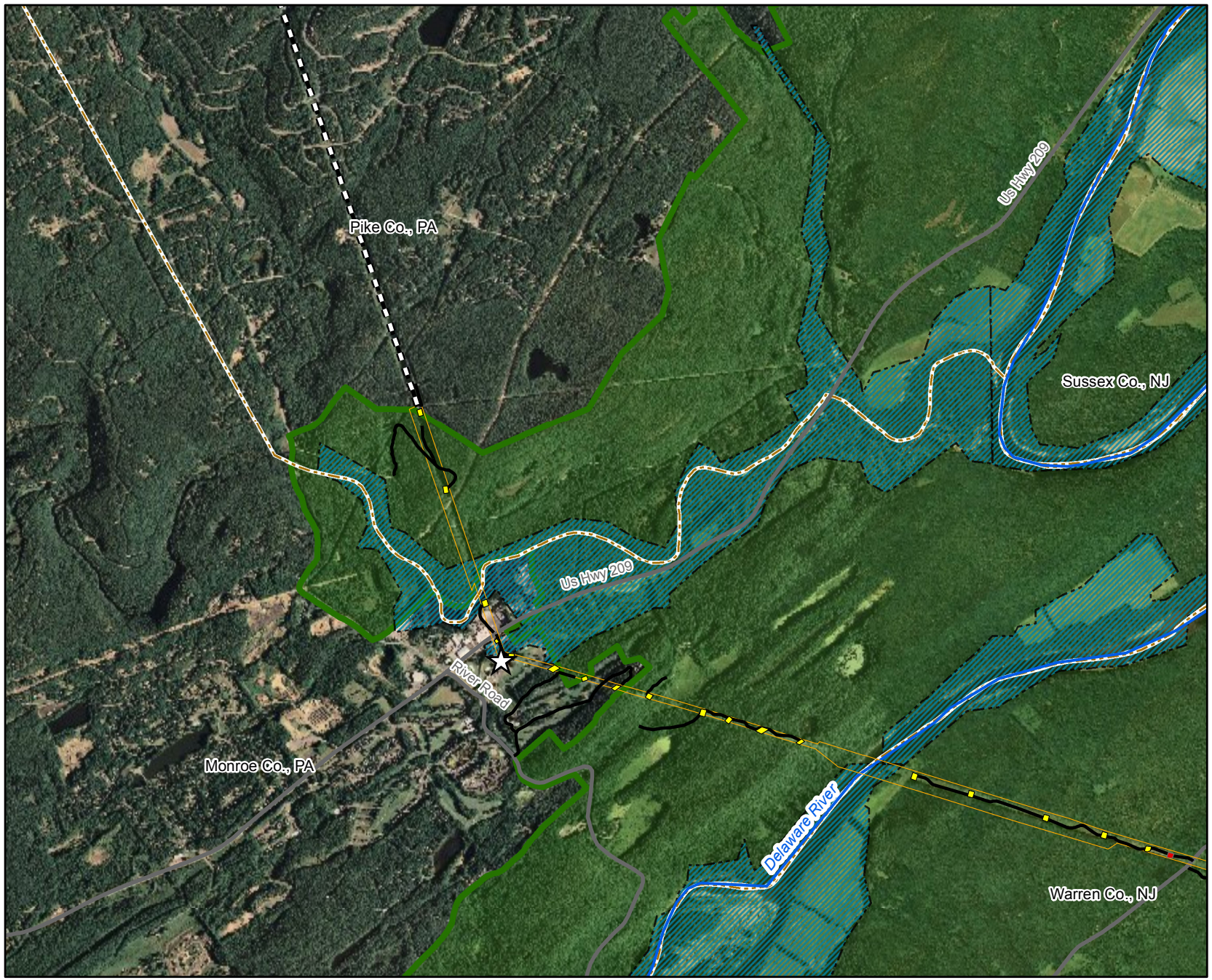
0 1,250 2,500
Feet

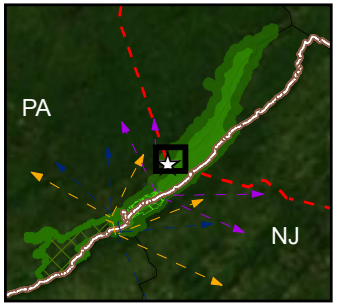
Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 22
Alternative 2 Floodplains in New Jersey

Source: ESRI Streetmap 2006, Penn State 2010, ESRI ArcGISonline Map Service 2010, PennDOT 2011, USGS 2006, NJ DEP 2008, NWI 1977

Projection: NAD 83 UTM Zone 18N
Date: July 2012





Legend

- Substation
- Crane Pad for Proposed Tower*
- Crane Pad for Existing Tower Removal
- Outside Study Area
- Alternative 2b Corridor
- Delaware River
- Proposed Access Road
- Road
- Delaware Water Gap National Recreation Area
- Floodplain
- County Line

** Crane pads for proposed towers will also be used for the removal of existing towers, where applicable*

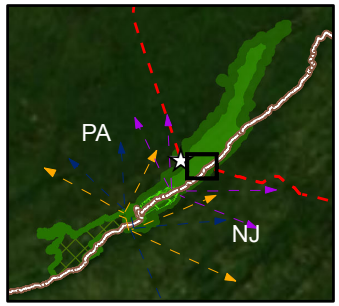
0 1,250 2,500
Feet

Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 23
Alternative 2b Floodplains in Pennsylvania

Source: ESRI Streetmap 2006, Penn State 2010, ESRI ArcGISonline Map Service 2010, PennDOT 2011, USGS 2006, NJ DEP 2008, NWI 1977

Projection: NAD 83 UTM Zone 18N
Date: July 2012



Legend

- Substation
- Crane Pad for Proposed Tower*
- Crane Pad for Existing Tower Removal
- Outside Study Area
- Alternative 2b Corridor
- Appalachian National Scenic Trail
- Delaware River
- Proposed Access Road
- Road
- Delaware Water Gap National Recreation Area
- Floodplain
- County Line

** Crane pads for proposed towers will also be used for the removal of existing towers, where applicable*

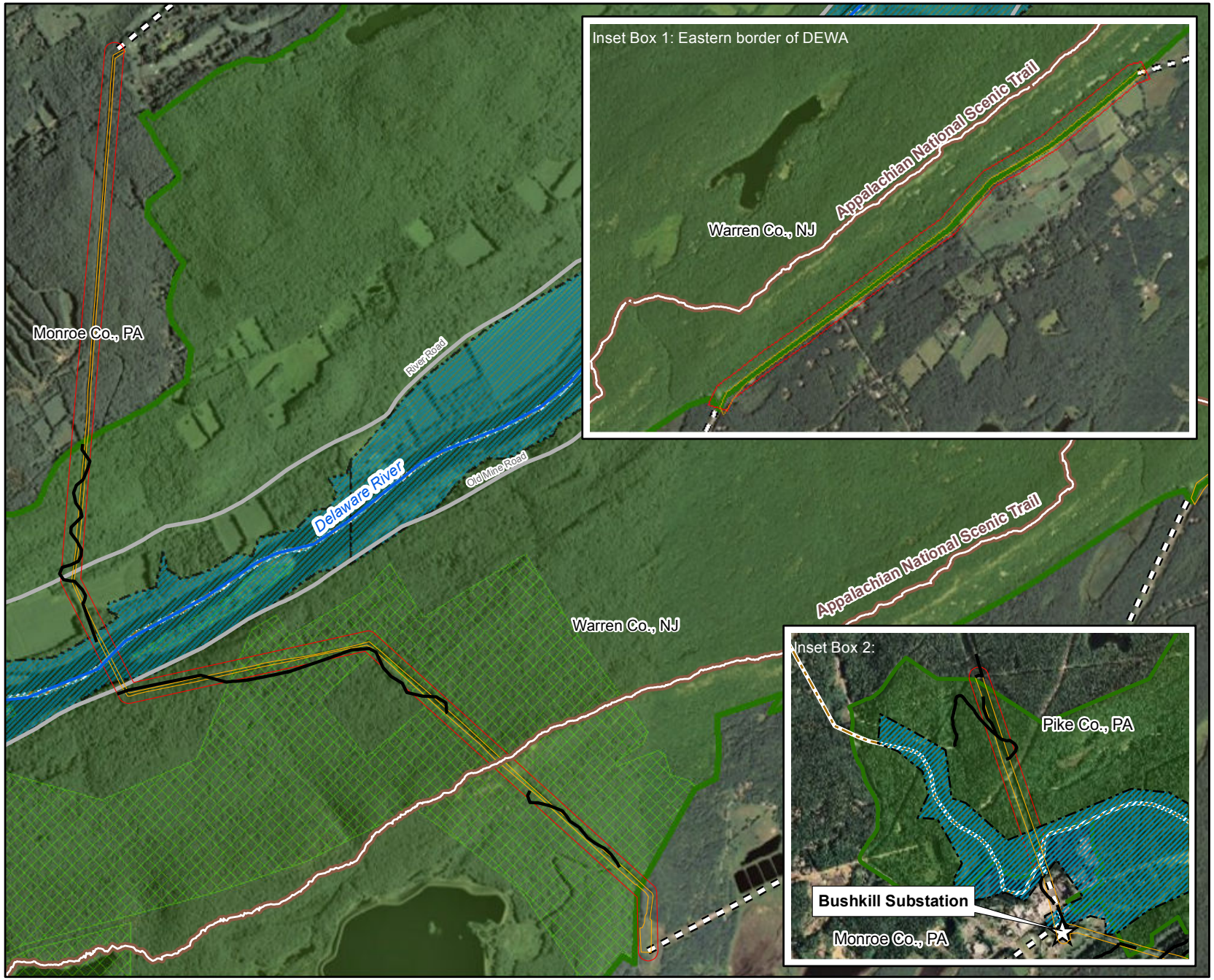
0 1,250 2,500
Feet

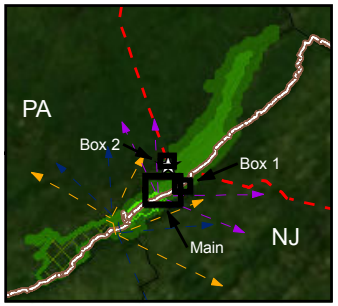
Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 24
Alternative 2b Floodplains in New Jersey

Source: ESRI Streetmap 2006, Penn State 2010, ESRI ArcGISonline Map Service 2010, PennDOT 2011, USGS 2006, NJ DEP 2008, NWI 1977

Projection: NAD 83 UTM Zone 18N
Date: July 2012





Legend

- Substation
- Outside Study Area
- Existing ROW in Study Area
- 350 ft Corridor
- Appalachian National Scenic Trail
- Delaware River
- Proposed Access Road
- Road
- Delaware Water Gap National Recreation Area
- Worthington State Forest
- Floodplain
- County Line

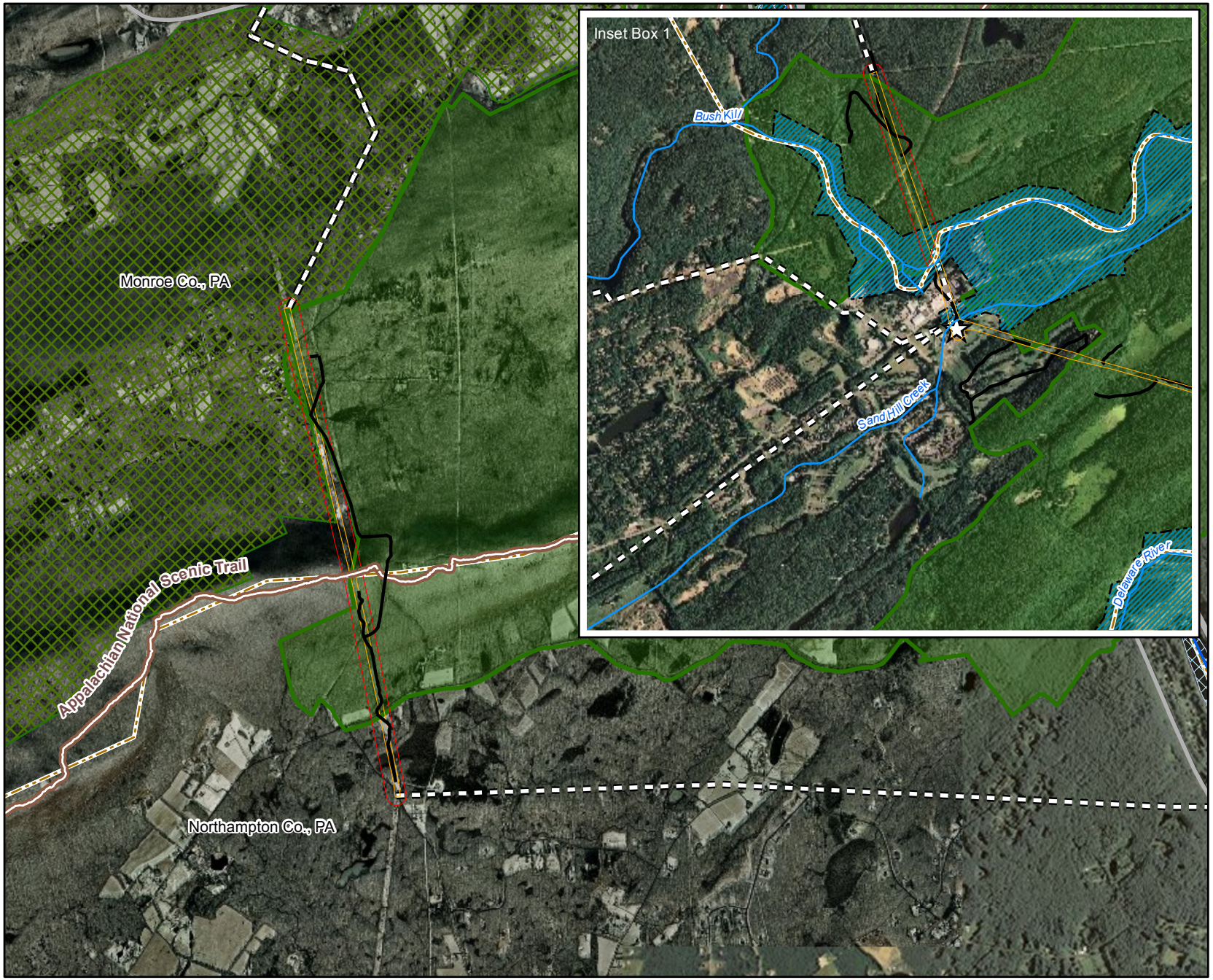
0 1,250 2,500
Feet
Scale applies to main frame and inset maps

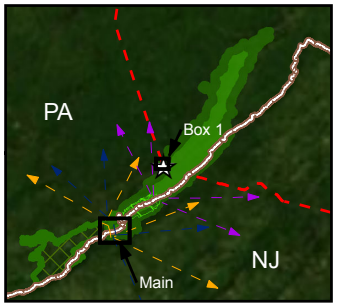
Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 25
Alternative 3 Floodplains

Source: ESRI Streetmap 2006, Penn State 2010, ESRI ArcGISonline Map Service 2010, PennDOT 2011, USGS 2006, NJ DEP 2008, NWI 1977

Projection: NAD 83 UTM Zone 18N
Date: July, 2012





Legend

- Substation
- Crane Pad for Proposed Tower*
- Outside Study Area
- Existing ROW in Study Area
- 350 ft Corridor
- Appalachian National Scenic Trail
- River/Stream
- Proposed Access Road
- Roads
- Delaware Water Gap National Recreation Area
- CVNWR Boundary
- Floodplain
- County Line

Note: Designated boundary of CVNWR is depicted, not all property is owned within the boundary

** Crane pads for proposed towers will also be used for the removal of existing towers, where applicable*

0 1,250 2,500
Feet
Scale applies to main frame and inset map

Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 26
Alternative 4/5 Floodplains

Source: ESRI Streetmap 2006, Penn State 2010, ESRI ArcGISonline Map Service 2010, PennDOT 2011, USGS 2006, NJ DEP 2008, NWI 1977

Projection: NAD 83 UTM Zone 18N
Date: July 2012

WETLANDS

Director's Order 77-1: *Wetland Protection* (NPS 2011a) and NPS *Management Policies 2006* (NPS 2006a) provide direction on the protection of wetlands, stating that the long-term goal is the net gain of wetlands. Specifically, under Director's Order 77-1, the NPS has adopted a goal of "no net loss of wetlands" and established the policies, requirements, and standards through which the NPS will meet its responsibilities to protect and preserve wetlands. Director's Order 77-1 states, "Where natural wetland characteristics or functions have been degraded or lost due to previous or ongoing human activities, the NPS will, to the extent appropriate and practicable, restore them to pre-disturbance conditions." Disturbing human activities may include the introduction of invasive species as result of clearing wetlands and clearing the ROW near wetlands that will encourage invasive plant species growth and spread (Executive Order 13112, "Invasive Species"). Additionally, "Where appropriate and practicable, the NPS will not simply protect, but will seek to enhance natural wetland values by using them for educational, recreational, scientific, and similar purposes that do not disrupt natural wetland functions" (NPS 2011a).

Executive Order 11990, "Protection of Wetlands," directs all federal agencies to avoid, to the extent possible, the long- and short-term adverse impacts associated with the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative. In the absence of such alternatives, parks must modify actions to preserve and enhance wetland values and minimize degradation.

For the NPS, any area that is classified as a wetland according to the U.S. Fish and Wildlife Service (USFWS) *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin et al. 1979) is subject to Director's Order 77-1. Under the Cowardin definition, a wetland must have one or more of the following three attributes:

- At least periodically, the land supports predominantly hydrophytes (wetland vegetation);
- The substrate is predominantly undrained hydric soil; and
- The substrate is nonsoil and is saturated with water or covered by shallow water at some time during the growing season of each year (Cowardin et al. 1979, 11).

The Cowardin wetland definition encompasses more aquatic habitat types than the definition and delineation manual used by the USACE for identifying wetlands subject to section 404 of the Clean Water Act. The Cowardin wetland definition includes USACE-defined wetlands, but also adds areas that, although lacking vegetation and/or soils due to natural physical or chemical factors such as wave action or high salinity, are still saturated or shallow, inundated environments that support aquatic life. The 1987 *Corps of Engineers Wetlands Delineation Manual* defines wetlands as "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions" (USACE 1987). The 1987 *Corps of Engineers Wetlands Delineation Manual* requires that all three of the parameters listed above (hydrophytic vegetation, hydric soil, wetland hydrology) be present in order for an area to be considered a wetland. Because soils have been dismissed as a stand-alone section in this document, discussions of wetland soil types (when known) and impacts resulting from soil compaction and subsequent changes to hydrology are encompassed in the "Wetlands" section of chapters 3 and 4.

State agencies have programs to protect and regulate wetlands under their jurisdiction. PADEP and USACE jointly regulate wetland activities in Pennsylvania. The federal Clean Water Act, section 404 (33 USC § 1344), and chapter 105 under Pennsylvania's Dam Safety and Waterway Management Rules and

Regulations govern wetland activities. PADEP has established the Wetland Protection Program to ensure that wetland functions and values related to water quality, wildlife habitat, and public safety are preserved. The program provides wetland protection with a no net loss policy and implements a program to restore historical wetland losses, with the goal of generating a net gain in wetlands. PADEP describes wetlands in two categories, including "Exceptional Value Wetlands" (includes wetlands that deserve special protection) and "other wetlands" (includes wetlands not categorized as exceptional value wetlands). Wetlands which serve as habitat for fauna or flora listed as threatened or endangered under the Endangered Species Act are considered Exceptional Value Wetlands (PA Code § 105.17 *Wetlands*) and are described where applicable in this section. Wetlands in the riparian buffer must be protected and maintained in a manner consistent with chapter 105 (relating to dam safety and waterway management). Additionally, PADEP chapter 102 requires minimum riparian buffers during construction activities, which protect perennial or intermittent rivers, streams, creeks, lakes, ponds, and reservoirs. Construction in areas that contain wetlands or water bodies may require joint permit applications.

In New Jersey, USACE and the NJDEP Division of Land Use Regulation program both have jurisdiction over tidal wetlands, navigable waters, and wetlands within 1,000 feet of navigable waterways. Wetlands are protected under the New Jersey Freshwater Wetlands Protection Act (NJSA 13:9B) and the federal Clean Water Act, section 404. NJDEP protects wetlands and transition areas as well as buffers under the New Jersey Freshwater Wetlands Protection Act. Similar to Pennsylvania, the NJDEP Division of Land Use Regulation describes Exceptional Wetlands as those sites with documented habitat or presence of threatened or endangered species; these wetlands are described where applicable in this section. The permitting agencies (state and USACE) use the USACE manual to determine jurisdictional wetlands, but the NPS must meet standards using the Cowardin method (Cowardin et al. 1979).

WETLAND ASSESSMENT METHODOLOGY

Characterization of wetlands along the alternative alignments within the parks came from several sources, including field surveys conducted during 2010 and 2011 (NPS 2011b), National Wetlands Inventory (NWI) maps, environmental reports, previous wetland delineations, and aerial photography. The USFWS NWI produces information on the characteristics, extent, and status of the nation's wetlands and deepwater habitats. Wetlands on the maps are based on the Cowardin wetland definition and classification system (Cowardin et al. 1979), so wetlands depicted on NWI maps (normally subject to ground-truthing) are considered wetlands by the NPS. The following reports were also used to characterize wetlands: *Field Survey Report: Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request Environmental Impact Statement* (NPS 2011b) and *Susquehanna–Roseland 500-kV Transmission Line Project PPL Electric Utilities: Wetlands and Other Waters of the United States Findings Report Delaware Water Gap National Recreation Area Pike and Monroe Counties, Pennsylvania* (Berger 2010a). Areas that appeared to be wetlands or were areas of known wetlands along each alternative alignment were visited in the field. Wetlands (and waters of the United States) along the alternatives were mapped using both the USACE methodology (1987) and the delineation methodology supported by the NPS.

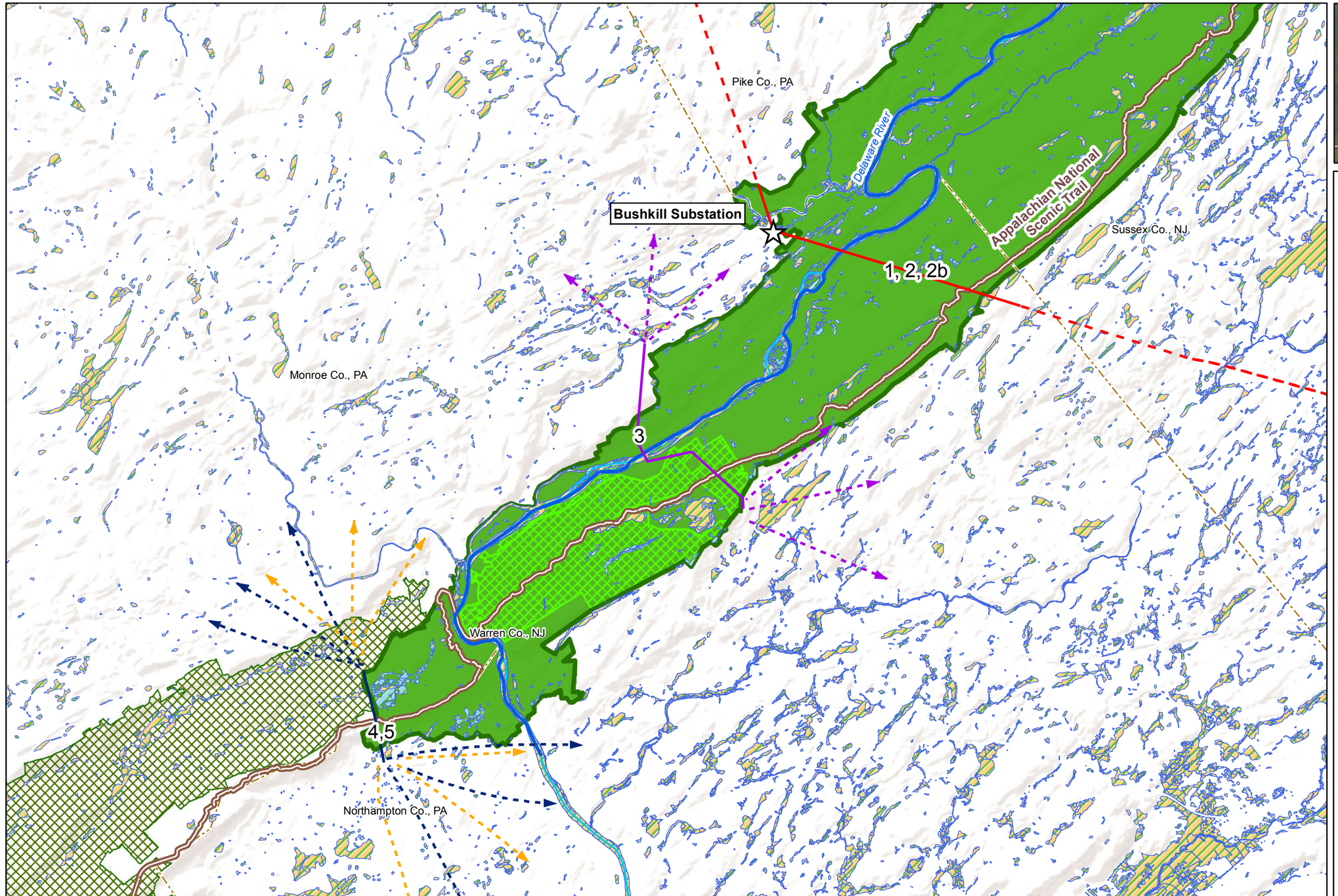
The paragraphs below describe general wetland communities that are present within the parks. Detailed descriptions of wetland systems and along the alignments for alternatives 1 through 5 and an evaluation of wetland functions and values follow the general discussion below. The detailed wetland descriptions for alternatives 1, 2, and 2b are based on surveys conducted by the applicant within NPS boundaries (Berger 2010a). These surveys were conducted between September 2008 and May 2009 and covered the existing ROW and proposed access roads. Surveys for alternatives 3, 4, and 5 are based primarily on the summer 2010 wetland surveys, which were conducted only within the boundaries of DEWA and APPA (NPS 2011b). The study area for the surveys along the alignments for alternatives 3, 4, and 5 (NPS 2011b) was limited to resources found along an alignment's centerline, within or intersected by a 200-foot corridor on

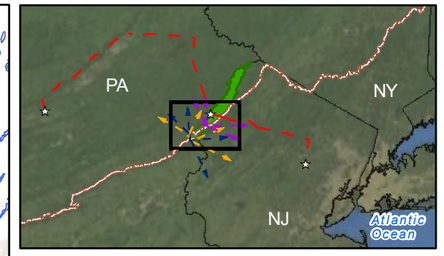
either side of the centerline, or within proposed access roads and staging areas (where known). Where an alternative alignment crossed APPA outside DEWA boundaries, the study area included a 500-foot corridor on either side of the trail in addition to the 400-foot alignment corridor (NPS 2011b). Portions of the alignments that fall within the study area but outside NPS boundaries are characterized with as much detail as possible from existing information, including previous reports and NWI maps, as described above.

Approximately 1,000 individually mapped wetland areas exist within the parks (figure 27). In general, wetland systems within the parks include palustrine, riverine, and lacustrine systems as well as special wetland systems such as fens, vernal pools and seeps, and peatlands.

Palustrine Wetlands: Palustrine wetland systems are nontidal wetlands that are dominated by trees, shrubs, persistent emergent species, lichens, or mosses (Cowardin et al. 1979). Palustrine wetlands are bordered entirely by upland areas or other wetland systems, and are commonly called marshes, bogs, swamps, or prairies. Cowardin subclasses and dominance types describe the type of vegetation present in the wetland. For example, within the parks, the palustrine systems that are present include emergent, forested, and scrub shrub systems. Specifically, there are large, complex, forested wetland systems that are on ridgetops bordering the Delaware River that flow downslope until they reach a broad floodplain. There are also broad expanses of wet meadows and freshwater marshes characterized by sedges. The following paragraphs describe general characteristics of the palustrine systems within the parks:

- **Palustrine Emergent Wetlands (PEM)**: Palustrine emergent wetlands are characterized by rooted herbaceous hydrophytes, which are commonly perennials and are present for most of the growing season of most years. Within the category of emergent wetlands, there are persistent and nonpersistent PEMs. In persistent PEMs, vegetation remains standing until the next growing season. Nonpersistent PEMs are dominated by species that fall below the water or to the surface at the termination of the growing season (Cowardin et al. 1979, 20). Palustrine emergent wetlands with persistent vegetation are referred to as PEM1 and with nonpersistent vegetation are PEM2.
- **Palustrine Emergent/Palustrine Scrub Shrub Wetlands (PEM/PSS)**: Palustrine scrub shrub wetlands (PSS) are wetlands where the woody vegetation is less than 6 meters tall, and is often composed of young trees, shrubby species, or species that exhibit stunted growth due to environmental conditions. These areas can be permanent, or the result of succession leading toward a forested wetland. The vegetation in this community can include broadleaf deciduous vegetation, needle-leaved evergreen vegetation, or dead vegetation (Cowardin et al. 1979, 20). Dead scrub shrub wetlands contain dead woody plants under 6 meters tall and are generally created due to disturbance such as landslides, beavers, fire, insect infestations, and air pollution (Cowardin et al. 1979, 20). The Cowardin classification of PEM/PSS refers to an area that exhibits both PEM and PSS wetland characteristics.
- **Palustrine Forested Wetlands (PFO)**: Palustrine forested wetlands have vegetation that is 6 meters or greater in height. These wetlands frequently are found in areas along rivers and streams, and in mountains where moisture is abundant. Generally, vegetation includes a canopy of trees, with an understory of younger trees and shrubs and an herbaceous layer. Palustrine broadleaf deciduous wetlands and palustrine needle-leaved evergreen forested wetlands can both be found in rich or decomposed organic soils. Also, dead forested wetlands have dead woody vegetation that is taller than 6 meters; these wetlands tend to be near beaver ponds or areas of human disturbance; these wetlands are caused by a variety of factors, including landslides, beavers, fire, or herbicides (Cowardin et al. 1979, 20–21).





Legend

- Substation
- Alternative 1, 2, 2b
- Alternative 3
- Alternative 4
- Alternative 5
- Appalachian National Scenic Trail
- Middle Delaware National Scenic and Recreational River
- Delaware River
- Delaware Water Gap National Recreation Area
- Worthington State Forest
- CVNWR Boundary
- NWI Wetlands
- Wetlands
- County Line

Note: Designated boundary of CVNWR is depicted, not all property is owned within the boundary

0 2 4
Miles

Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 27
Alternative Overview Map
Wetlands

Source: ESRI Streetmap 2006, Penn State 2010, ESRI ArcGISonline Map Service 2010, NJOIT 2010, USGS 2006, NJ DEP 2008, NWI 1977

Projection: NAD 83 UTM Zone 18N
Date: July, 2012

- **Fens, Seeps, and Vernal Pools**: Fens are defined as palustrine wetland communities in areas where the underlying bedrock is limestone. Seeps are defined as wetland areas that typically are found in sloping terrain, and are fed by groundwater. A typical vernal pool is a shallow depression on the forest floor that may or may not contain plants; it usually holds water from November to mid-June, and is dry the remainder of the year (NPS 2008a, 1).
- **Palustrine Nonvegetation Wetlands (PUBHx)**: This wetland is defined as a palustrine wetland with unconsolidated bottom that is permanently flooded and has been excavated.
- **Palustrine Emergent Wetlands (PEMB):** This palustrine wetland contains emergent vegetation and is saturated to the surface for extended periods during the growing season, although surface water is seldom present.
- **Riverine Wetlands**: In general, riverine wetland systems are composed of all wetland areas in a channel connecting two standing bodies of water, are not dominated by vegetation, and do not have ocean-derived salinity greater than 0.5 parts per thousand; springs that discharge into a stream or river are considered to be part of the riverine wetland (Cowardin et al. 1979). NWI maps characterize the Delaware River within the parks as a riverine, lower perennial, unconsolidated bottom, permanently flooded wetland. Lower perennial riverine wetlands have a low gradient and perennial flow, and the water movement is slow (Cowardin et al. 1979). Generally, the substrate of lower perennial wetlands is mainly mud or sand, and there may be a deficit of oxygen at some points in the year; these systems typically have a well-developed floodplain (Cowardin et al. 1979, 7–8).
- **Lacustrine Wetlands**: Lacustrine wetlands are described as being in a topographic depression or a dammed river channel, generally lacking vegetation (including trees, shrubs, persistent emergents, emergent mosses, or lichens), and generally larger than 20 acres (Cowardin et al. 1979). Additionally, lacustrine wetlands are bounded by upland habitat or a wetland containing trees, shrubs, persistent emergents, emergent mosses, or lichens. These wetlands include areas around lakes and reservoirs, as well as intermittent lakes (Cowardin et al. 1979, 9–10).

EVALUATION OF WETLAND FUNCTIONS AND VALUES

The existing wetland conditions were evaluated based on wetland functions and values described in NPS *Procedural Manual #77-1: Wetland Protection* (NPS 2012d). Functions and values of the wetlands are presented at locations where surveys occurred or where sufficient data on the wetlands were available. The wetland functions and values evaluation for the wetlands delineated at the parks included describing wetlands as Exceptional Value Wetlands (all other wetlands are considered ordinary wetlands) when applicable, as well as the following variables:

Functions

- **Groundwater Recharge/Discharge**: Recharge is the potential of a wetland to contribute water to an aquifer; discharge is the potential of a wetland to discharge groundwater to the surface. The wetland's ability to help maintain stream base flow has also been included in this variable.
- **Flood Attenuation/Alteration**: Flood attenuation/alteration functionality is evaluated based on the effectiveness of a wetland in reducing flood damage from prolonged periods of precipitation by storing and desynchronizing (i.e., gradually releasing at lower heights/velocities) floodwaters. The economic value of flood protection has also been included in this variable.
- **Fish/Shellfish Habitat**: Fish/shellfish habitat functionality is evaluated based on the effectiveness of seasonal or permanent watercourses associated with a wetland to provide habitat and the

essentials necessary for life for a diversity of types and abundance of populations of fish/shellfish and other aquatic organisms. The economic value of the fishery was also considered in this variable. Both resident and migratory fish species were considered.

- **Sediment/Toxicant Retention**: Sediment/toxicant retention functionality is evaluated based on the effectiveness of a wetland to reduce or prevent degradation of water quality by acting as a trap for sediments or toxic substances in runoff water that could adversely affect aquatic and terrestrial life.
- **Nutrient Removal**: Nutrient removal functionality is evaluated based on the effectiveness of a wetland to serve as a trap for nutrients carried by runoff from surrounding uplands or contiguous wetlands, and the wetland's ability to process these nutrients into other forms. The wetland also functions to prevent the adverse effects associated with excess nutrients entering aquifers or surface waters, including streams, rivers, lakes, ponds, and estuaries.
- **Production Export**: Production export functionality is evaluated based on the effectiveness of a wetland to produce food or other usable products for living organisms (including humans). Detrital nutrient export to downstream systems has been included in this variable.
- **Sediment/Shoreline Stabilization**: Sediment/shoreline stabilization functionality is evaluated based on the effectiveness of a wetland to stabilize streambanks against shear stresses and/or protect shorelines against erosion by reducing forces caused by waves. Other erosion and sediment control functions, such as reduction of water velocities and binding of the soil, have been included in this variable.

Values

- **Wildlife Habitat**: Wildlife habitat value is evaluated based on the effectiveness of a wetland to provide habitat and the essentials necessary for life for a diversity of types and abundance of populations of wildlife species typically associated with wetlands, their associated water bodies, and the wetland edge. Both resident and migratory species were considered. Faunal (wildlife) productivity has also been included in this variable.
- **Recreation (Consumptive/Nonconsumptive) and Tourism**: Recreation and tourism value is evaluated based on the suitability of a wetland and associated watercourses to provide active and/or passive recreational opportunities for both local and nonlocal populations. Consumptive use includes activities such as hunting and fishing, which may diminish the plants, animals, or other resources that are intrinsic to the wetland. Nonconsumptive use includes activities such as hiking, bird-watching, boating, and canoeing, which do not diminish the resources of the wetland. The economic value of tourism has also been included in this variable.
- **Education/Scientific**: Education/scientific value is evaluated based on the suitability of a wetland to serve as an "outdoor classroom," as a "reference site" for scientific study or research on ecosystems, or for interpretation.
- **Uniqueness/Heritage**: Uniqueness/heritage value is evaluated based on the effectiveness of a wetland or its associated water bodies to provide certain wetland attributes or special functions related to aspects of public health, recreation, and habitat diversity. This may include the wetland's overall health and appearance, its role in the overall ecology of the area, or its relative importance as a typical wetland class for the geographic location.
- **Visual Quality/Aesthetic**: Visual quality/aesthetic value is evaluated based on the effectiveness of a wetland in contributing to the visual or aesthetic quality or pleasing nature of the surrounding landscape.

- **Endangered Species Habitat**: Endangered species habitat value is evaluated based on the suitability of a wetland to support and/or provide the habitat requirements specific to endangered species.

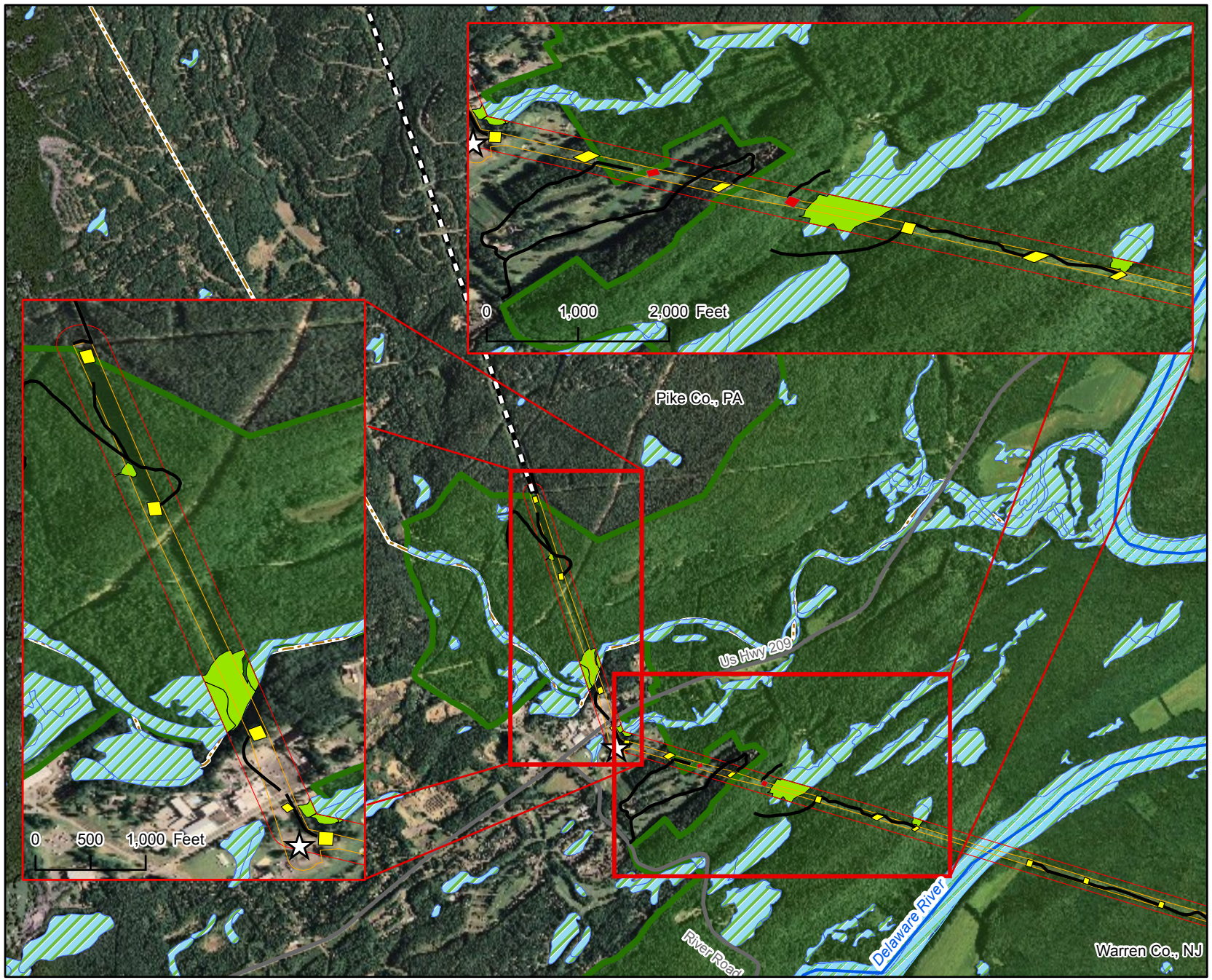
ALTERNATIVE 1 (NO ACTION), ALTERNATIVE 2, AND ALTERNATIVE 2b

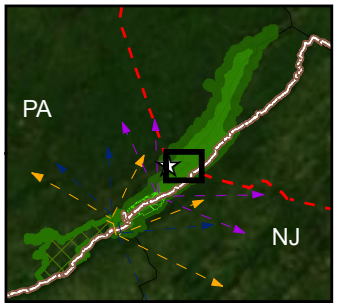
Inside the study area in Pennsylvania, a site investigation for the presence of jurisdictional waters of the United States, including wetlands, was conducted along the alignment for alternatives 1, 2, and 2b between September 2008 and May 2009 that covered Pike and Monroe counties, Pennsylvania, within the parks (figures 28 through 31). The site investigation identified four wetlands and waters of the United States within the boundaries of the parks in Pennsylvania (Berger 2010a, 4). Inside the study area in New Jersey, a site investigation for the presence of wetlands and open waters was conducted along the alignment for alternatives 1, 2, and 2b in September, October and November 2007 (PSE&G 2009). The site investigation identified five wetlands and waters of the United States within the boundaries of the parks in New Jersey (Berger 2010a, 4). Additionally, there are three wetlands located along alternatives 1, 2, and 2b but outside of park boundaries that are also discussed in this section. Rare and unique habitats that support wetland areas within the ROW are detailed in the paragraphs below; however, the entire community is discussed in detail in the "Rare and Unique Communities" section of this chapter. The paragraphs that follow describe the wetlands that exist along alternatives 1, 2, and 2b. Table 6 describes the functions and values provided by each wetland area.

Arnott Fen – is a calcareous wetland characterized as a PEM/PSS (palustrine emergent/palustrine scrub shrub) wetland along the alignment for alternatives 1, 2, and 2b located within Monroe County, Pennsylvania. This fen occupies approximately 5.3 acres of the larger wetland complex in which it is found. The portion of the wetland along the existing ROW is dominated by tussock sedge (*Carex stricta*) and cattail (*Typha latifolia*) in the emergent areas. The scrub shrub vegetation is located along the outer fringe of the wetland and is dominated by red maple (*Acer rubrum*), smooth alder (*Alnus serrulata*) and swamp rose (*Rosa palustris*). Arnott Fen is considered a rare and unique community as well as an Exceptional Value Wetland (by the Commonwealth of Pennsylvania) because it supports endangered species habitat. The plant community of Arnott Fen is considered globally imperiled, ranked as G1G2, and is the only community of its kind in Pennsylvania (NPS 2009g, 4). Arnott Fen provides habitat for and supports a known population of a federally endangered species (Mellon 2009). Arnott Fen has known populations of at least six plant species of special concern, discussed in more detail in the "Special-status Species" section.

Hogback Ridge – contains woodlands as well as a wetland characterized as a PEM/PSS1E (palustrine emergent/palustrine, scrub shrub, broad- leaved deciduous, seasonally flooded/saturated wetland) located within Monroe County, Pennsylvania. This wetland encompasses approximately 1.7 acres is considered a rare and unique community as well as an Exceptional Value Wetland because it supports endangered species habitat. This wetland contains open water with standing/dead wood. The emergent portion of the wetland is dominated by upright sedge, sphagnum moss (*Sphagnaceae* family), and Japanese stiltgrass (*Microstegium vimineum*) along the outer edges. The scrub shrub portion of the wetland is dominated by smooth alder, winterberry, and highbush blueberry (*Vaccinium corymbosum*). The wetland also contains deciduous scrub shrub wetland vegetation and special-status wetland plant species that are not found anywhere else in the study area and are discussed in more detail in the "Special-status Species" section.

Wetland AA, located within Pike County, Pennsylvania, is characterized as a PFO wetland. This wetland is located on private property outside the boundaries of DEWA but within the study area.





Legend

- Substation
- Crane Pad for Proposed Tower*
- Crane Pad for Existing Tower Removal
- Outside Study Area
- Existing ROW in Study Area
- 350 ft Corridor
- Delaware River
- Proposed Access Road
- Road
- Delaware Water Gap National Recreation Area
- Wetlands within 350ft buffer
- Wetlands
- County Line

** Crane pads for proposed towers will also be used for the removal of existing towers, where applicable*

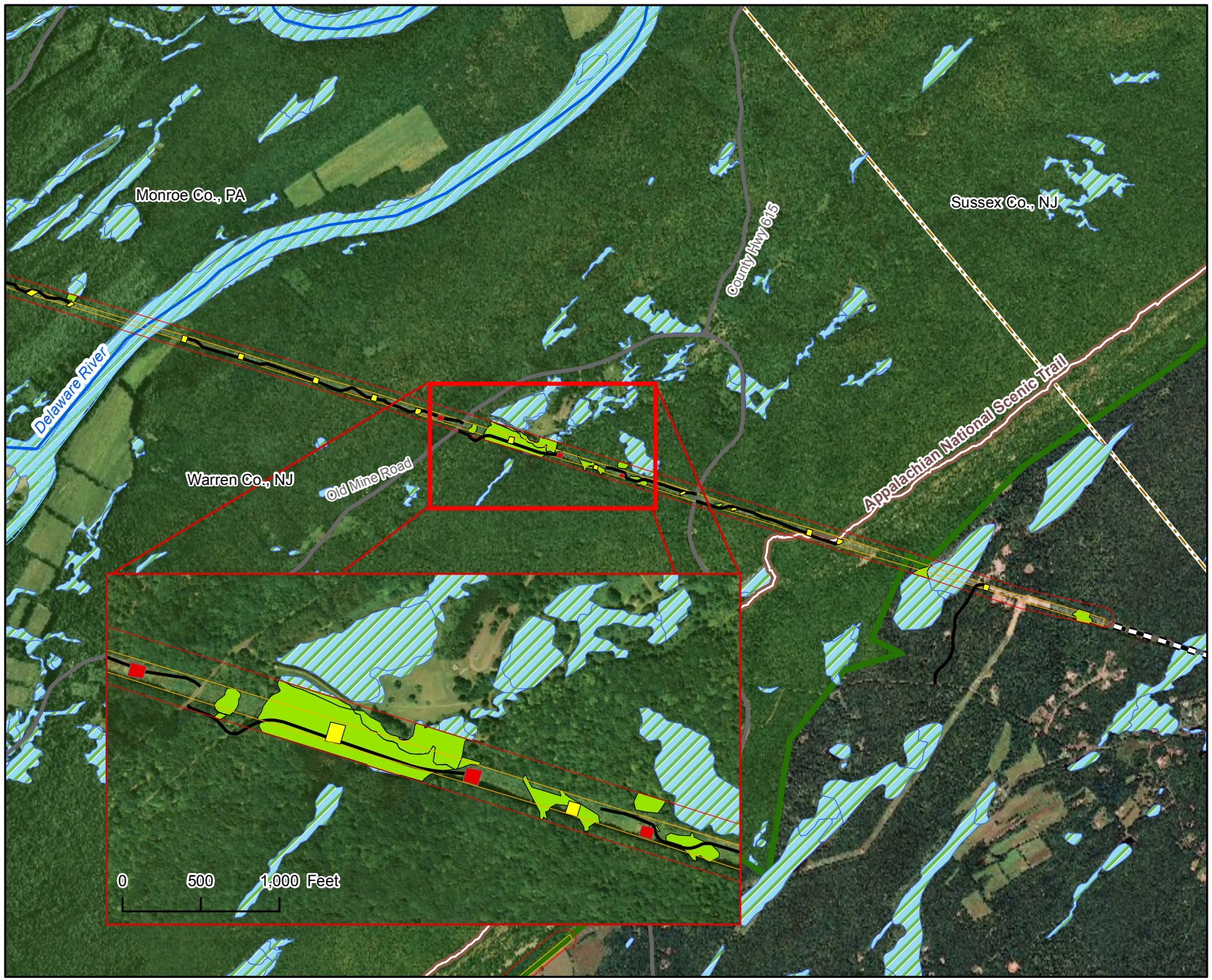
0 1,250 2,500
Feet

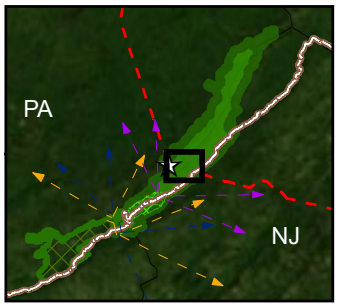
Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 28
Alternative 2 Wetlands in Pennsylvania

Source: ESRI Streetmap 2006, Penn State 2010, ESRI ArcGISonline Map Service 2010, PennDOT 2011, USGS 2006, NJ DEP 2008, NWI 1977

Projection: NAD 83 UTM Zone 18N
Date: July 2012





Legend

- Substation
- Crane Pad for Proposed Tower*
- Crane Pad for Existing Tower Removal
- Outside Study Area
- Existing ROW in Study Area
- 350 ft Corridor
- Appalachian National Scenic Trail
- Delaware River
- Proposed Access Road
- Road
- Delaware Water Gap National Recreation Area
- Wetlands within 350ft buffer
- Wetlands
- County Line

** Crane pads for proposed towers will also be used for the removal of existing towers, where applicable*

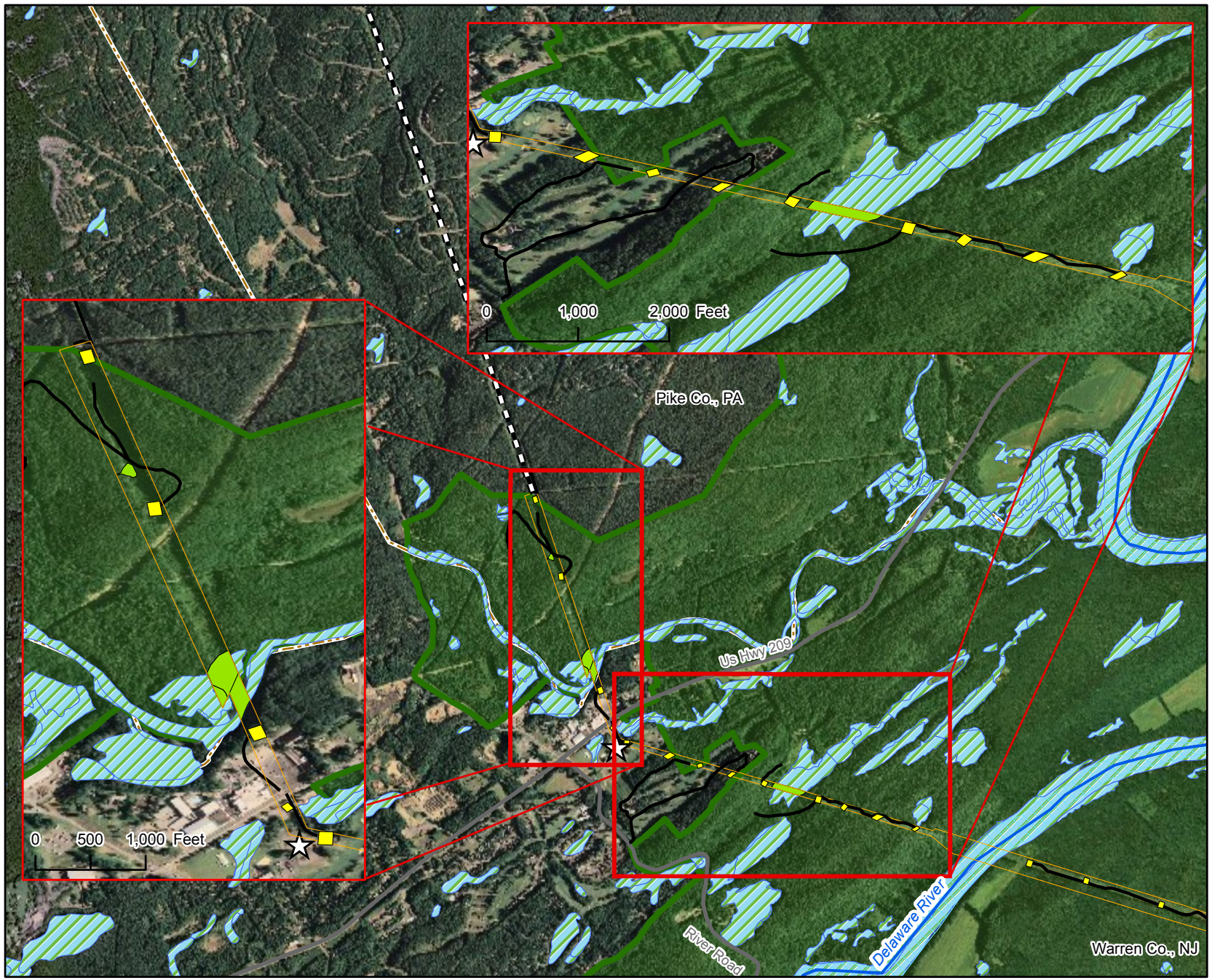
0 1,250 2,500
Feet

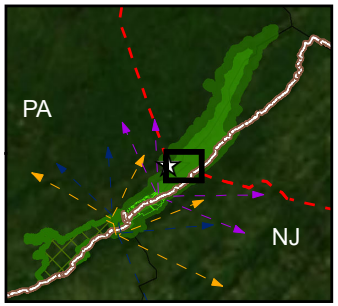
Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 29
Alternative 2 Wetlands in New Jersey

Source: ESRI Streetmap 2006, Penn State 2010, ESRI ArcGISonline Map Service 2010, PennDOT 2011, USGS 2006, NJ DEP 2008, NWI 1977

Projection: NAD 83 UTM Zone 18N
Date: July 2012





Legend

- Substation
- Crane Pad for Proposed Tower*
- Crane Pad for Existing Tower Removal
- Outside Study Area
- Alternative 2b Corridor
- Appalachian National Scenic Trail
- Delaware River
- Proposed Access Road
- Road
- Delaware Water Gap National Recreation Area
- Wetlands in Alternative 2b Corridor
- Wetlands
- County Line

** Crane pads for proposed towers will also be used for the removal of existing towers, where applicable*

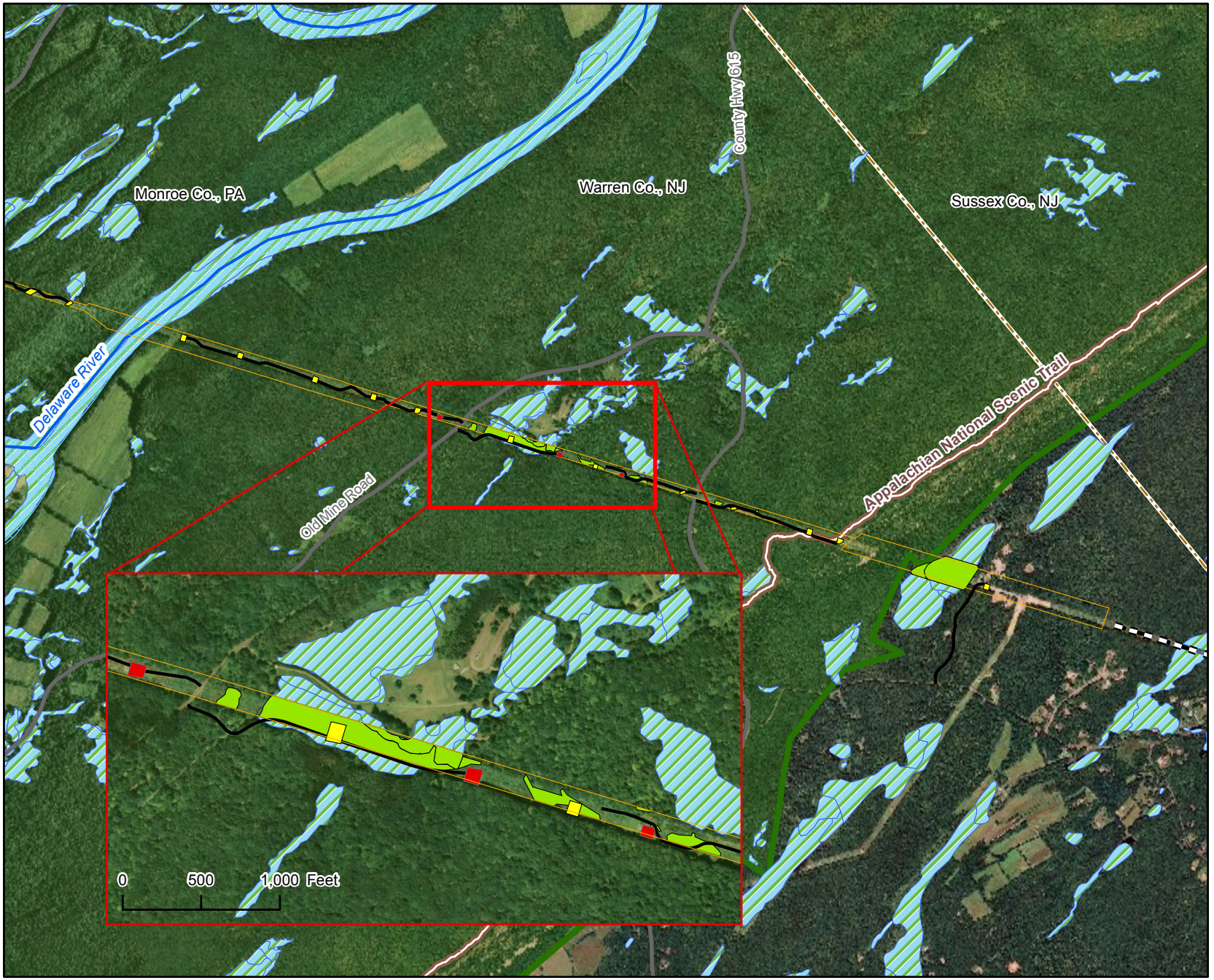
0 1,250 2,500
Feet

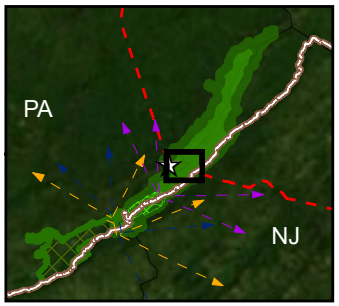
Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 30
Alternative 2b Wetlands in Pennsylvania

Source: ESRI Streetmap 2006, Penn State 2010, ESRI ArcGISonline Map Service 2010, PennDOT 2011, USGS 2006, NJ DEP 2008, NWI 1977

Projection: NAD 83 UTM Zone 18N
Date: July 2012





Legend

- Substation
- Crane Pad for Proposed Tower*
- Crane Pad for Existing Tower Removal
- Outside Study Area
- Alternative 2b Corridor
- Appalachian National Scenic Trail
- Delaware River
- Proposed Access Road
- Road
- Delaware Water Gap National Recreation Area
- Wetlands in Alternative 2b Corridor
- Wetlands
- County Line

** Crane pads for proposed towers will also be used for the removal of existing towers, where applicable*

0 1,250 2,500
Feet

Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 31
Alternative 2b Wetlands in New Jersey

Source: ESRI Streetmap 2006, Penn State 2010, ESRI ArcGISonline Map Service 2010, PennDOT 2011, USGS 2006, NJ DEP 2008, NWI 1977

Projection: NAD 83 UTM Zone 18N
Date: July 2012

TABLE 6: FUNCTIONS AND VALUES OF ALTERNATIVE 1, 2, AND 2B WETLANDS WITHIN PARK BOUNDARIES

Wetland	Arnott Fen	Hogback Ridge	Van Campen	Wetland BB	Wetland CC	Wetland 45	Wetland 42	Wetland 46	Wetland 47	Wetland FI
Functions										
Groundwater recharge/discharge	X	X	X	X	X	X	X	X	X	
Flood attenuation/alteration	X		X	X						X
Fish/shellfish habitat	X	X	X	X						X
Sediment/toxicant retention	X									X
Nutrient removal	X	X								X
Production export	X	X	X	X	X	X	X	X	X	X
Sediment/shoreline stabilization				X						X
Values										
Wildlife habitat	X	X	X	X	X	X	X	X	X	X
Recreation and tourism			X							X
Education/scientific	X	X								
Uniqueness/heritage	X	X	X	X						
Visual quality/aesthetic	X	X		X						
Endangered species habitat	X	X	X	X						

Source: Berger 2010a.

Note: Wetlands AA, BB, and CC along the B-K Line are also found in alternatives 3 and 4

Wetland BB is located within Pike County, Pennsylvania, and lies within the floodplain of Bushkill Creek. This wetland contains separate PEM and PFO portions. The emergent wetland is dominated by skunk cabbage (*Symplocarpos foetidus*) and tussock sedge (*Carex stricta*). A small stream within the forested portion of the wetland is dominated by red maple (*Acer rubrum*), but also supports tulip poplar (*Liriodendron tulipifera*) and black gum (*Nyssa sylvatica*). Wetland BB contains both temporary and saturated water regimes. The hydrology for the wetland is controlled by water from the nearby Bushkill Creek and associated tributaries. Bushkill Creek is characterized as a wild trout stream and a stocked trout stream. Wetland BB is greater than 10 acres in size. Therefore, wetland BB is considered an Exceptional Value Wetland because it is located in the floodplain of waters listed as Exceptional Value under Chapter 93 (relating to water quality) in Pennsylvania State Code § 105.17, "Wetlands."

Wetland CC is a small PEM/PSS wetland located near the northern portion of the alignment within Pike County, Pennsylvania. The emergent vegetation in wetland CC is dominated by sphagnum moss, Japanese stiltgrass, and steeplebush (*Spirea tomentosa*). The scrub shrub vegetation is dominated by smooth alder, highbush blueberry, and winterberry. Hydrology for this wetland is controlled primarily by water provided from underground seeps and springs that turn into a headwater stream.

Wetland FI is a very narrow (10 feet wide) PFO wetland located along the shoreline of the Delaware River within Monroe County, Pennsylvania. The vegetation includes a riparian buffer of sycamore (*Platanus occidentalis*) trees.

Van Campen Wetland this wetland is part of the greater Van Campen Brook riparian area and is considered an outstanding natural feature of DEWA, discussed in detail in the "Rare and Unique Communities" section of this chapter. This riparian area includes a category one stream. Category one streams are defined by the NJDEP as waters protected from any measureable changes in water quality because of their exceptional ecological significance, exceptional recreational significance, exceptional water supply significance, or exceptional fisheries resources. This riparian area also includes a popular recreation area, and an outstanding wetland complex. The Van Campen wetland complex (also referred to as the Watergate wetland) is within the ROW along the B-K Line of alternatives 1, 2, and 2b. It is characterized as a PEM/PSS wetland located within Warren County, New Jersey. The wetland contains emergent and deciduous scrub shrub wetland vegetation and is a rare and unique community as well as an Exceptional Value Wetland because this wetland supports a special-status plant and wildlife species. The wood turtle is state listed by New Jersey as a threatened wildlife species. Field observations during a 2010 through 2011 study confirmed wood turtle presence within the ROW at Van Campen Wetland and in adjacent portions of Van Campen Brook, east of Old Mine Road (EcolScience 2011). Reed meadowgrass (*Glyceria grandis*), also known as American manna grass, is state listed by New Jersey as an endangered plant species. Reed meadowgrass was observed during rare plant surveys conducted in 2010 within the ROW, tucked in a seepage area with other herbaceous wetland plants (Mellon 2010a, 2010b). The emergent portion of the wetland is dominated by upright sedge, steeplebush, and Japanese stiltgrass. The scrub shrub portion of the wetland is dominated by smooth alder and maleberry (*Lyonia ligustrina*). In April 2012, it was observed that the majority of the alder had been removed during vegetation maintenance activities. Hydrology for this wetland is likely provided by underground springs and seeps.

Wetland 42 has both PEM/PSS and PFO wetland portions and is partially located in the proposed ROW within Warren County, New Jersey. The emergent vegetation is dominated by cattail, sensitive fern (*Onoclea sensibilis*) and Japanese stiltgrass. The scrub shrub vegetation is dominated by silky willow (*Salix sericea*), smooth alder, multiflora rose (*Rosa multiflora*) and highbush blueberry. The forested portion of wetland 42 is dominated by tulip poplar (*Liriodendron tulipifera*), but also supports yellow birch (*Betula alleghaniensis*) and American beech (*Fagus grandifolia*). The understory of the forested

wetland is dominated by sphagnum moss and Japanese stiltgrass but also supports cinnamon fern (*Osmunda cinnamomea).* Underground seeps and springs provide overland flow across this forested wetland.

Wetland 45 is a PEM/PSS wetland in the ROW within Warren County, New Jersey. The emergent vegetation in this wetland is dominated by cinnamon fern and Japanese stiltgrass but also supports soft rush (*Juncus effusus*), sedge species (*Carex spp*. not flowering at time of survey), false hellebore (*Veratrum viride*), sensitive fern, and sphagnum moss. The scrub shrub portion of the wetland is dominated by multiflora rose, Japanese barberry (*Berberis thunbergii*), highbush blueberry, and silky willow; additional shrub species include spicebush (*Lindera benzoin*). The hydrology of the wetland includes narrow corridors of seeps, saturated soils and rivulets, as well as a free-flowing stream inches wide.

Wetland 46 is a PEM/PSS adjacent to a bermed, isolated, man-made open water pond located entirely within the maintained ROW in Warren County, New Jersey. The vegetation in the sapling/shrub stratum is dominated by sheep laurel (*Kalmia latifolia*), smooth alder, and maleberry. The vegetation in the herbaceous stratum is dominated by sphagnum moss but soft rush (*Juncus effusus*), Canada rush (*Juncus canadensis*), and steeplebush are also present. This wetland is primarily an open water habitat; the hydrololgy for this wetland is provided by underground seeps and springs which allow the water to pond within the berms.

Wetland 47 is a PEM/PSS wetland in the ROW within Warren County, New Jersey. The vegetation in the sapling/shrub stratum is dominated by highbush blueberry and Allegheny blackberry (*Rubus allegheniensis*). The vegetation in the herbaceous stratum is dominated by cinnamon fern and sphagnum moss. The wetland drains to an unnamed tributary of Van Campen Brook and is characterized as a seep or spring originating from rock strata within the ROW (EcolScience 2008). The primary function of this wetland is groundwater recharge/discharge. Other functions and values of wetland 47 are included in table 6.

- Wetland NWI-1 is a PEM/PSS wetland within Warren County, New Jersey which surrounds an open-water wetland known as Sand Pond. Sand Pond and the wetlands surrounding it are outside the boundaries of DEWA but are within the study area.
- Wetland 49 is a PEM/PSS wetland outside the park boundaries but still within the study area. Vegetation is unknown because this area has not been studied by NPS.

In addition to the wetlands site investigation, a vernal habitat assessment was conducted for the wetland systems along the proposed access roads along the ROW of alternatives 1, 2, and 2b within the New Jersey segment of the parks. The assessment took place from March 2009 to July 2009 and was conducted in accordance with the NJDEP freshwater wetlands vernal habitat protocols (EcolSciences 2010a, 1). The assessment resulted in the identification of one wetland area as potentially containing vernal habitat (EcolSciences 2010a, 1). However, this vernal habitat is not located within alternatives 1, 2, and 2b and is therefore not discussed further.

ALTERNATIVE 3

Within the study area, wetlands along the alternative 3 alignment were field-delineated, and function and value assessments of the wetlands delineated along the alignment were performed (NPS 2011b) (table 7, figure 32). Within the boundaries of DEWA, five wetlands were found along the alternative 3 ROW (wetlands 3, 4, 5/6, 8, and 10) and are described in more detail below. Acreages of these wetland areas are generally not described because these wetland areas extend beyond the existing ROW. There is also one wetland along alternative 3 outside park lands. There are no rare and unique communities known as wetland areas along the alternative 3 alignment. A more detailed description of each of the wetlands follows:

- Wetland 3 is within the ROW of alternative 3, east of the Delaware River, in New Jersey. This wetland is classified as a PEMY (palustrine, emergent, saturated/semipermanent/seasonal wetland) and consists of a seep that flows from fractured shale and drains to an intermittent stream channel. Wetland 3 is vegetated predominantly with Japanese barberry, an invasive species, and is subdominated by hydrophytic plant species. No appreciable soil accumulation was present within the wetland, precluding soil profile analysis.
- Wetland 4 is within the ROW of alternative 3, northeast of wetland 3. This wetland is classified as a PEMY wetland and consists of a seep that flows from fractured shale and drains to an intermittent stream channel. This emergent wetland is vegetated predominantly with steeplebush. No appreciable soil accumulation was present within the wetland, preventing soil profile analysis.
- Wetland 5/6 is a wetland complex adjacent to the ROW of alternative 3, east of the Delaware River, in New Jersey. This wetland is classified as a PEMY wetland and consists of a seep that flows from glacial till and drains to an intermittent stream channel. This emergent wetland is sparsely vegetated with New York fern, cinnamon fern, large leaved violet (*Viola blanda*), and sedge species (*Carex* spp.). No appreciable soil accumulation was present within the wetland, preventing soil profile analysis.
- Wetland 8 is within the ROW of alternative 3, east of the Delaware River, in New Jersey. This wetland is classified as a PEMB wetland and consists of a seep that flows from fractured shale and drains to a perennial stream channel. This emergent wetland is vegetated predominantly with sphagnum moss. The soil matrix within this wetland had a chroma value of 2 or less with redox concentrations and depletions, thus indicating hydric soils.
- Wetland 10 is along alternative 3 in New Jersey where the ROW follows the boundary of DEWA. This wetland is classified as a PSS wetland that is seasonally flooded. Wetland 10 is vegetated mainly with highbush blueberry, cinnamon fern, and red maple saplings. The soil matrix within this wetland had a chroma value of 2 or less with redox concentrations and depletions, thus indicating hydric soils.
- NWI-3 is a PFO4/1E (palustrine, forested, needle-leaved evergreen/broad-leaved deciduous seasonally flooded/saturated wetland) outside the boundaries of DEWA but within the study area. This wetland is along the existing alternative 3 ROW where it runs alongside the boundary for DEWA. The wetland is vegetated with a mix of needle-leaved evergreen species and broadleaf deciduous species and is seasonally flooded.
- In addition to the wetlands described above, wetlands AA, BB, and CC, as previously described above in alternatives 1, 2, and 2b also exist along the alignment for alternative 3.

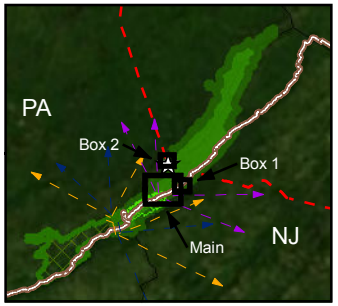
TABLE 7: FUNCTIONS AND VALUES OF ALTERNATIVE 3 WETLANDS WITHIN PARK BOUNDARIES

Wetland	Wetland 3 PEMY	Wetland 4 PEMY	Wetlands 5/6 PEMY	Wetland 8 PEMB	Wetland 10 PSS
Functions					
Groundwater recharge/discharge	X	X	X	X	X
Flood flow alteration				X	
Fish and shellfish habitat					
Sediment/toxicant retention				X	X
Nutrient removal					X
Production export	X	X	X	X	X
Sediment/shoreline stabilization				X	
Values					
Wildlife habitat	X	X	X	X	X
Recreation					
Educational value					
Uniqueness/heritage					
Visual quality/aesthetics	X	X	X	X	X
Endangered species habitat					

Source: NPS 2011b.

Note: Functions and values of wetland NWI-3 were not available; wetlands outside park boundaries were not surveyed.

Wetland values for AA, BB, and CC are addressed in table 6.



Legend

- Substation
- Outside Study Area
- Existing ROW in Study Area
- 350 ft Corridor
- Appalachian National Scenic Trail
- Delaware River
- Proposed Access Road
- Road
- Delaware Water Gap National Recreation Area
- Worthington State Forest
- Wetlands within 350ft buffer
- Wetlands
- County Line

0 1,250 2,500
Feet
Scale applies to main frame and inset maps

Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 32
Alternative 3 Wetlands

Source: ESRI Streetmap 2006, Penn State 2010, ESRI ArcGISonline Map Service 2010, PennDOT 2011, USGS 2006, NJ DEP 2008, NWI 1977

Projection: NAD 83 UTM Zone 18N
Date: July, 2012

ALTERNATIVE 4

Inside the study area, wetlands along the alternative 4 alignment were field-delineated in the summer of 2010 (NPS 2011b), and function and value assessments of the wetlands delineated along the alternative 4 ROW were performed table 8, figure 33). Within the boundaries of DEWA, two wetlands were found along the alternative 4 alignment and are described as wetlands 1 and 2. Acreages of these wetland areas are generally not described because these wetland areas extend beyond the existing ROW. An additional wetland was identified within the ROW but outside the boundary of the park. The wetland systems identified along alternative 4 are characterized as PFOs. More detailed descriptions of the wetlands follow:

- Wetland 1 is a forested wetland system east of Totts Gap Road and south of Mountain Road. This wetland is classified as a PFO and consists of a bowl-shaped depression within the floodplain of an unnamed stream channel. This forested wetland is dominated by red maple, willow oak (*Quercus phellos*), American hornbeam (*Carpinus caroliniana*), and silver maple (*Acer saccharinum*) in the canopy and understory. Japanese stiltgrass, an invasive species, and jack-in-the-pulpit were identified as dominant groundcover species. The soil matrix within this wetland had a chroma value of 2 or less with mottling of the matrix, thus indicating hydric soils.
- Wetland 2 is on the opposite side of the ROW from wetland 1, adjacent to the alternative 4 ROW. This wetland is classified as a PFO and is on a slope above the floodplain of an unnamed tributary to Cherry Creek. This forested wetland is dominated by red maple, willow oak, and silver maple in the canopy with an understory of spicebush. Japanese stiltgrass, an invasive species, was identified as the dominant groundcover species. The soil matrix within this wetland had a chroma value of 2 or less with mottling of the matrix, thus indicating hydric soils.
- Wetland NWI-4 is outside the boundaries of DEWA but within the study area. This wetland is a PSS1E/PFO1E wetland. This forested and scrub shrub wetland area is dominated by broadleaf deciduous vegetation. This wetland area is seasonally flooded.
- In addition to the wetlands described above, wetlands AA, BB, and CC, as previously described above in alternatives 1, 2, and 2b also exist along the alignment for alternative 4.

ALTERNATIVE 5

Inside the study area, wetlands along the alternative 5 alignment were field-delineated during the summer of 2010 (NPS 2011b), and function and value assessments of the wetlands delineated along the alternative 5 ROW were performed (table 8, figure 33). Two wetlands were found along alternative 5 within the boundaries of DEWA, and one was found outside the boundaries of the park; these wetlands are the same wetlands as described above for alternative 4 (wetlands 1, 2, and NWI-4). Unlike alternative 4, alternative 5 does not include wetlands along the B-K Line (wetland AA, wetland BB, and wetland CC). The wetland systems identified along the alternative 5 ROW inside the park are characterized as PFOs. Wetland 1 is part of Totts Gap, which consists of Totts Gap Natural Heritage Site and Totts Gap Swamp; this wetland and the PFO/PSS NWI-4 wetland are described in more detail under alternative 4.

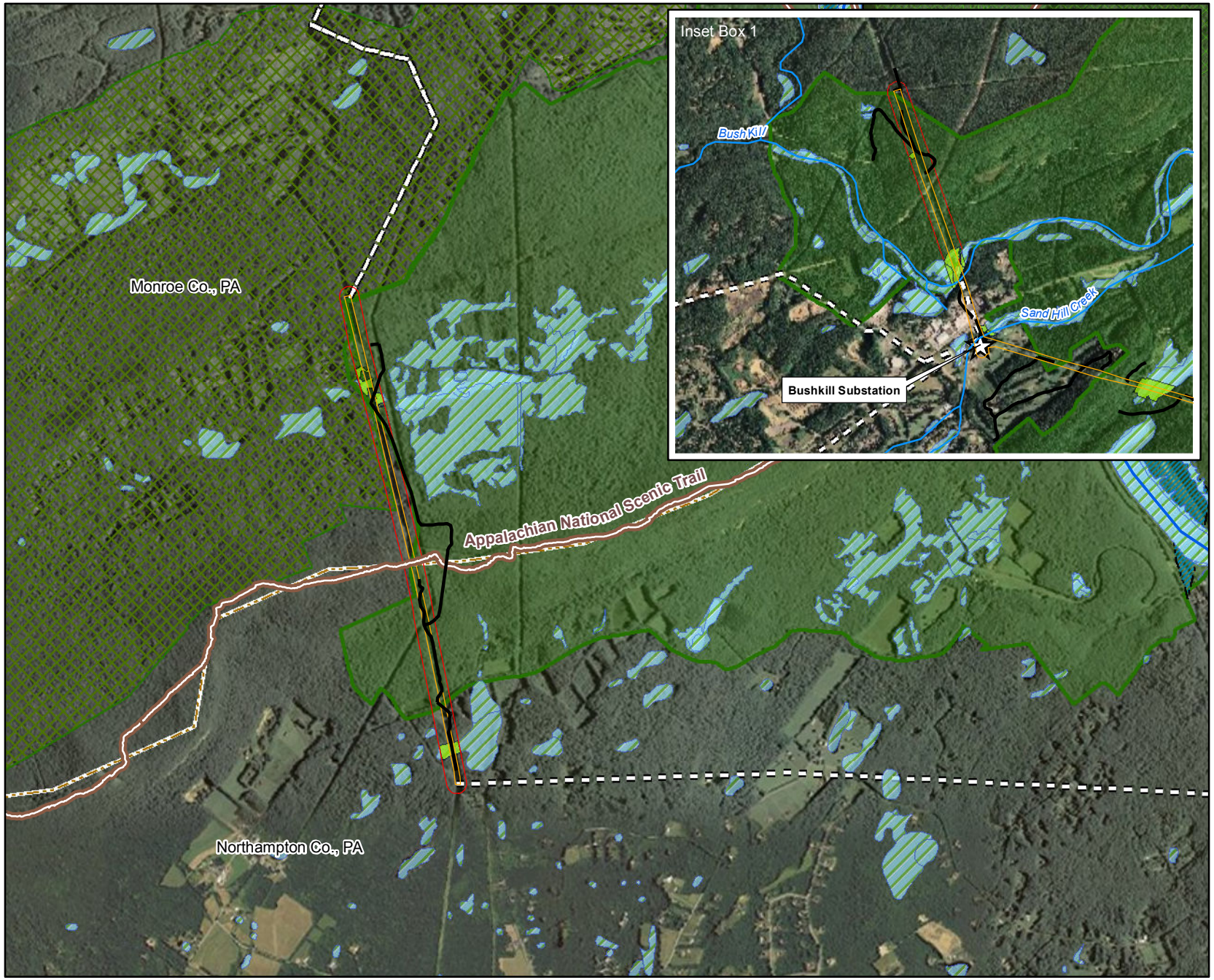
TABLE 8: FUNCTIONS AND VALUES OF ALTERNATIVES 4 AND 5 WETLANDS WITHIN PARK BOUNDARIES

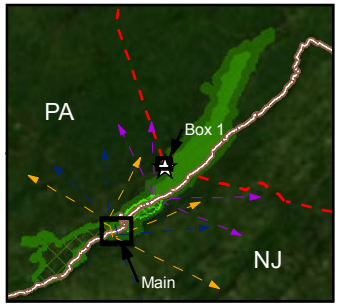
Wetland	Wetland 1 PFO	Wetland 2 PFO
Functions		
Groundwater recharge/discharge	X	X
Flood flow alteration	X	X
Fish and shellfish habitat		
Sediment/toxicant retention		X
Nutrient removal		X
Production export	X	X
Sediment/shoreline stabilization		X
Values		
Wildlife habitat	X	X
Recreation		
Educational value	X	
Uniqueness/heritage	X	
Visual quality/aesthetics	X	X
Endangered species habitat		

Source: NPS 2011b.

Note: Functions and values of wetland NWI-4 were not available; wetlands outside park boundaries were not surveyed.

Wetland values for AA, BB, and CC are addressed in table 6.





Legend

- Substation
- Outside Study Area
- Existing ROW in Study Area
- 350 ft Corridor
- Appalachian National Scenic Trail
- River/Stream
- Proposed Access Road
- Delaware Water Gap National Recreation Area
- CVNWR Boundary
- Wetlands within 350ft buffer
- Wetlands
- County Line

Note: Designated boundary of CVNWR is depicted, not all property is owned within the boundary

0 1,250 2,500
Feet
Scale applies to main frame and inset maps

Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 33
Alternative 4/5 Wetlands

Source: ESRI Streetmap 2006, Penn State 2010, ESRI ArcGISonline Map Service 2010, PennDOT 2011, USGS 2006, NJ DEP 2008, NWI 1977

Projection: NAD 83 UTM Zone 18N
Date: July, 2012

OUTSIDE THE STUDY AREA

Outside the study area in Pennsylvania, the S-R Line could pass through Pike, Monroe, Carbon, Northampton, Wayne, Lackawanna, and Luzerne counties. Although these counties are largely undeveloped, they are some of the fastest growing and developing counties within Pennsylvania, particularly Monroe and Pike counties (Commonwealth of PA 2005a, 2005b, 2005c, 2005d, 2005e, 2005f, 2005g). As more and more land is developed, the park lands will become increasingly important natural areas. Development within the counties in and around the parks is discussed in the "Socioeconomics" section of this chapter. All seven counties contain a combination of private and public lands. More than 20,000 acres of Monroe County have been designated as the Cherry Valley National Wildlife Refuge (NWR), although not all 20,000 acres are under current ownership or management of the USFWS. In Pike County, which contains a large portion of DEWA, wetlands compose between 6% and 7% of the county land (Tiner 1990, 25). Pike County wetlands are mainly forested and forested scrub shrub, and freshwater ponds, lacustrine wetlands (along lakes), and riverine wetlands are also found within the county (USFWS 2010a; Tiner 1990, 73, 80). Northampton County contains less undeveloped land than the other counties (approximately 62%) (Commonwealth of PA 2005f, 1), and only about 1.2% of the land in Northampton County is wetland areas (mainly forested wetlands) (Tiner 1990, 76). Carbon County contains about 1.2% wetlands, the majority of which are forested wetland areas (Tiner 1990, 41). Approximately three-quarters of Carbon County is undeveloped, due in large part to the rugged terrain, and contains both private and public lands and a portion of APPA (Commonwealth of PA 2005g, 1). In Wayne, Lackawanna, and Luzerne counties between 3% and 5% of the land area is covered by wetlands (Tiner 1990, 25). The types of wetlands found within these counties are similar to those found in Pike County, although Luzerne and Wayne counties have more emergent wetland areas (USFWS 2010a; Tiner 1990, 63, 68, 92).

Outside the study area in New Jersey, the S-R Line could pass through Morris, Sussex, and Warren counties. About 14% of the land in Sussex County is wetland areas, with about 9% being forested wetlands and 5% being herbaceous, agricultural, or disturbed wetland areas, including known limestone fen communities (Morris Land Conservancy 2003, 20). In Warren County, roughly 10% of the land is wetland areas (Warren County Planning Board 2008, 53). Lastly, in Morris County, roughly 13% to 14% of the land is wetland areas (Tiner 1985, 21). The wetlands found in these counties are similar to those found within the Pennsylvania counties. Additionally, Morris County includes agricultural wetland areas (USFWS 2010a).

VEGETATION

GENERAL VEGETATION

The 10 counties within the entire S-R Line area (Monroe, Pike, Northampton, Wayne, Carbon, Luzerne, and Lackawanna counties in Pennsylvania and Warren, Sussex, and Morris counties in New Jersey) remain largely undeveloped, with only 14.2% of the land being developed. Over 70% of the S-R Line area is composed of natural landscapes (forests, wetlands, and open water). DEWA is one of the largest public open spaces remaining in the northeastern metropolitan corridor, with nearly 90% of its land remaining undeveloped. Table 9 presents the land use within the project area and within DEWA.

TABLE 9: LAND USE TOTALS FOR THE PROJECT AREA AND WITHIN DEWA

Land Use Type	Entire Project Area		DEWA	
	Acres	Percentage of Total Area	Acres	Percentage of Total Area
Deciduous forest	1,761,366	53.2	34,738	50.3
Mixed forest	213,801	6.4	16,254	23.5
Coniferous forest	101,429	3.1	2,970	4.3
Wetlands	176,433	5.3	3,311	4.8
Agricultural land	466,100	14.1	4,613	6.7
Open water	78,594	2.4	3,000	4.3
Developed area	469,035	14.2	4,028	5.8
Other	46,943	1.4	196	0.3

Source: USGS 2010.

The variations in topographic, geographic, and hydrologic conditions throughout DEWA support 69 different vegetation associations or plant communities, including 30 that are classified as vulnerable, imperiled, or critically imperiled under state or global conservation rankings (NPS 2007a, 62). The diversity of vegetation associations within DEWA support more than 1,300 vascular plant species, many of which have survived despite past human disturbances within the park (NPS 2008b, 36). For the purposes of this EIS, vegetation associations were divided into the following vegetation types: deciduous, mixed deciduous, and coniferous forests; grasslands; successional areas, including old fields and scrub shrub vegetation communities; and wetland areas dependent on hydrologic conditions that may be seasonal or permanent. These vegetation types are further classified by growing conditions related to elevation and soil moisture and are discussed in more detail below.

Historical and current human activities are apparent in many vegetation communities in DEWA, and the human influence often defines the landscape. The forests in DEWA are typical of second-growth forests in the Appalachian Mountains (NPS 2010j, vi). Much of the forest in DEWA is second growth in areas that were historically logged or farmed (NPS 2008b, 36). Remnants of old farms can still be found in the park, including areas that contain old orchards. One of the orchards that can still be seen today in the park, Roberts Farm Orchard, is widely believed to have the oldest apple trees in any national park, some over 200 years old (NPS 2003b, 1). Agricultural production is not just a practice of the past in DEWA, but is still practiced in some areas of the park today. Agricultural production occurs on roughly 3,000 acres of land within DEWA (NPS 2008b, 36). Cropland areas where agriculture is still practiced are maintained in the park to preserve a feeling of the cultural history and landscape of the area; however, maintenance of agricultural lands within DEWA is carried out through a no-tilling policy. Aside from these agricultural areas, approximately 1,500 acres of land in the parks is maintained as grassland and scrub shrub to provide wildlife habitat, including shrubby hedgerows that separate agricultural croplands (NPS 2008b, 36). The areas maintained by DEWA as grassland and scrub shrub are generally old field areas that are mowed biannually to prevent the growth of a successional forest (NPS 2007a, 61, 271). The NPS may also use prescribed burns to maintain old agricultural fields in the park to protect rare and endangered species, control invasive plants, and maintain historic and scenic vistas and resources, as well as for agricultural purposes (NPS 2004b, 6). Fires are a natural process and DEWA uses prescribed burns to promote natural forest conditions that are resilient to fire, insects, and diseases, while providing for diverse wildlife habitats.

The old field vegetation community requires management to prevent further succession and maintain the plant community. Invasive species, such as autumn olive (*Elaeagnus umbellata*), multiflora rose (*Rosa*

multiflora), and bush honeysuckles, tend to dominate the successional scrub shrub habitats (NPS 2007a, 61). In some areas formerly used for agriculture, conifer species have been intentionally planted in large plots. These are dominated by pine (*Pinus* spp.) and spruce (*Picea* spp.) in the canopy, and eastern red cedar (*Juniperus virginiana*) in the subcanopy. The understory often contains native northern dewberry (*Rubus flagellaris*) and early low blueberry (*Vaccinium pallidum*) as well as many invasive species, such as Japanese barberry (*Berberis thunbergii*) and multiflora rose (NPS 2007b, 3). Invasive species commonly are found on previously disturbed land, and are often found in old fields and other abandoned agricultural areas (NPS 2007a, 61); the "Invasive Plant Species" section contains more detailed information.

The parks are largely composed of deciduous, low-elevation mesic (moist) Appalachian oak forests dominated by white oak (*Quercus alba*) and northern red oak (*Q. rubra*). Associated species in the Appalachian oak forest include sugar maple (*Acer saccharum*), black birch (*Betula lenta*), bitternut hickory (*Carya cordiformis*), American beech (*Fagus grandifolia*), and tulip poplar (*Liriodendron tulipifera*) (NPS 2007a, 5).

The Eastern Rivers and Mountains Network began monitoring the vegetation communities of DEWA in 2007 to obtain information on the condition of the park's vegetation and soil resources. This monitoring has discovered several trends in the vegetation communities within DEWA. Within the dry oak forests (which are described below in detail), the predominant seedlings and saplings are not of the same species as the canopy trees. The older trees in the canopy are dominated by oaks, while the seedlings and saplings are mostly white pine (*Pinus strobus*), maples, black birch, and shadbush. This indicates that the species composition of the dry forests within DEWA will change in the future (NPS 2010j, v–vi). Additionally, monitoring has revealed that less than 40% of the survey plots are free of invasive plant species; the spread of invasive species in DEWA is a threat to the native plant communities (NPS 2010j, vi). Invasive plant species are discussed in detail in the "Invasive Plant Species" section of this chapter.

Vegetation communities can vary based on environmental conditions such as geology, topography, soils, and hydrology. The following vegetation associations are classified by elevation and moisture. Habitat types are also described within the overall vegetation classifications.

High-elevation Xeric Forests: Areas with thin and rocky soils commonly result in drier conditions at higher elevations and are commonly composed of xeric, or dry, terrestrial forests. Some areas where these conditions are found in the park include a portion of the Kittatinny Ridge on the New Jersey side of the park and the low glaciated plateau, an area with a matrix of different forests on the Pennsylvania side of the park (NPS 2007a, 57). In both areas, dry conditions create deciduous oak/heath woodlands that are common and generally consist of chestnut oak (*Quercus prinus*), other oak species (*Quercus* spp.), pine species, black birch, and red maple (*Acer rubrum*). Shrub layers generally consist of a dense cover of plants that prefer acidic conditions: mountain laurel (*Kalmia latifolia*), black huckleberry (*Gaylussacia baccata*), sheep laurel (*K. angustifolia*), and early lowbush blueberry (NPS 2007b, 95).

One of the most common terrestrial forest types found in higher elevations is a mixed forest characterized as dry oak/mixed hardwood forest. This forest type is dominated by deciduous oaks but also contains white pine in the understory. The presence of white pine within the shrub layer generally indicates that the area may eventually succeed to a dry white pine/oak forest (NPS 2007b, 89). The dominant oak species can vary and is dependent on the moisture and nutrient condition of the soils (e.g., white oaks thrive on moist soils, while black oaks [*Quercus velutina*] do best in the dry upland slopes).This forest can be found in a variety of areas, including those with varying slope and soil/rock compositions. Oak species dominate the canopy, with red maple and black birch as common canopy associates. The shrubby layer generally includes American witch-hazel (*Hamamelis virginiana*), flowering dogwood (*Cornus florida*), and saplings of canopy species. In some cases, the lower shrub layer consists of great laurel (*Rhododendron*

maximum) and black huckleberry. The herbaceous layer can vary and is dependent on the availability of water in surrounding drainage areas, but generally includes eastern hay-scented fern and Canada mayflower (*Maianthemum canadense*). Vegetation communities distributed in areas of rocky outcroppings are adapted to exposed bedrock, dry conditions, and thin soil.

A mixed forest type dominated by coniferous species and characterized by the presence of pitch pine (*Pinus rigida*) is considered a rare type of dry vegetation association known as a mixed hardwood rocky summit. This forest type is generally found on rocky summits, including Kittatinny Ridge, where sandstone boulders or outcroppings are found. Although most of the vegetation associations found growing in ridgetop bedrock outcroppings are generally sparse and predominantly composed of shrubs and grasses, pitch pine/mixed hardwood rocky summits support trees stunted by the shallow, acidic soil (NPS 2007a, 58). The canopy is dominated by pitch pine, chestnut oak, and black birch. The shrub layer is composed of scrub oak (*Quercus ilicifolia*) and common serviceberry (*Amelanchier arborea*), while the sparse herbaceous layer generally includes hairgrass (*Deschampsia flexuosa*) and little bluestem (*Schizachyrium scoparium*) (NPS 2007b, 185).

One scrub shrub community found in the parks is successional bear oak/heath scrub shrub. This is a dry scrub shrub community found commonly on the Kittatinny Ridge and is dominated by a short shrub layer of black huckleberry, mountain laurel, and lowbush blueberry (*Vaccinium angustifolium*). Bear oak and quaking aspen (*Populus tremuloides*) are occasionally found as a taller shrub layer. Fire is often a determining factor in the location and survival of successional bear oak/heath scrub shrub and other vegetation associations that rely on fire to maintain or promote the correct conditions for the plant community. For example, the bear oak/wavy hairgrass scrub shrub, dominated by bear oak and wavy hairgrass, succeeds dry oak/heath forest after the occurrence of a fire that clears away part of the forest, allowing more light for shrub and grass species (NPS 2007b, 209, 261).

Mid-elevation Mesic Forests: Many areas at middle and low elevations of the parks provide conditions where soils consistently contain moisture and support terrestrial forests requiring damp conditions. These vegetation associations tend to be found in ravines and on lower slopes, although some can be found at higher elevations. Deciduous Appalachian oak forest is dominated by white and northern red oak and is found in the lower elevations of the parks where soil conditions are moist. It is the most common forest type in DEWA. Mixed woodlands found in areas with moist soil conditions include eastern white pine/successional hardwood forests and northern red oak/mixed hardwood forest. Eastern white pine/successional hardwood forest is dominated by a canopy of mature white pine with younger hardwood species, exemplified by red maple and black birch in the subcanopy. This forest type is generally found in the middle to lower elevations. The herbaceous layer contains eastern hay-scented fern and Canada mayflower. The eastern white pine/successional hardwood forest is found on the Walpack Ridge in New Jersey at higher elevations than most mesic terrestrial forests (NPS 2007b, 168).

Northern red oak/mixed hardwood forest is a common vegetation association found in slightly moist areas of the park, and is often used as a broader association to describe many of the mesic forests throughout the park. As a result, the species found within this association are highly variable; however, northern red oak is generally dominant. Northern red oak/mixed hardwood associations are found in ravines, areas with calcareous bedrock, steep slopes, floodplains, or recently disturbed upland drainages (NPS 2007a, 59). Generally, the canopy includes northern red oak but lacks the chestnut oak that is commonly found in higher and drier vegetation communities. There are many codominant species, such as red maple, black oak, hickory (*Carya* sp.), and black birch. The subcanopy layer generally includes American hornbeam, while the shrubby layers are generally composed of northern spicebush, American witch-hazel, Eastern hop-hornbeam (*Ostrya virginiana*), and early lowbush blueberry. The herbaceous layer is generally composed of Christmas fern (*Polystichum acrostichoides*), eastern hay-scented fern, the invasive garlic mustard (*Alliaria petiolata*), Canada mayflower, and club mosses (*Lycopodium* spp.).

Coniferous forests characterized by eastern hemlock (*Tsuga canadensis*) are considered an important indicator for maintaining the health of the park forest ecosystem and as such are important vegetation associations within DEWA. Eastern hemlock forests support many species of wildlife, both terrestrial and aquatic, as well as other plant species. Understory species such as rattlesnake plantain, leatherwood, Canada mayflower, and wood sorrels thrive in hemlock forest stands; several species of birds have been identified as hemlock-obligate species, including black-throated green warbler (*Dendroica virens*), blue-headed vireo (*Vireo solitarius*), and northern goshawk (*Accipiter gentilis*) (Quimby 1996, 4). DEWA contains 141 forest stands that contain eastern hemlock, composing 2,800 acres, or about 5% of DEWA (NPS 2010k). Eastern hemlock forests are found in areas with moist, cool conditions, particularly in low-elevation ravines. Hemlock forests are a climax community that can live for 800 or more years (NPS 2008b, 37). However, hemlock stands are vulnerable to fire, winds, and flooding because of their shallow roots, and have been greatly threatened throughout their range by the hemlock wooly adelgid (*Adelges tsugae*), a nonnative invasive pest species.

Within DEWA, forest stands containing eastern hemlock include eastern hemlock forest and mixed associations of eastern hemlock/northern hardwood forest and eastern hemlock/mixed hardwood palustrine forest vegetation communities (NPS 2007b, 9, 33, 173). Eastern hemlock forest and eastern hemlock/northern hardwood forest are generally found on north-facing, steep ravine slopes. Eastern hemlock/mixed hardwood palustrine forest is found in upland depressions with semipermanent to permanent flooding in higher-elevation drainages, including drainages originating from Kittatinny Ridge. The understory in hemlock/mixed hardwood palustrine forest is predominantly composed of great laurel and sedge species.

Palustrine Forests and Meadows and Scrub Shrub: Wetland vegetation associations may be forested or successional scrub shrub and are generally found in wet lowland areas such as low terrace floodplains of smaller creeks, areas where there is a broad flat with diffuse drainage and poorly drained soil, and upland depressions with poor drainage. Deciduous palustrine forest dominated by red maple is the most common palustrine forest throughout DEWA and can tolerate conditions that range from temporarily to permanently flooded. Common species within these forests include red maple, northern spicebush, jewelweed (*Impatiens capensis*), and skunk cabbage (*Symplocarpus foetidus*) (NPS 2007b, 33, 195).

Riparian areas are found on floodplain terraces or tributaries where flooding and soil conditions are the principal determinants of riparian vegetation associations, which can include grasslands, forests, scrub shrub, or more herbaceous areas (NPS 2007a, 60–61). The most common palustrine scrub shrub is dominated by silky dogwood (*Cornus amomum*) and is generally found in wet areas of formerly used agricultural fields or pastures. Besides silky dogwood, this successional wetland type is dominated by shrubby plants including crack willow (*Salix fragilis*), hairyfruit sedge (*Carex trichocarpa*), reed canarygrass (*Phalaris arundinacea*), and arrow-leaf tearthumb. This vegetation association may succeed to a floodplain forest if woody species survive (NPS 2007b, 235). Other lowland wet-environment vegetation associations, including wet meadows, sedge meadows, marshes, wetlands, bogs, seeps, fens, and vernal pools, are found in areas with specific hydrological conditions. Specific descriptions of wetlands within the study area are described in the "Wetlands" section of this chapter.

The characterization of the vegetation communities along the alternative alignments is based on sources that include the following: *Classification and Mapping of Vegetation and Fire Fuel Models at Delaware Water Gap National Recreation Area* (NPS 2007a, 2007b); *Field Survey Report: Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request Environmental Impact Statement* (NPS 2011b); *National Biological Information Infrastructure Gap Analysis Program: National Land Cover* (USGS 2010); and applicable county natural area inventories. Detailed descriptions of vegetation along the alignments are based primarily on surveys conducted in 2010 and 2011; however, these surveys were conducted only within the boundaries of DEWA and APPA. Portions of the alignments that fall within the

study area but outside NPS boundaries are characterized with as much detail as possible from existing information. These studies are included in the "References" section of this EIS.

Methodology: The ROW and adjacent habitat within DEWA and APPA were surveyed during vegetation surveys in 2010 and 2011 (NPS 2011b). The land outside the parks but within the study area was characterized mainly using the land cover dataset of the U.S. Geological Survey Gap Analysis Program (USGS 2010). This program uses digital data to create land cover maps that depict major ecological systems, which are categorized by the U.S. Geological Survey National Vegetation Classification Standard. Included in the ecological systems are developed areas, ranging from open space (containing mostly lawn grasses) to high intensity development (containing 80% to 100% impervious surfaces). The following descriptions of the vegetation along the alternative alignments generally discuss vegetation in DEWA, because MDSR and APPA are contained within DEWA.

Alternative 1 (No Action), Alternative 2, and Alternative 2b

In general, the vegetation found along the alignment of alternatives 1, 2, and 2b contains a mix of vegetation communities reflecting wet, moist, and xeric conditions, as described above. The B-K Line ROW crosses through many rare and unique habitats: a calcareous wetland (Arnott Fen), Hogback Ridge, Delaware River riparian corridor, eastern hemlock forests, Van Campen Brook riparian area, Kittatinny Ridge, and talus slope communities; these habitats are described in detail in the "Rare and Unique Communities" section. Hogback Ridge has long been considered the most important area of biodiversity in all of DEWA.

At the time of vegetation surveys for this EIS, the vegetation in the ROW was at varying stages of succession (NPS 2011b). The vegetation in the ROW has not been maintained consistently over the life of the transmission line. The maintenance also differs between Pennsylvania and New Jersey. Since 2007, the vegetation within the ROW in New Jersey has been maintained more consistently and is therefore kept at an earlier stage of succession than the vegetation in Pennsylvania. A large-scale vegetation removal project was conducted prior to the application for this project.

Vegetation within the ROW is identified as that typical of a scrub shrub area, dominated by herbaceous and shrub species. However, tree species found in adjacent woodlands within the habitat adjacent to the ROW are also present. Pioneer species such as eastern red cedar also are present. The habitat on either side of the existing ROW of alternatives 1, 2, and 2b consists of deciduous, coniferous, and mixed forest stands. The woodland vegetation communities along the alignment outside the ROW are consistent with the Appalachian oak forest type and generally include deciduous tree species dominated by oaks, including chestnut oak, northern red oak, and black oak. On lower elevations, the deciduous, oak-dominated mesic forests either contain white, black, or northern red oaks as the dominant species, or a combination of these trees dominate the canopy. On the steep slopes close to APPA, the forests are high elevation and xeric, and chestnut oak tends to be the dominant species. The vegetation in these woodlands is sparse due to the topography.

Several other vegetation types or associations are found along the habitat adjacent to the ROW of alternatives 1, 2, and 2b, including mixed deciduous/coniferous forests dominated by sycamore (*Platanus occidentalis*); mixed deciduous/coniferous forests dominated by sugar maple, American beech, and yellow birch (*Betula alleghaniensis*); and deciduous forests dominated by red maple and red alder (*Alnus rubra*). Red maple and red alder forests are present near wetlands and contain species tolerant of moist conditions. Additionally, the forests along the alignment for alternatives 1, 2, and 2b contain several coniferous species, including eastern red cedar, white pine, and eastern hemlock. Coniferous species are dominant or codominant in several of the woodlands along the alignment for alternatives 1, 2, and 2b and usually have sparse understories. Eastern hemlock, an important component of forest species diversity in

DEWA, is found throughout the habitat adjacent to the ROW of the alignment for alternatives 1, 2, and 2b, including as a codominant species in several forest stands.

The forests adjacent to the existing ROW are mostly continuous. The exceptions are found where roads and a ROW unrelated to this project bisect the forests. In Pennsylvania, the ROW for alternatives 1, 2, and 2b provides grassland habitat. In addition, the alignment crosses a small portion of agricultural cropland and leaves DEWA property several times near the Bushkill Substation (figures 34 and 35). Outside the park boundaries, but inside the study area, the alignment travels through developed area, including a golf course bordered by a deciduous forest.

Alternative 3

Inside the study area, the alternative 3 ROW would stay within the DEWA boundaries and cross both MDSR and APPA (figure 36). The vegetation within the ROW of alternative 3 and adjacent woodlands contains a mix of vegetation communities that reflect wet, moist, and xeric conditions. These include mixed forests, deciduous forests, agriculture, and scrub shrub.

Vegetation within the ROW of alternative 3 contains species typical of scrub shrub; however, at the time of vegetation surveys for this EIS, the vegetation in the ROW was at varying stages of succession. In addition to scrub shrub habitat, the ROW contains several tree species, including eastern hemlock, striped maple (*Acer pensylvanicum*), American beech, and black, yellow, and gray birch.

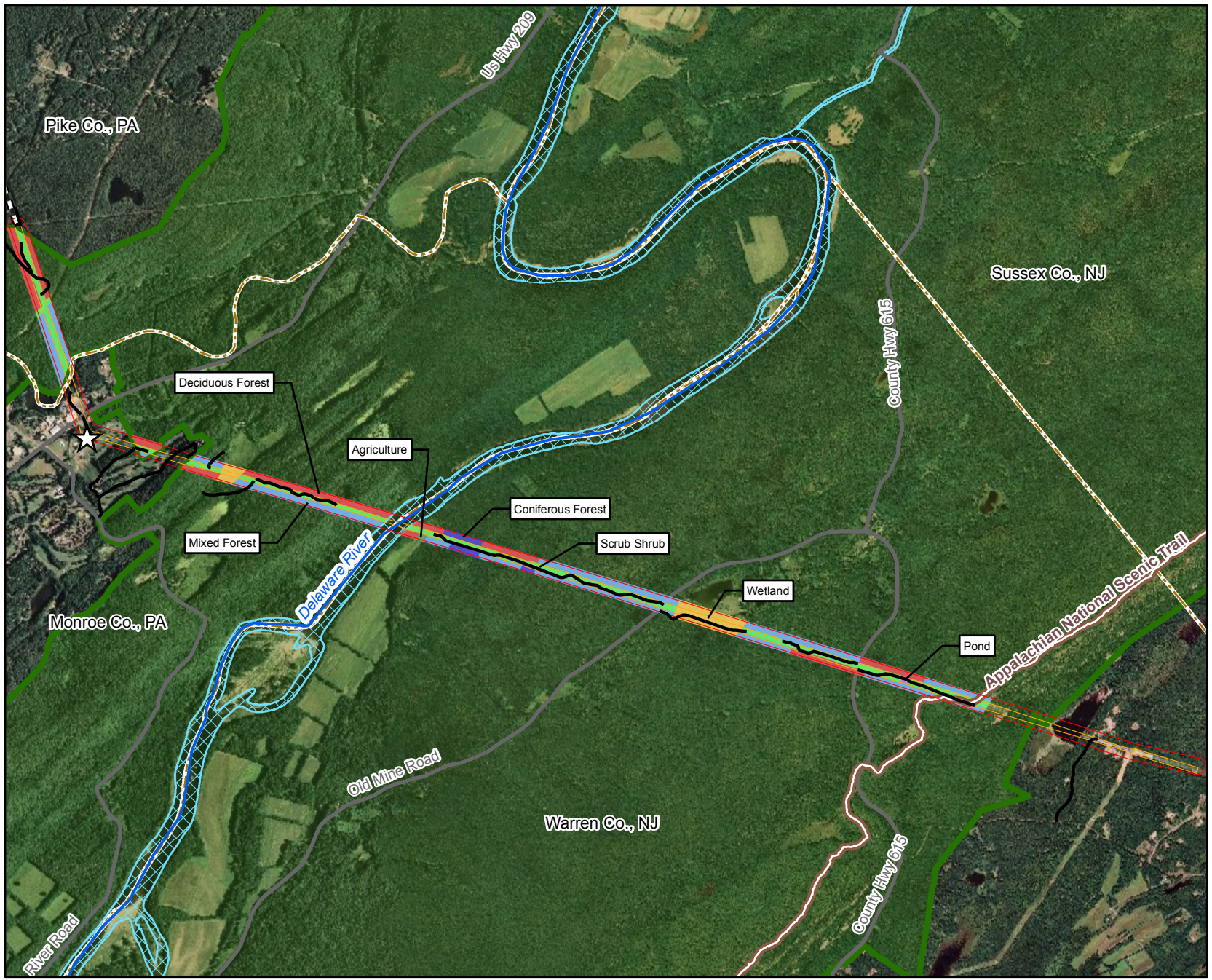
In general, woodland vegetation communities adjacent to the ROW for alternative 3 include primarily deciduous tree species in mixed and deciduous forest stands. These forests are often dominated by tulip poplar, white ash, sugar maple, American beech, red maple, and occasionally eastern hemlock, although few forest stands are dominated by just one species. Invasive plant species are found in the understory of most forest stands and vegetation communities and are discussed in the “Invasive Plant Species” section. The canopy cover is complete or nearly complete at the lower elevations. Both the canopy and groundcover are sparser in the steep topography around APPA.

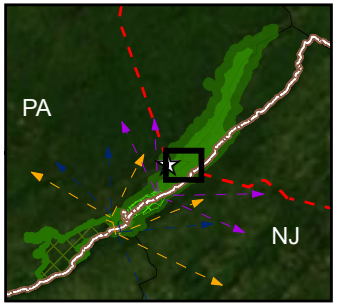
A small section (approximately 500 linear feet) of the alternative 3 ROW and adjacent habitat contains agricultural land. At the time of the 2010 vegetation surveys, there was evidence of a controlled burn in this area from wildfire suppression completed in Worthington State Forest in the summer of 2010. The NPS uses controlled burns, otherwise known as prescribed fires, to reduce hazardous fuel loads near developed areas, to manage landscapes, and to restore natural woodlands (NPS 2010l).

Outside DEWA boundaries, the following forest types are present within the study area: Appalachian hemlock/hardwood forests, northeastern interior dry–mesic oak forest, central Appalachian pine/oak rocky woodlands, and central Appalachian oak and pine forests. The hemlock/hardwood forests are dominated by sugar maple, yellow birch, and beech in the canopy; hemlocks are frequent as minor canopy associates.

Alternative 4

Inside the study area, alternative 4 would run within or adjacent to the southwest boundary of DEWA and would cross APPA (figure 37). Alternative 4 contains vegetation indicative of high-elevation xeric, mid-elevation mesic, and scrub shrub communities within the ROW and surrounding forests.





Legend

- Substation
- Outside Study Area
- Existing ROW in Study Area
- 350 ft Corridor
- Appalachian National Scenic Trail
- Delaware River
- Road
- Delaware Water Gap National Recreation Area
- Middle Delaware National Scenic and Recreational River
- County Line

Vegetation Types

- Agriculture
- Coniferous Forest
- Deciduous Forest
- Mixed Forest
- Pond
- Scrub Shrub
- Wetland

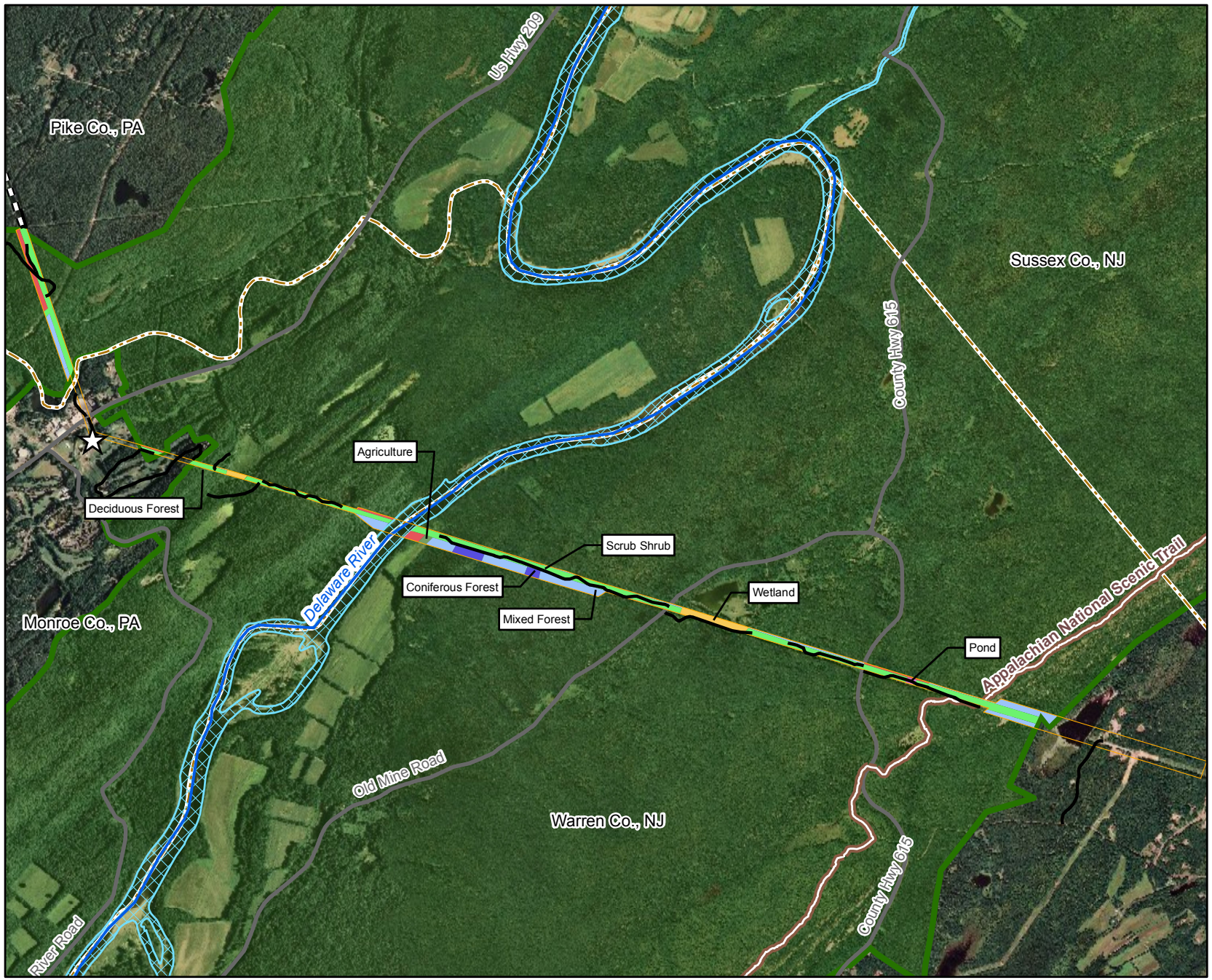
0 1,500 3,000
Feet

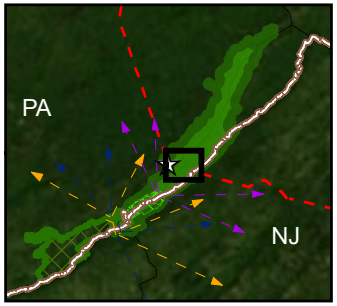
Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 34
Alternative 2 Vegetation

Source: ESRI Streetmap 2006, Penn State 2010, ESRI ArcGISonline Map Service 2010, PennDOT 2011, USGS 2006, NJ DEP 2008

Projection: NAD 83 UTM Zone 18N
Date: July 2012





Legend

- Substation
- Outside Study Area
- Alternative 2b Corridor
- Appalachian National Scenic Trail
- Delaware River
- Road
- Delaware Water Gap National Recreation Area
- Middle Delaware National Scenic and Recreational River
- County Line

Vegetation Types

- Agriculture
- Coniferous Forest
- Deciduous Forest
- Mixed Forest
- Pond
- Scrub Shrub
- Wetland

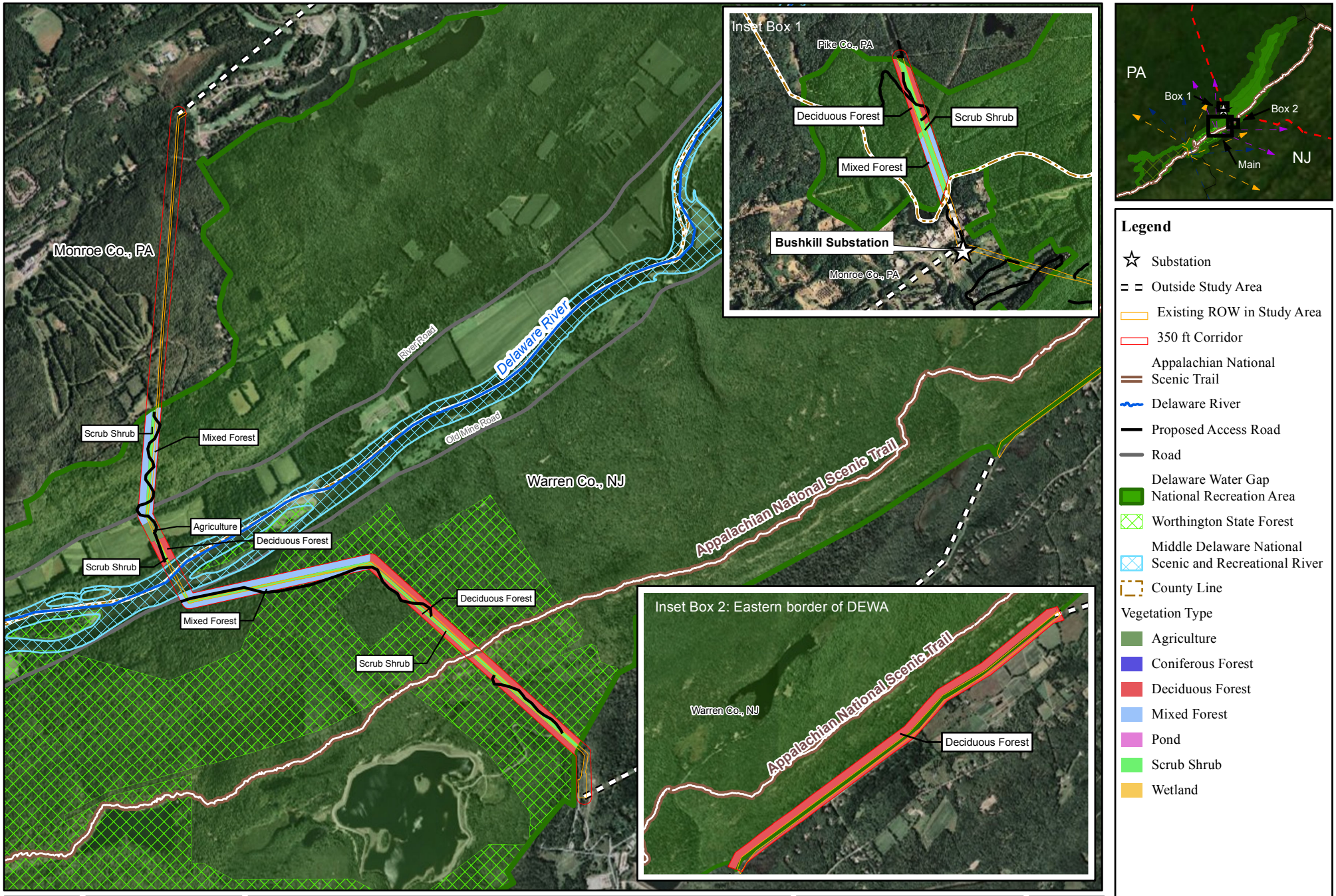
0 1,500 3,000
Feet

Susquehanna to Roseland
Transmission Line Proposal
and
Right-of-Way Request EIS

Figure 35
Alternative 2b Vegetation

Source: ESRI Streetmap 2006, Penn State 2010, ESRI ArcGISonline Map Service 2010, PennDOT 2011, USGS 2006, NJ DEP 2008

Projection: NAD 83 UTM Zone 18N
Date: July 2012

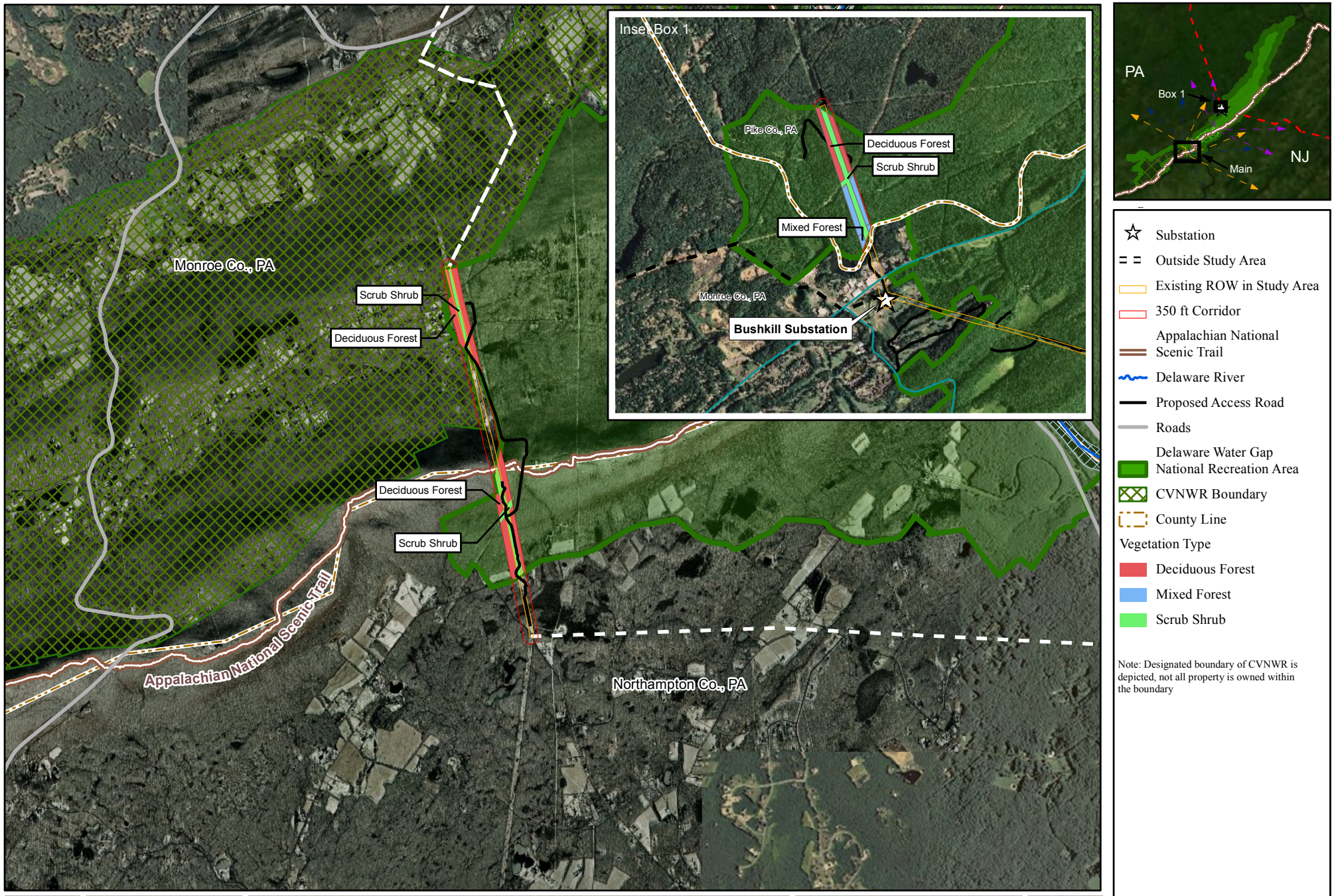


Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 36
Alternative 3 Vegetation

Source: ESRI Streetmap 2006, Penn State 2010, ESRI ArcGISonline Map Service 2010, PennDOT 2011, USGS 2006, NJ DEP 2008

Projection: NAD 83 UTM Zone 18N
Date: July 2012



Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 37
Alternative 4/5 Vegetation

Source: ESRI Streetmap 2006, Penn State 2010, ESRI ArcGISonline Map Service 2010, PennDOT 2011,NJOIT 2010, USGS 2006, NJ DEP 2008,

Projection: NAD 83 UTM Zone 18N
Date: July 2012

The alternative 4 ROW vegetation communities are primarily scrub shrub with thick woody shrub species and small specimens of tree species. Nearly half of the alternative 4 alignment is outside the parks' boundaries and the vegetation could not be surveyed; however, the ROW in these areas is expected to be consistent with the above description as it is an existing, maintained transmission line ROW.

In general, vegetation communities adjacent to the ROW of alternative 4 include woodland communities of deciduous tree species; however, the portion of alternative 4 that follows the B-K Line also contains mixed deciduous/coniferous mesic forests. Along the portion of alternative 4 at the southern boundary of DEWA, the woodlands along the habitat adjacent to the ROW are dominated by red maple, black cherry, and tulip poplar, within the lower elevations of the alignment. As the alignment continues south, the dominant species are red maple and tulip poplar. The southern portion of the alignment within the study area crosses APPA within the boundaries of DEWA (figure 37). This portion of the alternative 4 ROW is on steep slopes; these high-elevation xeric forests are characterized by oak species, including northern red oak, chestnut oak, and pin oak, but none of these species dominate the forest.

Outside DEWA boundaries, the following ecological systems are found within the study area: Appalachian hemlock/hardwood forests, northeastern interior dry–mesic oak forest, central Appalachian pine/oak rocky woodlands, and central Appalachian oak and pine forests.

Alternative 5

Alternative 5 would follow the same route through DEWA and APPA as alternative 4, except it would not include the 0.6-mile portion that would connect to the B-K Line (figure 37); therefore, alternative 5 does not contain mixed deciduous/coniferous mesic forests within the study area. The vegetation found along the alternative 5 ROW contains a mix of vegetation communities including high-elevation xeric, mid-elevation mesic, dominated by deciduous species, and scrub shrub communities, as described for alternative 4.

Outside the Study Area

Outside the study area in Pennsylvania, the S-R Line could pass through Carbon, Lackawanna, Luzerne, Monroe, Northampton, Pike, and Wayne counties. These counties are largely undeveloped, with total area of undeveloped land ranging from approximately 62% to 95% (Commonwealth of PA 2005a, 2005b, 2005c, 2005d, 2005e, 2005f, 2005g). Monroe County contains more than 20,000 acres that have been designated as the Cherry Valley NWR; however, not all 20,000 acres are under current ownership or management of the USFWS.

The natural areas of these counties are dominated by two forest types, Appalachian oak forest and northern hardwood forest, which are similar to the type of deciduous woodlands described within DEWA (PATNC 1990, 5–6; 1991a, 7–9; 1991b, 6–8; 1998, 5–7; 2005a, 5–8; 2005b, 6–10; 2006, 5–7). Mixed oak forests are dominated by red oak, white oak, and black oak with some white pine. Common associate species include red maple, sugar maple, American beech, white ash, hickories (*Carya* spp.), and tulip poplar. A shrub layer of blueberries, viburnums, northern spicebush, American witch-hazel, shadbush (*Amelanchier* sp.), and great laurel is common. At higher elevations, the dominant species is chestnut oak. Other ridgetop species include assorted oaks, black gum, gray birch (*Betula populifolia*), red maple, black huckleberry, blueberries, and mountain laurel. Another community that can be found on exposed ridgetops is dominated by pitch pine and scrub oak, with an understory of huckleberry, black chokeberry (*Photinia melanocarpa*), lowbush blueberry, teaberry (*Gaultheria procumbens*), and bracken fern. In the lower mesic areas, forests contain eastern hemlock and white pine with an abundance of great laurel (PATNC 1990, 5–6; 1991a, 7–9; 1991b, 6–8; 1998, 5–7; 2006, 5–7).

Northern hardwood forests of these Pennsylvania counties are dominated by sugar maple, red maple, American beech, yellow birch, eastern hemlock, and/or white pine. The northern hardwood forests are found in areas of past logging, and regeneration in these areas is often slow due to the poor condition of the soils (PATNC 1990, 5–6; 1991a, 7–9; 1991b, 6–8; 1998, 5–7; 2006, 5–7).

These counties also contain an abundance of both nutrient-poor and nutrient-rich wetlands. The dominant vegetation of nutrient-poor wetlands includes a mat of sphagnum moss (*Sphagnum* sp.), sedges, sundews (*Drosera* spp.), pitcher plants (*Sarraceniaceae*), cranberries (*Vaccinium* spp.), and small shrubs surrounded by a bog forest with black spruce (*Picea mariana*), larch (*Larix* sp.), sedges, and moss. In contrast, nutrient-rich wetlands support a vegetation community that includes red maple, eastern hemlock, ash, black gum, and yellow birch with an understory of blueberry and swamp azalea (*Rhododendron viscosum*) (PATNC 1990, 5–6; 1991a, 7–9; 1991b, 6–8; 1998, 5–7; 2006, 5–7). Wetlands are described in more detail in the "Wetlands" section.

Outside the study area in New Jersey, the S-R Line would traverse Sussex, Warren, and Morris counties. These counties are largely undeveloped, with total area of undeveloped land ranging from approximately 41% to 85% (Morris County Planning Board 2007, 3-1–3-4; Sussex County Division of Planning 2009, 18–26; Warren County Planning Board 2005, 33–47). Warren County encompasses all of Worthington State Forest. Sussex County contains Wallkill River NWR. Warren, Sussex, and Morris counties fall within three ecoregions: Northeastern Highlands, Northern Piedmont, and Ridge and Valley. The vegetation of these ecoregions within the undeveloped portions of New Jersey is Appalachian oak forest. This forest type is described in detail above. These New Jersey counties are also rich in wetland habitats (Woods, Omernik, and Moran 2007, 3–11); wetlands are described in more detail in the "Wetlands" section.

INVASIVE PLANT SPECIES

Invasive plant species within DEWA, MDSR, and APPA pose a significant risk to the many vegetation communities that also function as wildlife habitat within the parks, particularly to rare or unique vegetation associations. Invasive species are typically opportunistic and often spread quickly without natural barriers or enemies, resulting in alteration of habitat conditions. These changes can result in adverse impacts on native vegetation and wildlife. The colonization of invasive plants causes major problems, including crowding out native species, contributing to species extinctions, altering the structure of natural plant communities, disrupting ecosystem functions, and degrading recreational opportunities (NJDEP 2004). Within DEWA, 241 invasive plant species have been documented (NPS 1998a, 1). Invasive species are prominent in the groundcover and understory layers of mesic forests and riparian areas within DEWA; however, the xeric forests are largely free of invasive plant species (NPS 2009d, ii-16).

Disturbed and early successional areas such as old agricultural fields provide ideal habitat for invasive species (NPS 2009e, 45) colonization. This is also true for transmission line ROWs, which are routinely disturbed by clearing. The invasive plant species of highest concern are presented in table 10 (NPS 2009e, 18). The two most widespread invasive plants in DEWA, as determined in survey plots, are tree-of-heaven (*Ailanthus altissima*) and Japanese barberry (NPS 2009e, 46). Tree-of-heaven is a particularly difficult invasive species to control, because of its ability to spread by seeds, root suckers, cuttings, and sprouted stumps (NPS 1998a, 2). Another invasive plant species, purple loosestrife (*Lythrum salicaria*), has taken over many wetland areas of the park.

TABLE 10: PREVALENT INVASIVE PLANT SPECIES IN DEWA

Common Name	Scientific Name
Asian bittersweet	*Celastrus orbiculatus*
Autumn olive	*Elaeagnus umbellata*
Bush honeysuckle	*Lonicera* spp.
Garlic mustard	*Alliaria petiolata*
Japanese barberry	*Berberis thunbergii*
Japanese knotweed	*Polygonum cuspidatum*
Japanese stiltgrass	*Microstegium vimineum*
Multiflora rose	*Rosa multiflora*
Purple loosestrife	*Lythrum salicaria*
Tree-of-heaven	*Ailanthus altissima*

Source*:* NPS 2009e, 18.

Because of the difficulty in controlling many invasive plant species, ongoing management is necessary to keep these species from invading important areas. DEWA uses an early detection program for invasive species that targets multiple species at resource areas that have high value, such as rare natural communities (NPS 2009d, ii-19). DEWA also has several programs that target specific invasive species, such as the biocontrol program for purple loosestrife and the herbicide control program for common reed (*Phragmites australis*) (NPS 2009d, iv-81-iv-96). Additionally, the Northeast Region's Exotic Plant Management Team works to control autumn olive, tree-of-heaven, multiflora rose, Japanese knotweed, purple loosestrife, bush honeysuckle, Japanese hops (*Humulus japonicus*), and tearthumb through cooperative planning efforts (NPS 2009d, iv-99–iv-100). However, despite the use of best management practices (BMPs), it is often impossible to stop the spread of many invasive species.

Vegetation studies conducted throughout DEWA indicated that about 34 % of the survey sites were free of any invasive species, 17 % of the survey sites had only 1 invasive species present, and one survey site contained 10 species (NPS 2009e, 17). These results are consistent with the trends observed through the Eastern Rivers and Mountains Network vegetation and soil monitoring program, where 39 % of the survey plots were found to be free of invasive species (NPS 2010j, vi). Results of the studies indicated that successional and highly disturbed areas within the park provided the optimal conditions for colonization by invasive plant species, whereas cliffs and dry terrestrial communities had the least colonization by invasive plant species (NPS 2009e, 45).

The Eastern Rivers and Mountains Network has an early detection monitoring program to provide early identification and elimination of invasive species before they become widespread within a park. First, a short list of generally 10 to 20 potential likely invasive species is created for each park. Park staff members become familiar with the listed invasive species and monitor for new invasive species. Rapid response of identification, extent, and removal of the invasive species is employed. In DEWA this early detection program has successfully led to the quick discovery of three invasive plant species—narrowleaf bittercress (*Cardamine impatiens*), linden arrowwood (*Viburnum dilatatum*), and Amur corktree (*Phellodendron amurense*) (NPS 2010m, 3–11).

Alternative 1 (No Action), Alternative 2, and Alternative 2b

Nearly all invasive species observed inside the study area along alternatives 1, 2, and 2b during the 2010 vegetation surveys were found within the existing ROW (NPS 2011b). Ten invasive species were

observed over the length of the alignment for alternatives 1, 2, and 2b. These include tree-of-heaven, winged euonymus (*Euonymus alatus*), Japanese barberry, autumn olive, multiflora rose, Japanese stiltgrass, Canada thistle (*Cirsium arvense*), garlic mustard, purple loosestrife, and Asian bittersweet (a vine). The ROW contains invasive species throughout its length, likely because of the periodic but historically inconsistent disturbance resulting from the clearing required to maintain the area beneath the transmission lines.

Alternative 3

Inside the study area, nine species of invasive plants were identified within the proposed alignment of alternative 3 during the 2010 and 2011 vegetation surveys (NPS 2011b). Species that are found along the alternative 3 ROW include tree-of-heaven, black locust (*Robinia pseudoacacia*), and shrubs of Japanese barberry, autumn olive, multiflora rose, Japanese honeysuckle, and wineberry. The herbaceous species Japanese knotweed and garlic mustard are also present. Most of these species are found in the ROW of alternative 3 and habitat adjacent to the ROW. Portions of the habitat adjacent to the ROW are free of invasive species, whereas others contain a high abundance of invasive species. The ROW contains invasive species throughout its length, primarily because of the periodic disturbance resulting from the clearing required to maintain the area beneath the transmission lines.

Alternative 4

Inside the study area, 11 invasive plant species were found along the proposed alignment of alternative 4 during the 2010 and 2011 vegetation study (NPS 2011b). The following species are found within the ROW and adjacent habitat: Canada thistle, Japanese barberry, autumn olive, garlic mustard, and multiflora rose. The ROW also contains Japanese stiltgrass, Asian bittersweet, common privet, spotted knapweed (*Centaurea stoebe*), winged euonymus, and Japanese honeysuckle. The habitat areas adjacent to alternative 4 south of APPA within the boundaries of DEWA are free of invasive species, and the ROW contains one invasive species, Japanese stiltgrass.

Alternative 5

The alternative 5 alignment would follow the same route through DEWA and APPA as alternative 4, except it would not include the 0.6-mile portion of the B-K Line. Therefore, the invasive species along the alternative 5 ROW include Canada thistle, Japanese barberry, autumn olive, Japanese stiltgrass, Asian bittersweet, common privet, spotted knapweed, Japanese honeysuckle, and multiflora rose.

Outside the Study Area

Outside the study area in Pennsylvania, the S-R Line could pass through Carbon, Lackawanna, Luzerne, Monroe, Northampton, Pike, and Wayne counties. Invasive species are found throughout Pennsylvania, including these counties. Nonnative plants such as tree-of-heaven, Asian bittersweet, Japanese barberry, multiflora rose, Japanese honeysuckle, autumn olive, and garlic mustard have become commonplace in disturbed woodlands, often to the point of excluding some of the native plants. In wetlands and along streams, purple loosestrife, Japanese hops, and Japanese knotweed are aggressive, weedy species that follow in the wake of disturbance and crowd out native species. The species with the greatest impact on these communities tend to be robust herbs such as purple loosestrife and Japanese knotweed, but vines such as Japanese hops are also serious problems. Aquatic habitats of the rivers, streams, and lakes are also vulnerable to invasion by exotics (PATNC 1998, 7–8; 2006, 7–8).

Outside the study area in New Jersey, the S-R Line would traverse Sussex, Warren, and Morris counties. More than 1,000 nonnative plant species have become established in New Jersey (NJDEP 2004). Some

nonnative, invasive species common to Sussex and Morris counties are Japanese barberry, spotted knapweed, Canada thistle, Japanese honeysuckle, Tatarian honeysuckle (*Lonicera tatarica*), Morrow's honeysuckle (*Lonicera morrowii*), curly pondweed (*Potamogeton crispus*), and black locust. Purple loosestrife, Japanese stiltgrass, tree-of-heaven, garlic mustard, lesser celandine (*Ranunculus ficaria*), multiflora rose, and Asian bittersweet are also found in one or more of these counties.

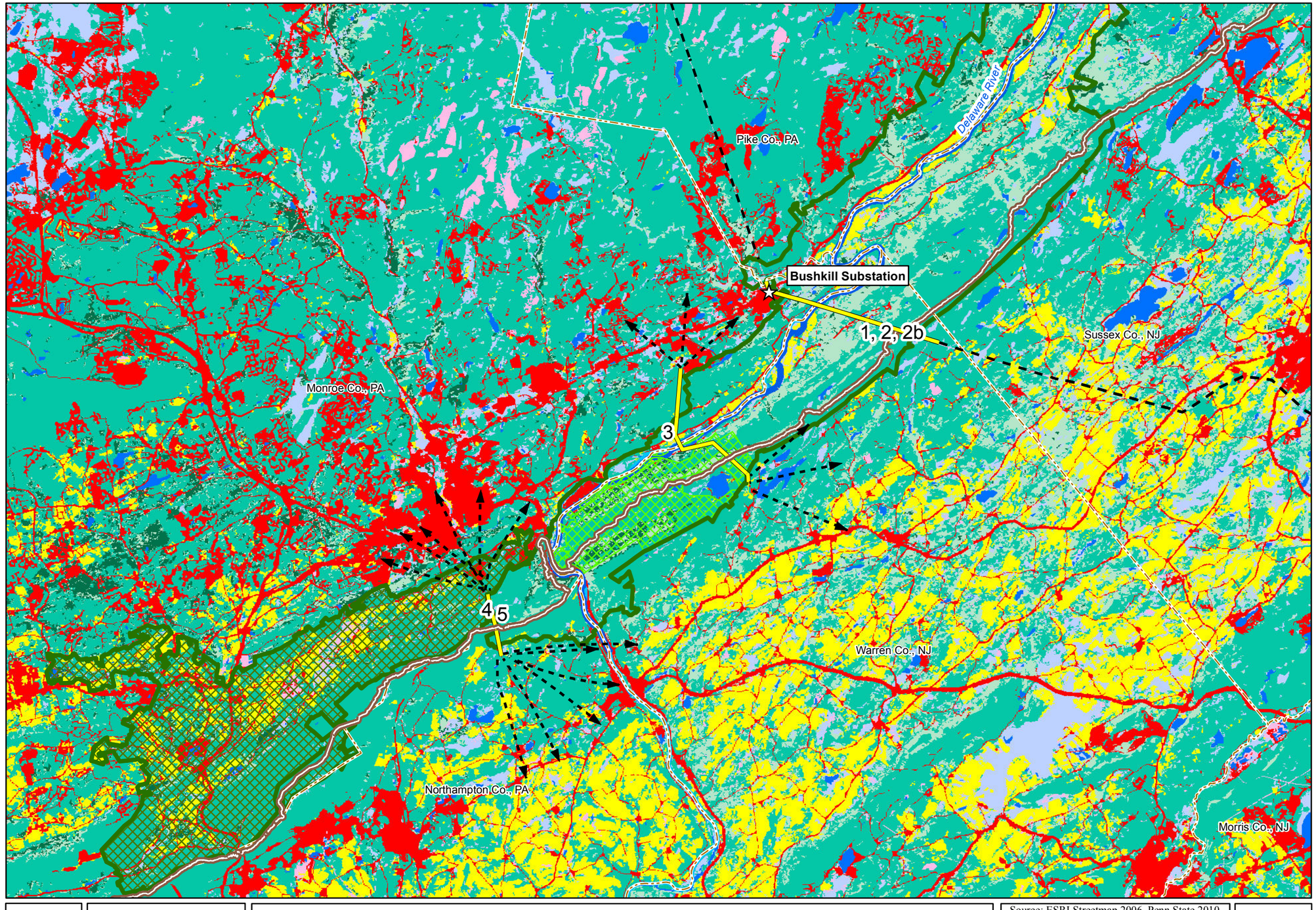
LANDSCAPE CONNECTIVITY, WILDLIFE HABITAT, AND WILDLIFE

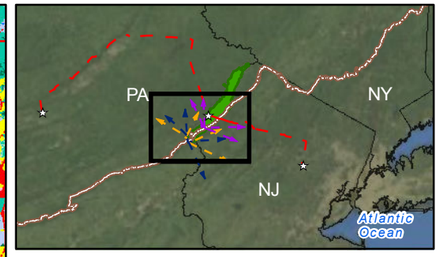
LANDSCAPE CONNECTIVITY

Landscape connectivity is the degree to which the landscape facilitates or impedes movement between resource patches (Taylor et al. 1993, 571). It is a generally accepted principle that larger contiguous land areas provide more ecological services and fragmentation disrupts these services and diminishes the value of fragmented lands. A primary goal of land managers is to achieve a high degree of connectivity within the landscape. For lands in the eastern United States, the preservation of large tracts of undisturbed, contiguous tracts of forests, wetlands, surface waters, and floodplains is a priority. Many native species are dependent on the interior forests and the connection of these undisturbed forests to wetlands, riparian corridors, and surface waters. Land management to maintain large forest patch sizes and smaller inter-patch distances supports landscape connectivity. National parks and other large tracts of public land often serve as hubs for colonization of other patches within the regional landscape and as refuges for wildlife populations within the highly populated eastern states.

The NPS aims to conserve large, contiguous areas of undisturbed forest, wetlands, surface waters, and floodplains for native species; these areas represent the habitats described in this document. DEWA, MDSR, and APPA play an important role in preserving undisturbed contiguous natural habitats, not only within park boundaries but regionally. DEWA provides 67,000 acres of national park within a mixed landscape in western New Jersey and eastern Pennsylvania. Regional land cover types are shown in figure 38. Large tracts of hardwood forests dominated by oaks and coniferous forests dominated by eastern hemlock are prevalent within DEWA. The forests of DEWA, including those surrounding APPA, provide some of the increasingly rare forest interior of the mid-Atlantic region. Additionally, the Delaware River is the last and largest free-flowing river in the eastern United States (NPS 2003a, 6), devoid of dams along its length, allowing unimpeded migration for many fish species.

Habitat fragmentation is the alteration of habitat resulting in spatial separation of habitat patches, which reduces the connectivity of habitats on a landscape scale (Hogan 2011). Habitat fragmentation occurs naturally through geological forces, climate change, floods, and earthquakes. However, human alteration of habitat through processes such as creation of agricultural land and construction of infrastructure has dramatically altered and fragmented natural landscapes (Laverty et al. n.d.). Infrastructure projects such as roads, trails, natural gas pipelines, and electric transmission lines have the potential to fragment the large tracts of contiguous forest within DEWA. Habitat fragmentation within the parks can be managed through careful consideration of projects that would remove tracts of habitat, particularly forests, or create substantial amounts of habitat edge. In general, openings in the forest, such as for roads and power lines, should be avoided, and concentrated in already disturbed areas away from contiguous, undisturbed forested lands (Faaborg et al. 1993, 336). Habitat edge, while promoting local species diversity, encourages the establishment of invasive species and reduces the quality of interior forest habitat (Rosenberg et al. 1999, 9). For example, creating habitat edge through a forest will reduce the size of interior forest patches. If interior forest or core forest is defined by mature forest that is at least 300 feet from a forest edge (NJ Highlands Council 2008a, 2), creating or expanding a ROW through forest will further reduce interior forest habitat. Invasive and opportunistic plant and animal species will have an increased potential to affect or displace native species. Increasing edge habitat can potentially subject forest-interior bird species to increased nest predation and parasitism (Rosenberg et al. 1999, 9).





Legend

- Substation
- Inside Study Area
- Outside Study Area
- Appalachian National Scenic Trail
- Middle Delaware National Scenic and Recreational River
- Delaware River
- Delaware Water Gap National Recreation Area
- Worthington State Forest
- CVNWR Boundary
- County Line

Land Use/Land Cover

- Deciduous Forest
- Evergreen Forest
- Mixed Forest
- Agriculture
- Developed
- Open Water
- Wetlands
- Other

Note: Designated boundary of CVNWR is depicted, not all property is owned within the boundary

0 1.5 3
Miles

Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 38
Alternatives Overview Map
Regional Land Cover

Source: ESRI Streetmap 2006, Penn State 2010, ESRI ArcGISonline Map Service 2010, PennDOT 2011, USGS 2006, NJ DEP 2008,

Projection: NAD 83 UTM Zone 18N
Date: July, 2012

All the alternatives being considered use existing utility ROWs within the park and continue outside the park to Susquehanna Substation in Pennsylvania and Roseland Substation in New Jersey, where possible. The ROWs being considered for the alternatives are various widths and have varying frequencies of vegetation maintenance. Therefore, these alternatives and the associated ROWs already represent edge habitat within the forest blocks that surround them. However, the magnitude of the disruption not only in vegetation but in activity and other areas can seriously alter the existing condition.

Alternative 1 (No Action), Alternative 2, and Alternative 2b

Inside the study area, the B-K Line ROW ranges from 80 to 100 feet wide and creates a linear tract from east to west across one of the widest portions of DEWA. The ROW also bisects MDSR and APPA. The specific vegetation cover, both within the existing ROW and adjacent to the ROW, is described in detail in the "Vegetation" section. The parks contain large areas of contiguous habitat that include ROWs, major and minor roads, and trails (figure 39). From the DEWA boundary heading east to Community Drive in Pennsylvania, alternatives 1, 2, and 2b would pass through forest that includes relatively innocuous breaks by other utility ROWs and roads, such as Creek Road. Moving southeastward off the ridge, the ROW would cross Big Bushkill Creek and exit the park while crossing the developed Route 209 corridor in Pennsylvania outside the park. The habitat patches adjacent to the ROW in this area range from approximately 1 acre to 507 acres. Once crossing the Delaware River from the west, the ROW would continue into New Jersey, where the portion of DEWA near the ROW consists of steep ridges that are mostly forested. The ROW would cross APPA at the crest of a forested ridge. From Community Drive to the eastern boundary of DEWA, the habitat patches are larger, ranging from 47 to 5,301 acres. In Pennsylvania, the habitats adjacent to the existing ROW are crossed by two existing ROWs, major and minor roads (US 209, Community Drive, Freeman Tract Road, and Creek Road), McDade Trail, and development at the Bushkill Substation and Fernwood Hotel and Resort. Habitat adjacent to the existing ROW in New Jersey is fragmented by major and minor roads (Millbrook, Old Mine, and Nobebosco roads) and development at the Watergate Recreation Site and Camp No-Be-Bo-Sco. The park provides a mosaic of different habitat types that include roads and utility ROW without fragmenting the nature of the ecosystem.

Alternative 3

Inside the study area, the proposed transmission line expansion route under alternative 3 would cross DEWA, MDSR, and APPA using an existing ROW that is approximately 40 to 125 feet wide. The alternative 3 alignment would also cross Worthington State Forest in New Jersey (figure 40).

Proceeding into DEWA from the western boundary in Pennsylvania, the ROW of alternative 3 would leave the fragmented forest area of the Great Bear Golf and Country Club along the Route 209 corridor. Within the park boundary, the ROW would pass over a forested ridge before descending the ridge to a floodplain that contains agricultural fields. The ROW would cross a forest buffer of the Delaware River before making the crossing just downstream from Tocks Island. The contiguous habitat patches adjacent to this portion of the alternative 3 alignment range from approximately 57 acres to 693 acres and are fragmented by major and minor roads (River Road, Mosiers Knob Road, and Hidden Lake Road) and McDade Trail. Crossing into New Jersey, the existing ROW along alternative 3 crosses through largely unbroken forests of the Worthington State Forest. The habitat patches in New Jersey range from 695 to 4,332 acres and is fragmented by Old Mine Road along the Delaware River. The ROW for alternative 3 would proceed eastward midway up Raccoon Ridge before turning southeast to the crest of the ridge and APPA. The ROW would then head northeast and down the eastern slope of the ridge through the Yards Creek Power Plant and parallel the park boundary to the study area. The portion of the ROW that heads northeast to the study area would pass through mixed-use areas of Yards Creek and agricultural/residential lands with large forest patches that are less contiguous than those inside the parks.

The alternative 3 alignment would follow the DEWA boundary in New Jersey, paralleling APPA. The forests within the DEWA boundary are contiguous in this area; however, the lands adjacent to DEWA in this area contain large portions of agriculture fields and are bisected by small roads.

Alternative 4

Inside the study area, the alternative 4 alignment would cross through APPA, the southern portion of DEWA, and the Cherry Valley NWR established boundary, but not on Federal property, along an existing ROW in Pennsylvania that is approximately 70 to 120 feet wide. The forests along the existing ROW of alternative 4 within the study area are dominated by deciduous forests and contain shrub-dominated rocky summit outcrop areas and several wetlands. Totts Gap Road runs along the alternative 4 alignment and two existing ROWs run parallel to the alignment within 0.5 mile. These features, as well as other roads (Mountain Road and NPS Drive) fragment the habitats along the alternative 4 alignment (figure 41). The habitat patches adjacent to the alignment range from approximately 1 acre to 945 acres, with the smallest patches found between the alternative 4 alignment and the other existing ROWs. Outside the parks, residential lots also fragment the contiguous forest near this alternative.

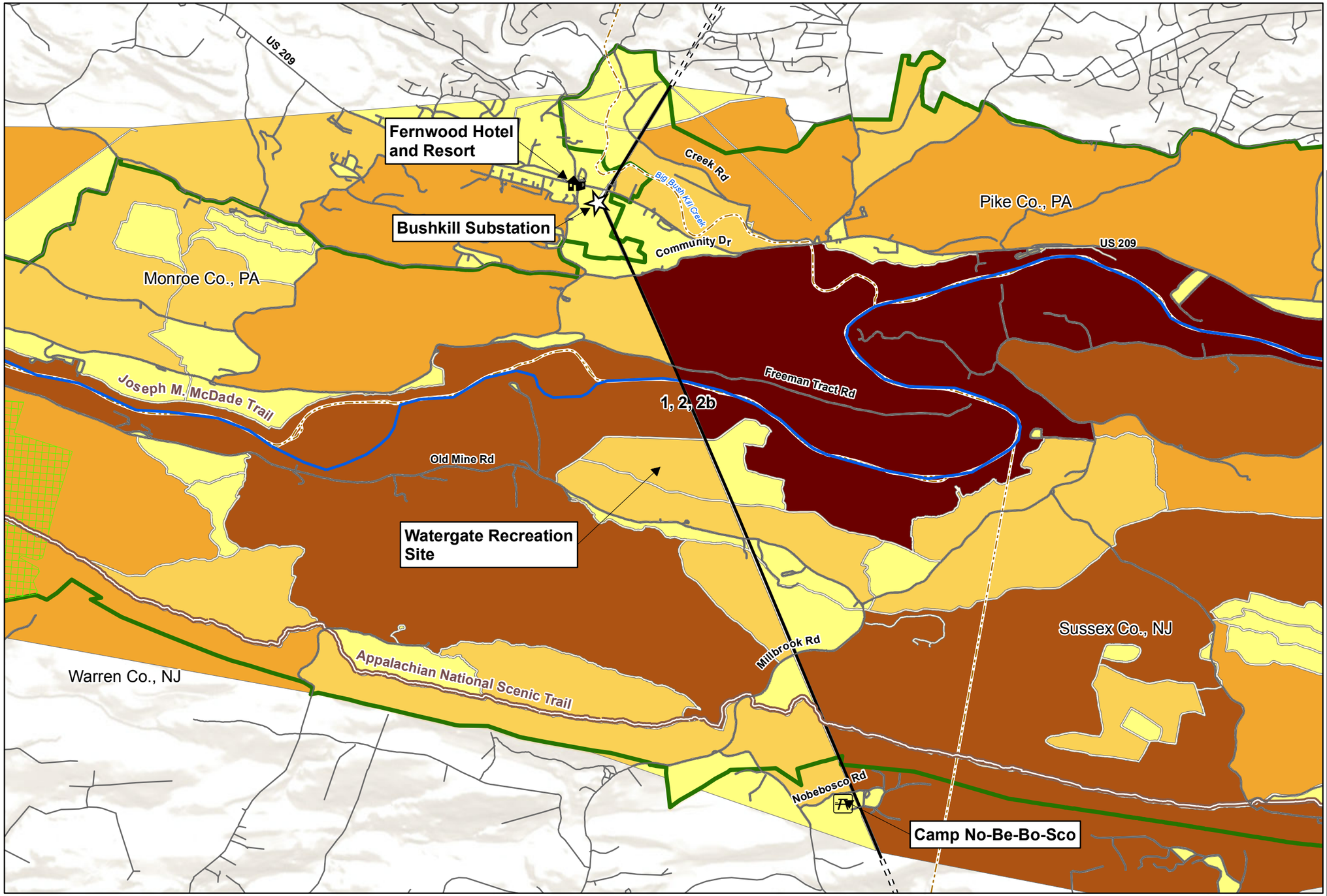
The alternative 4 alignment would connect with the alternative 2 alignment at the Bushkill Substation and travel west through another portion of DEWA. As described for alternatives 1 and 2, the ROW in this portion of DEWA passes through forest that is broken up by other utility ROWs (e.g., Columbia Gas Transmission Company pipeline) and roads (such as Creek Road).

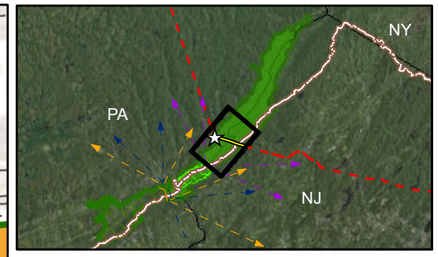
Alternative 5

Inside the study area, alternative 5 would follow the same route as alternative 4 inside the study area, with the exception of the portion from the Bushkill Substation to the western boundary of DEWA; therefore, the information for habitat fragmentation under alternative 5 is the same as discussed for alternative 4.

Outside the Study Area

Outside DEWA in New Jersey, Sussex and Warren counties contain approximately 97,000 acres of state land. In Pennsylvania, Pike, Monroe, and Northampton counties contain approximately 166,000 acres of state lands (Donahue and Morlock 2009, slide 3). In addition to the public lands, numerous hunting clubs near the park contain forest cover. Maintaining connectivity between DEWA and other large tracts of forested lands outside the park is an initiative promoted by DEWA (Donahue and Morlock 2009, slide 3). Approximately 40% of New Jersey is developed (Environment New Jersey 2011). However, approximately 75% of the Highlands Region, which encompasses most of Sussex, Warren, and Morris counties, remains undeveloped (NJ Highlands Council 2008b, 25). Appendix G-5 presents the state game lands, wildlife management areas, state parks, state forests, important mammal areas (IMAs), important bird areas (IBAs), federal lands, NWRs, and The Nature Conservancy (TNC) Preserves that could be crossed in Carbon, Lackawanna, Luzerne, Monroe, Northampton, Pike, and Wayne counties in Pennsylvania and Morris, Sussex, and Warren counties in New Jersey. IMAs and IBAs are designated for the critical habitat they provide; therefore development in these lands should be limited.





Legend

- Substation
- Alternative 2,2b
- Outside Study Area
- Appalachian National Scenic Trail
- Middle Delaware National Scenic & Recreational River
- River/Stream
- Roads
- Delaware Water Gap National Recreation Area
- Worthington State Forest
- County Line

Habitat Patch Acreages

- 0 - 150 acres
- 150 - 500 acres
- 500 - 1,200 acres
- 1,200 - 3,200 acres
- 3,200 - 8,000 acres

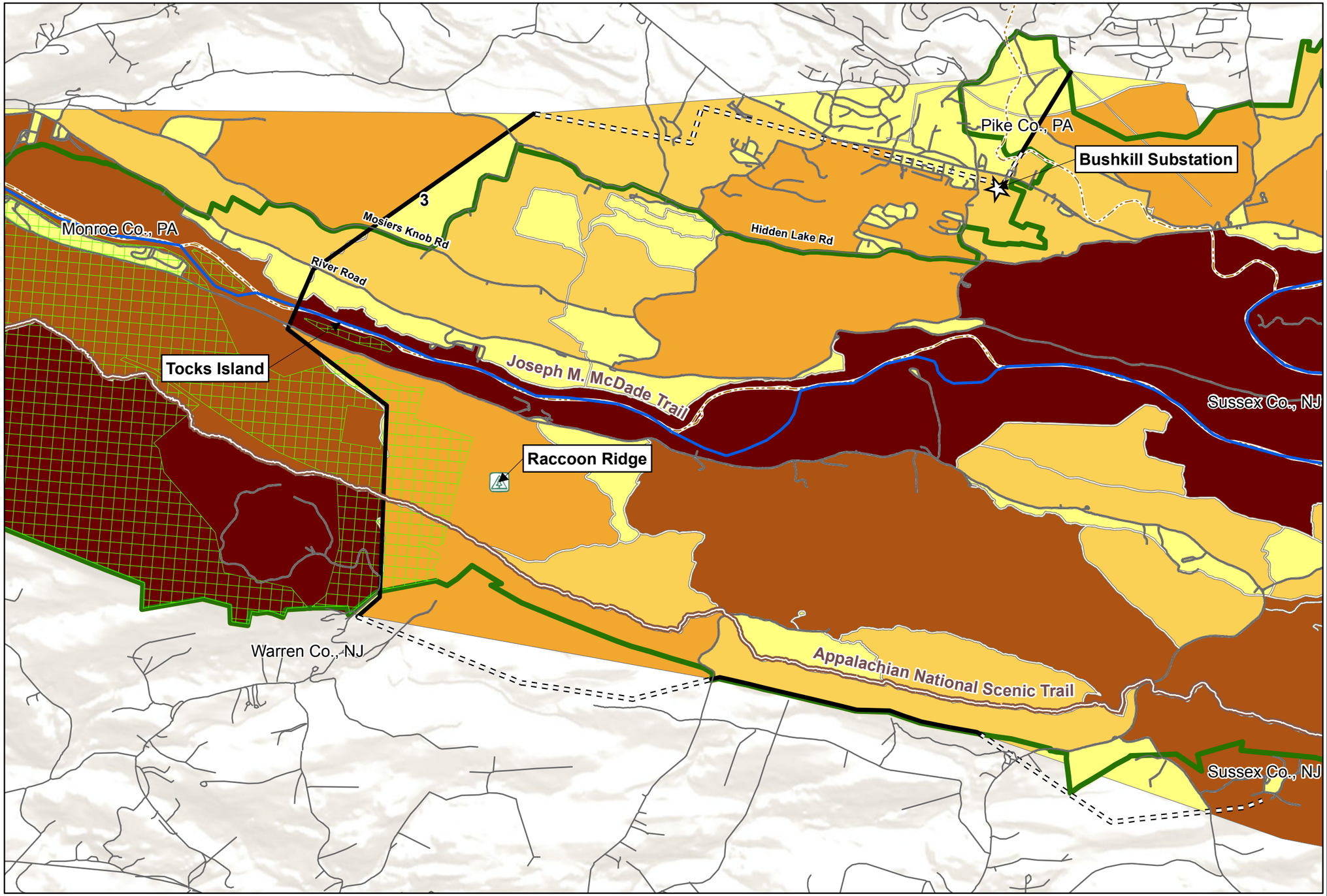
0 0.5 1 Miles

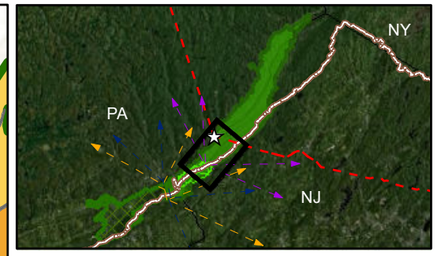
Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 39
Alternative 2/2b Habitat Patches

Source: ESRI Streetmap 2009;
NPS 2011;
ArcGIS Map Service 2010;

Projection: NAD 83 UTM Zone 18N
Date: July, 2012





Legend

- Substation
- Alternative 3
- Outside Study Area
- Appalachian National Scenic Trail
- Middle Delaware National Scenic & Recreational River
- Roads
- Delaware Water Gap National Recreation Area
- Worthington State Forest
- County Line

Habitat Patch Acreages

- 0 - 150 acres
- 150 - 500 acres
- 500 - 1,200 acres
- 1.200 - 3,200 acres
- 3,200 - 8,000 acres

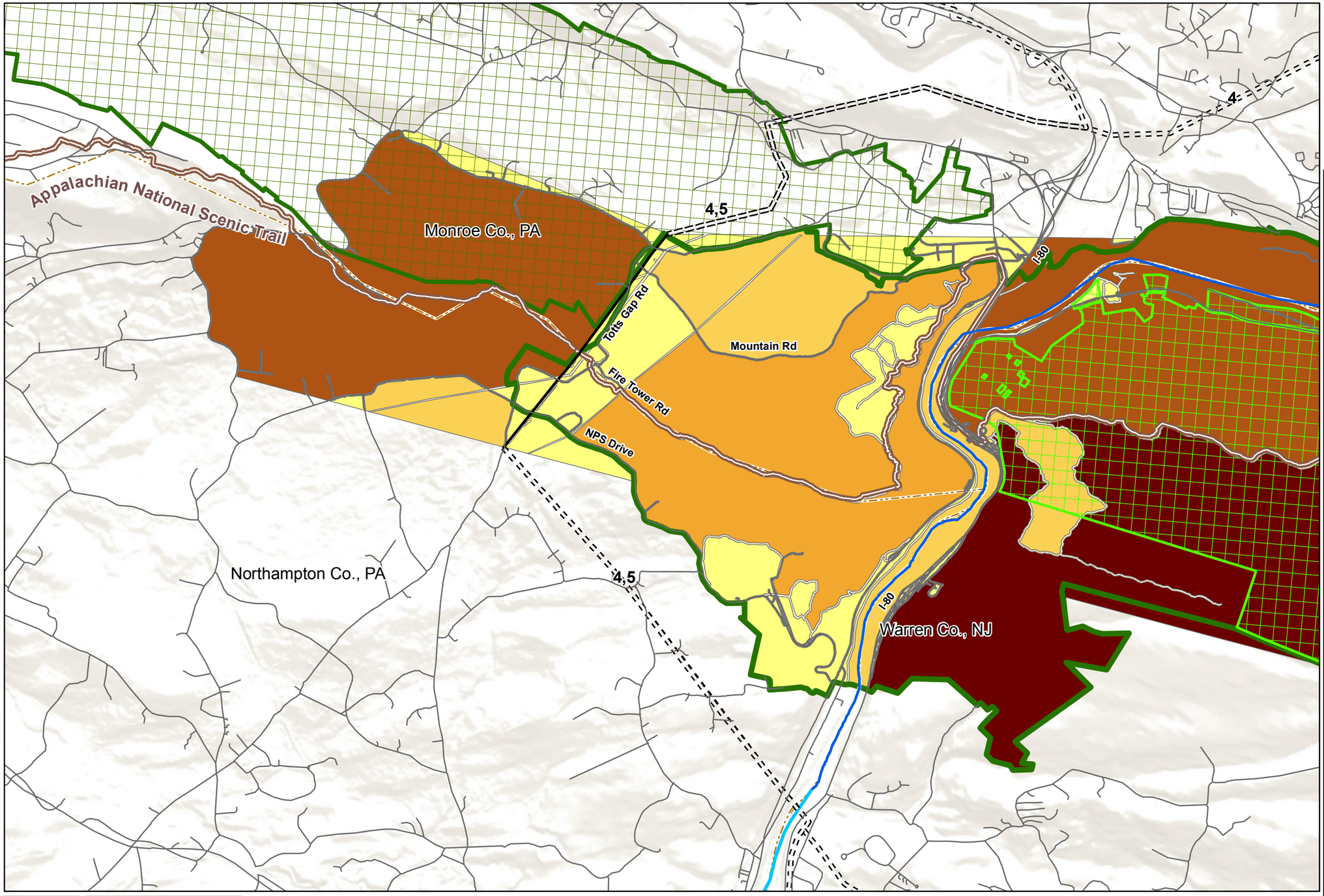
0 0.5 1
Miles

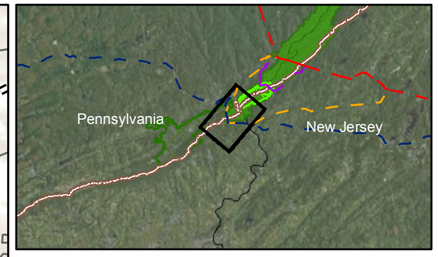
Susquehanna to Roseland
Transmission Line Proposal
and
Right-of-Way Request EIS

Figure 40
Alternative 3 Habitat Patches

Source: ESRI Streetmap 2009;
NPS 2011;
ArcGIS Map Service 2010;

Projection: NAD 83 UTM Zone 18N
Date: July, 2012





Legend

- Alternative 4,5
- Outside Study Area
- Appalachian National Scenic Trail
- Middle Delaware National Scenic & Recreational River
- Delaware River
- Roads
- Delaware Water Gap National Recreation Area
- Worthington State Forest
- CVNWR Boundary
- County Line

Habitat Patch Acreages

- 0 - 150 acres
- 150 - 500 acres
- 500 - 1,200 acres
- 1.200 - 3,200 acres
- 3,200 - 8,000 acres

Note: Designated boundary of CVNWR is depicted, not all property is owned within the boundary

0 0.5 1
Miles

Susquehanna to Roseland
Transmission Line Proposal
and
Right-of-Way Request EIS

Figure 41
Alternative 4,5 Habitat Patches

Source: ESRI Streetmap 2009;
NPS 2011;
ArcGIS Map Service 2010;

Projection: NAD 83 UTM Zone 18N
Date: July, 2012

WILDLIFE AND WILDLIFE HABITAT

DEWA, MDSR, and APPA provide a high diversity of contiguous undeveloped wildlife habitat that allows for a diversity of wildlife species. The available expanse of undeveloped and varied habitat within the parks becomes more crucial to wildlife as the availability of large areas of undeveloped contiguous habitat outside the parks becomes limited by habitat fragmentation from development or agriculture. As a result of conservation and protection of park lands, the parks support thousands of species, including many that are rare, endangered, or of special concern.

Wildlife presence determinations discussed are based on observations from park-specific inventories, including incidental observations during vegetation surveys during summer and fall of 2010 and spring of 2011 designed to characterize and identify vegetation communities and the potential for the presence of species of special concern (NPS 2011b). Due to the brief duration of the vegetation surveys, the wildlife species documented provide a "snapshot" of species presence and do not provide certainty as to whether all species observed reside in the habitats or whether they are temporarily using these habitats for foraging, migration, or other activities. When combined with other known presence determinations information, such as checklists and park information, these observational data can reasonably be used to describe species composition within the characterized habitats. Sources for the following sections include previous studies and surveys, websites, county planning departments, and nongovernmental organizations, as well as consultation with state and federal resource agencies.

The NPS has an ongoing program to inventory and monitor wildlife species within DEWA, including species of special concern and their habitats. Outside DEWA, MDSR, and APPA, lands owned by the states of New Jersey and Pennsylvania, USFWS, and organizations such as TNC protect additional wildlife habitat within the study area. Both New Jersey and Pennsylvania have prepared and implemented comprehensive wildlife conservation strategies that provide goals for conserving species at risk as well as maintaining sustainable and diverse wildlife populations (PGC and PFBC 2005, 1; NJDEP 2008a, 1). In Pennsylvania, the National Wildlife Federation, Pennsylvania Wildlife Federation, Pennsylvania Federation of Sportsman's Clubs, Mammal Technical Committee/Pennsylvania Biological Survey, and the Carnegie Museum of Natural History have formed a partnership to identify and designate IMAs. IMAs that traverse or could be traversed by each alternative are discussed below. The National Audubon Society's program of designated IBAs recognizes sites within the study area that provide resident and migratory birds with essential habitat for food, shelter, and/or nesting as IBAs. The IBA Program is a global effort to recognize and conserve habitat that is vital to birds and biodiversity (Audubon PA 2010, 1). Inside the study area, all the alternatives cross Kittatinny Ridge, and alternatives 1, 2, 2b, and 3 cross the Delaware Riparian River Corridor, which are considered important migratory bird routes. IBAs are discussed primarily within the "Migratory Birds" section.

Alternatives 1 through 5

Several broad categories are used to define wildlife habitat: deciduous, coniferous, and mixed woodlands, wetlands, scrub shrub, and developed/maintained areas. Wildlife species that are known to be present or that may be found within these areas as resident or seasonally present individuals are discussed below. Migratory bird species, species of special concern, and invasive animal species are presented in separate sections following the general wildlife discussion.

Wildlife species that live in forested areas often broadly use all three types of woodlands (deciduous, coniferous, and mixed). Wildlife documented within the parks that use all woodland habitats include mammal species such as black bear (*Ursus americanus*), white-tailed deer (*Odocoileus virginianus*), raccoon (*Procyon lotor*), striped skunk (*Mephitis mephitis*), and eastern gray squirrel (*Sciurus carolinensis*) as well as other small mammal species that may include eastern chipmunk (*Tamias striatus*)

and a variety of mouse, shrew, mole, and bat species. Black bear, white-tailed deer, porcupine, gray squirrel, eastern chipmunk, American crow, and red-bellied woodpecker were observed within woodland habitats during vegetation surveys (NPS 2011b).

Bird species considered permanent residents that are often found within deciduous woods include ruffed grouse (*Bonasa umbellus*), downy and hairy woodpeckers (*Picoides pubescens* and *P. villosus*), black-capped chickadee (*Poecile atricapilla*), tufted titmouse (*Baeolophus bicolor*), white-breasted nuthatch (*Sitta carolinensis*), and blue jay (*Cyanocitta cristata*). A number of raptor species are found in deciduous woodlands as permanent residents: eastern screech owl (*Megascops asio*), great horned owl (*Bubo virginianus*), northern goshawk, and red-tailed hawk (*Buteo jamaicensis*). Other raptors may use deciduous woodlands seasonally or in migration and are discussed in "Migratory Birds." Seasonally, the bird species found within deciduous woodlands would be supplemented by summer resident species, many of which are Neotropical migrants and are described below. Bird species that were observed during vegetation surveys include black-capped chickadee, blue jay, downy woodpecker, great crested flycatcher, barred owl, red-eyed vireo, red shouldered hawk (*Buteo lineatus*), red-tailed hawk, tufted titmouse, and white-breasted nuthatch (NPS 2011b). Reptiles such as eastern garter snake (*Thamnophis sirtalis sirtalis*), northern black racer (*Coluber constrictor constrictor*), and black rat snake (*Elaphe obsoleta*) are representative of reptile species that use deciduous habitat; where deciduous woodlands and moist conditions are present, salamanders, northern gray treefrog (*Hyla versicolor*), and American toad (*Bufo americanus*) may also be found. Garter snake, timber rattlesnake, American toad, and northern gray treefrog were some of the species observed during vegetation surveys (NPS 2011b).

Several wildlife species are more frequently found within coniferous forests, such as red squirrel (*Tamiasciurus hudsonicus*) and winter resident bird species, including golden-crowned kinglet (*Regulus satrapa*), ruby-crowned kinglet (*R. calendula*), purple finch (*Carpodacus purpureus*), and red-breasted nuthatch (*Sitta canadensis*).

Wetlands typically have water present seasonally or year-round. Wildlife species are generally attracted to wetlands as a source of water, and some species are wetland specialists, including beaver (*Castor canadensis*) and muskrat (*Ondatra zibethicus*). Bird species that use wetland or riparian areas include wading birds and waterfowl. Wetland bird species include green heron (*Butorides virescens*), Canada goose (*Branta canadensis*), mallard (*Anas platyrhynchos*), wood duck (*Aix sponsa*), and passerine species such as willow flycatcher (*Empidonax traillii*), common yellowthroat (*Geothlypis trichas*), and swamp sparrow (*Melospiza georgiana*). Aquatic insects are more common in wetland areas because they require water sources as habitat during a portion of their life cycles. Amphibians, including northern spring peeper (*Pseudacris crucifer crucifer*), bullfrog (*Rana catesbeiana*), and green frog (*R. clamitans melanota*) as well as toads and salamanders, are all reliant on water/wetland habitats for their reproductive cycles and have been observed during vegetation surveys. Reptile species such as common snapping turtle (*Chelydra serpentina serpentina*), eastern painted turtle (*Chrysemys picta picta*), and northern water snake (*Nerodia sipedon sipedon*) are commonly found in wetland and riparian areas.

Scrub shrub habitat in areas of previous disturbance and along the existing ROWs may be used by wildlife species found within adjacent woodlands that use the ROWs as foraging and travel corridors. White-tailed deer and opportunistic scavengers such as opossum (*Didelphis virginiana*), skunk, and red fox can be found within the ROWs along with summer resident bird species, especially flycatchers and insectivorous Neotropical migrants. In addition, bird species preferring thickets and edges, such as song sparrow (*Melospiza melodia*), eastern towhee (*Pipilo erythrophthalmus*), and eastern bluebird (*Sialia sialis*), are often present as well as aerial foragers that include prairie warbler (*Dendroica discolor*) and several species of flycatchers and swallows. During the vegetation studies, the following bird species were observed within scrub shrub habitat: American goldfinch (*Carduelis tristis*), blue-gray gnatcatcher, Carolina wren (*Thryothorus ludovicianus*), common yellowthroat, gray catbird (*Dumetella carolinensis*),

northern cardinal, and indigo bunting (NPS 2011b). Open areas within this habitat provide basking areas for many of the snake species mentioned above, for eastern box turtle (*Terrapene carolina carolina*), and for five-lined skink (*Eumeces fasciatus*). Eastern box and wood turtles were observed within scrub shrub habitat during vegetation surveys (NPS 2011b). Herbaceous vegetation in this more open habitat creates habitat for butterfly and other pollinator insect species and dragonflies. An invertebrate survey conducted along the existing ROW identified 32 butterfly and 29 dragonfly and damselfly species (including 2 unknown species) (EcolSciences 2009a, 8).

Agriculture and developed lands were grouped together because they are the result of disturbance to a previously existing natural habitat. Species that occupy these areas are generally tolerant of human activity and are generalists in their requirements for food, shelter, and other necessities. Species that are known to use these habitats include mourning dove (*Zenaida macroura*), rock pigeon (*Columba livia*), European starling (*Sturnus vulgaris*), common grackle (*Quiscalus quiscula*), house finch (*Carpodacus mexicanus*), and house sparrow (*Passer domesticus*) as well as other common bird species such as the American robin (*Turdus migratorius*), blue jay, and American crow (*Corvus brachyrhynchos*). White-tailed deer, raccoon, opossum, and eastern gray squirrel can also become adapted to human activity surrounding developed areas. Raptors may use the open areas of agricultural fields and developed areas to forage for small mammals. Reptiles and amphibians that are found as opportunistic species that forage within agricultural lands and developed areas include garter snakes, toads, and, where there is adequate moisture, frogs such as the northern cricket frog (*Acris crepitans*); reptiles also use agricultural fields for nesting habitat. In addition to the open habitat offered by agricultural and developed areas, open grasslands offer similar habitat for insects and aerial foragers, such as raptors and swallows, as well as foraging corridors for opportunistic scavengers and carnivores such as raccoon and red fox. Open grasslands also provide habitat for grassland bird species including grasshopper sparrow (*Ammodramus savannarum*), field sparrow (*Spizella pusilla*), and wild turkey (*Meleagris gallopavo*) (McNaught 2004, 4).

One IBA is found within the study area, the Delaware Water Gap and Valley macro-site IBA, designated as such by the New Jersey Audubon Society (NJ Audubon 2010a, 1). This macro-site IBA would be crossed by all the alternative alignments. It encompasses the Delaware River from the New York state line south 40 miles along the Delaware River. Species that are known to be present within this macro-site IBA include bald eagle, northern goshawk, red shouldered hawk, barred owl, sharp-shinned hawk, red-headed woodpecker, savannah sparrow, grasshopper sparrow, bobolink, gold-winged warbler, veery, and cerulean warbler.

Three IMAs are found within the study area: the Delaware State Forest/Bushkill Creek Area IMA (crossed by alternatives 1, 2, 2b, and 3), the Delaware Water Gap/Pocono Environmental Education Center IMA (crossed by all alternatives), and the Cherry Valley Watershed IMA (crossed by alternatives 4 and 5). Together, the Delaware State Forest/Bushkill Creek Area and the Delaware Water Gap/Pocono Environmental Education Center IMAs support black bear, bobcat, northern river otter, beaver, Allegheny woodrat, little brown myotis, big brown myotis, fisher (*Martes pennanti*), and northern water shrew. The Cherry Valley Watershed IMA supports northern river otter, northern myotis, small-footed bat, snowshoe hare, black bear, and bobcat.

A full list of wildlife species known to be present within DEWA is presented in appendix G. Observations of these species during vegetation, invertebrate, and other studies are also indicated in this appendix.

Outside the Study Area

Outside the study area in Pennsylvania, the S-R Line could pass through Carbon, Lackawanna, Luzerne, Monroe, Northampton, Pike, and Wayne counties. In New Jersey, the S-R Line could cross Sussex, Warren, and Morris counties. The habitat in these counties consists mostly of deciduous forest, interspersed with smaller areas of developed/agricultural, wetlands, scrub shrub, and mixed and coniferous habitat types. Species that are known to be present within these habitats inside the study area, as described above, are likely to also be present outside the study area in similar habitats. White-tailed deer, squirrels, raccoons, opossums, cottontail rabbits (*Sylvilagus floridanus*), and skunks are likely to be present, as well as bird species listed above. Other likely species may include permanent resident bird species such as turkey vulture (*Cathartes aura*), northern flicker (*Colaptes auratus*), and northern cardinal (*Cardinalis cardinalis*), as well as Neotropical species of flycatchers, tanagers, orioles, and warblers as described in the section "Migratory Birds" below.

Appendix G-5 presents the state game lands, wildlife management areas, state parks, state forests, IBAs, IMAs, federal lands, NWRs, and TNC preserves that could be crossed in Carbon, Lackawanna, Luzerne, Monroe, Northampton, Pike, and Wayne counties in Pennsylvania and Morris, Sussex, and Warren counties in New Jersey. As previously discussed, these private, state, and federally owned lands protect crucial wildlife habitat; therefore, a variety of wildlife is expected to be present in these lands.

MIGRATORY BIRDS

The north-to-south orientation of the Delaware River Riparian Corridor and the surrounding topography, including Kittatinny Ridge, provide an ideal corridor for the seasonal migration of birds (McNaught 2004, 2). Kittatinny Ridge through Pennsylvania and New Jersey is part of the Appalachian Raptor Migration Flyway and is considered a globally significant flyway for fall and spring migration. Approximately 14,000 to 20,000 migratory raptors funnel through the area between August and December each year (Heintzelman 2009, i). Kittatinny Ridge is also important to migrating passerines that use the topographic feature for orientation during northbound (spring) and southbound (fall) migrations. The surrounding forests serve as stopover areas for resting and feeding. Passerines are birds of the order Passeriformes, which is the most diverse order of birds, containing over 5,000 identified species. This group includes all perching birds, such as warblers, sparrows, jays, and pigeons. The Kittatinny Ridge is recognized worldwide for its importance to migrating birds, particularly raptors. The ridge is part of the larger flyway that has been petitioned for designation by the USFWS as the "Kittatinny-Shawangunk National Raptor Corridor" by over 275 national and international organizations and concerned citizens and scientists (Heintzelman 2009). Additionally, the Delaware River Riparian Corridor is a part of the Atlantic Flyway, and provides important breeding and foraging habitat for migratory species, particularly migratory waterfowl.

As stated in the "Wildlife and Wildlife Habitat" section, the National Audubon Society has designated several IBAs within the parks. Kittatinny Ridge is incorporated into several IBAs within DEWA, including Upper Delaware Scenic River and Hawk Mountain Sanctuary–Kittatinny Ridge in Pennsylvania. These IBAs support migrating raptors including bald eagle (*Haliaeetus leucocephalus*), peregrine falcon (*Falco peregrinus*), osprey (*Pandion haliaetus*), northern goshawk, and northern harrier (*Circus cyaneus*). Over 140 bird species have been recorded during fall migration, including at least 27 warbler species (McNaught 2004, 2–3; Audubon PA 1999a, 1). Appendix G presents a list of birds that use the habitats of DEWA and could therefore be expected to migrate along Kittatinny Ridge. Because of the number of birds that use the ridge during migrations, Kittatinny Ridge is a considered globally important flyway in the spring and fall (Audubon PA 2006, 6). A portion of the Dutch Mountain Wetland/State Game Lands 57 IBA lies within Luzerne County. This IBA contains the only confirmed breeding site of the blackpoll warbler in Pennsylvania (Audubon PA 1999a, 1).

In New Jersey, a macro-site IBA, Delaware Water Gap and Valley, encompasses several other IBAs including Clove Brook Road Corridor, Kittatinny Camp/Van Ness Road, Stokes State Forest/High Point State Park, Walpack Valley, Bear Swamp Wildlife Management Area–Sussex, Old Mine Road, and Mount Tammany Cliffs. The Delaware Water Gap and Valley macro-site supports the migration of and provides breeding habitat for raptors such as bald eagle, northern goshawk, and red shouldered hawk. It also provides breeding and stopover habitat suitable for Acadian flycatcher (*Empidonax virescens*), veery (*Catharus fuscescens*), blue-winged warbler (*Vermivora cyanoptera*), golden-winged warbler (*Vermivora chrysoptera*), prairie warbler (*Dendroica discolor*), black-throated green warbler (*Dendroica virens*), cerulean warbler (*Dendroica cerulea*), black-and-white warbler (*Mniotilta varia*), hooded warbler (*Wilsonia citrina*), Louisiana waterthrush (*Seiurus motacilla*), worm-eating warbler (*Helmitheros vermivorum*), eastern towhee (*Pipilo erythrophthalmus*), scarlet tanager (*Piranga olivacea*), Baltimore oriole (*Icterus galbula*), and yellow-breasted chat (*Icteria virens*) (NJ Audubon 2010a). Pennsylvania and New Jersey counties contain many IBAs that could be crossed by the Susquehanna to Roseland transmission line. The IBAs within each county are presented in appendix G-5.

The USFWS Division of Migratory Bird Management has identified birds of conservation concern. These species are those that are not listed as threatened or endangered under the Endangered Species Act, but that represent the highest conservation priority. Without conservation efforts, these species are likely to become candidates for listing under the Endangered Species Act. Table 11 presents the species identified for USFWS Region 5 (Northeast Region) and Bird Conservation Region 28 (Appalachian Mountains). These species are all migratory and could be present within the study area during migration seasons.

Pennsylvania and New Jersey contain protected federal, state, and private lands that provide habitat for migratory birds within the project area. Throughout this discussion of migratory birds, the habitats identified along the proposed alternative alignments are only discussed as they are used by migrant species. Other bird species that use these habitats are discussed in the "Wildlife and Wildlife Habitat" section. Any undeveloped habitat or habitat that provides food and shelter will likely be used by migrating birds during stopovers anywhere along the routes for all alternatives. In general, migrating species will seek out similar habitats in migration to those used for nesting (i.e., wetland species will use wetland habitats for resting and feeding, if available).

Migrating Passerines: DEWA is home to over 260 species of permanent resident, seasonally present (breeding or wintering), or migratory birds (McNaught 2004, 4). Approximately 55% of birds within DEWA are considered Neotropical migrant species and may be found as summer resident (breeding species) or transient species traveling through the study area on northbound (spring) and southbound (fall) migrations (PEEC 2008; USFWS 2009a). As defined by Rappole, Neotropical migrants are "Western Hemisphere bird species all or part of whose populations breed north of the Tropic of Cancer and winter south of that line" (DeGraaf and Rappole 1995, 9). In general, many of these species can be said to breed in North America and travel to South and Central America or the Caribbean for the winter; however, at least 30 species of Neotropical migrants have overlapping distributions of year-round resident populations and winter resident populations, including great blue heron (*Ardea herodias*), turkey vulture (*Cathartes aura*), killdeer (*Charadrius vociferus*), and mourning dove (*Zenaida macroura*) (DeGraaf and Rappole 1995, 10).

TABLE 11: BIRDS OF CONSERVATION CONCERN FOR USFWS REGION 5 AND BIRD CONSERVATION REGION 28

Common Name	Scientific Name	USFWS Region 5	Bird Conservation Region 28
Red-throated loon (nb)	*Gavia stellata*	X	
Pied-billed grebe	*Podilymbus podiceps*	X	
Horned grebe (nb)	*Podiceps auritus*	X	
Greater shearwater (nb)	*Puffinus gravis*	X	
Audubon's shearwater (nb)	*Puffinus lherminieri*	X	
American bittern	*Botaurus lentiginosus*	X	
Least bittern	*Ixobrychus exilis*	X	
Snowy egret	*Egretta thula*	X	
Bald eagle[a]	*Haliaeetus leucocephalus*	X	X
Peregrine falcon[a]	*Falco peregrinus*	X	X
Yellow rail	*Coturnicops noveboracensis*	X	
Black rail	*Laterallus jamaicensis*	X	
Wilson's plover	*Charadrius wilsonia*	X	
American oystercatcher	*Haematopus palliatus*	X	
Solitary sandpiper (nb)	*Tringa solitaria*	X	
Lesser yellowlegs (nb)	*Tringa flavipes*	X	
Upland sandpiper	*Bartramia longicauda*	X	X
Whimbrel (nb)	*Numenius phaeopus*	X	
Hudsonian godwit (nb)	*Limosa haemastica*	X	
Marbled godwit (nb)	*Limosa fedoa*	X	
Red knot (*rufa* ssp.)[b] (nb)	*Calidris canutus*	X	
Semipalmated sandpiper (Eastern) (nb)	*Calidris pusilla*	X	
Purple sandpiper (nb)	*Calidris maritima*	X	
Buff-breasted sandpiper (nb)	*Tryngites subruficollis*	X	
Short-billed dowitcher (nb)	*Limnodromus griseus*	X	
Least tern[c]	*Sternula antillarum*	X	
Gull-billed tern	*Gelochelidon nilotica*	X	
Arctic tern	*Sterna paradisaea*	X	
Black skimmer	*Rynchops niger*	X	
Short-eared owl (nb)	*Asio flammeus*	X	
Northern saw-whet owl (S. Appalachian breeding pop.)	*Aegolius acadicus*		X
Whip-poor-will	*Caprimulgus vociferus*	X	X
Red-headed woodpecker	*Melanerpes erythrocephalus*	X	X
Yellow-bellied sapsucker (S. Appalachian breeding pop.)	*Sphyrapicus varius*		X
Olive-sided flycatcher	*Contopus cooperi*	X	X
Loggerhead shrike	*Lanius ludovicianus*	X	X
Black-capped chickadee (S. Appalachian pop.)	*Poecile atricapillus*		X
Bewick's wren (*bewickii* ssp.)	*Thryomanes bewickii*	X	X

Common Name	Scientific Name	USFWS Region 5	Bird Conservation Region 28
Sedge wren (nb*)	*Cistothorus platensis*	X	X
Bicknell's thrush	*Catharus bicknelli*	X	
Wood thrush	*Hylocichla mustelina*	X	X
Blue-winged warbler	*Vermivora cyanoptera*	X	X
Golden-winged warbler	*Vermivora chrysoptera*	X	X
Prairie warbler	*Dendroica discolor*	X	X
Bay-breasted warbler	*Dendroica castanea*	X	
Cerulean warbler	*Dendroica cerulea*	X	X
Worm-eating warbler	*Helmitheros vermivorum*	X	X
Swainson's warbler	*Limnothlypis swainsonii*	X	X
Louisiana waterthrush	*Seiurus motacilla*		X
Kentucky warbler	*Oporornis formosus*	X	X
Canada warbler	*Wilsonia canadensis*	X	X
Henslow's sparrow	*Ammodramus henslowii*	X	X
Nelson's sharp-tailed sparrow	*Ammodramus nelsoni*	X	
Saltmarsh sharp-tailed sparrow	*Ammodramus caudacutus*	X	
Seaside sparrow[c]	*Ammodramus maritimus*	X	
Rusty blackbird (nb*)	*Euphagus carolinus*	X	X
Red crossbill (S. Appalachian pop.)	*Loxia curvirostra*		X

a. Endangered Species Act delisted.
b. Endangered Species Act candidate.
c. Nonlisted subspecies or population of threatened or endangered species
nb = nonbreeding in this region.
nb* = nonbreeding in Bird Conservation Region 28, but not USFWS Region 5.

Migratory behavior has evolved from the need for reliable food resources and to reduce competition and predation (DeGraaf and Rappole 1995, 10). Migration of Neotropical species is primarily nocturnal, traveling from one stopover to another between sunset and pre-dawn, when they stop again to rest and forage. As a result, during spring and fall, habitats within the parks provide critical food resources and shelter for migrant passerines and the number of species that may be found within the parks increases beyond the number of species that are found as year-round, wintering, or seasonal residents.

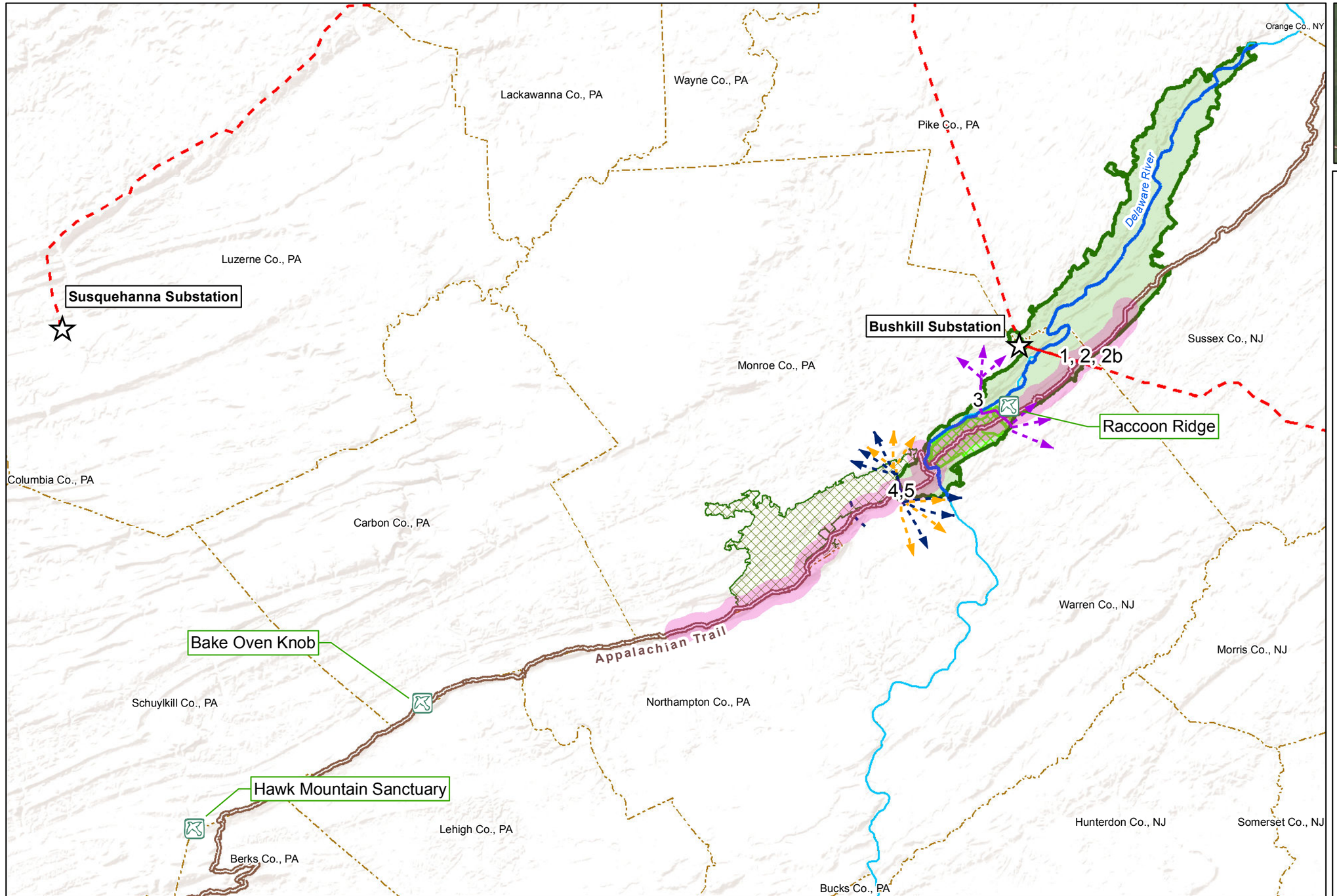
Kittatinny Ridge is the backbone of the Northern Ridge and Valley ecoregion, and this area provides a variety of habitats that suit a wide variety of bird species (figure 42). The dominant habitat types include scrub shrub, deciduous, coniferous (including eastern hemlock stands), and mixed forests, agricultural/developed areas and grasslands, and freshwater wetlands. Because of the wide variety of habitats in the parks and specifically along Kittatinny Ridge, the ridge is attractive for many passerines; when birds descend from migratory flights, they tend to be attracted to the highest topography and concentrate at these points (Audubon PA 2006, 7).

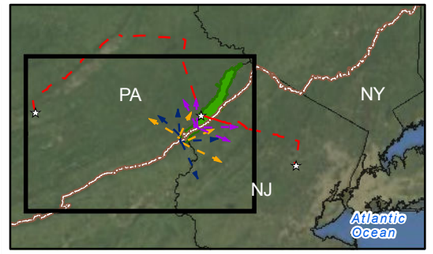
Many sensitive Neotropical migratory bird species are recorded as spring and fall transients, because they do not remain in the area for an extended period but use the habitats along Kittatinny Ridge and in the parks for resting and feeding during migration. Almost any Neotropical migrant species that breeds in the northeastern forests of North America may be found during migration in habitats found at the parks. These species may include blackpoll warbler (*Dendroica striata*), bay-breasted warbler (*Dendroica castanea*), Cape May warbler (*Dendroica tigrina*), and palm warbler (*Dendroica palmarum*), all of which

have breeding ranges in northern New England and Canada. Some individuals of these species may remain to nest; examples include golden-winged warbler in scrub shrub, cerulean warbler and worm-eating warbler in deciduous forests, and wood thrush (*Hylocichla mustelina*) and eastern wood-pewee (*Contopus virens*) in deciduous and mixed forests (Rosenberg and Robinson 2003, 4–5). The eastern hemlock forests of the Northern Ridge and Valley ecoregion provide breeding habitat for Acadian flycatcher, Blackburnian warbler (*Dendroica virens*), and black-throated green warbler (McNaught 2004, 4). Other species have been observed in DEWA during breeding season, but nesting has not been confirmed. They may be considered potential nesting species and would also be among the species that use the area for feeding during migration. Examples include Nashville warbler (*Vermivora ruficapilla*), yellow-breasted chat, and prothonotary warbler (*Protonotaria citrea*). DEWA supports migrant species that breed farther north and may overwinter in the park, including ruby-crowned kinglet (*Regulus calendula*), dark-eyed junco (*Junco hyemalis*), and purple finch. Appendix G presents the bird species known to be present within DEWA, including migratory species, and was developed from the *Delaware Water Gap National Recreational Bird Checklist* (PEEC 2008).

Migrating Raptors: Kittatinny Ridge is one of the most important raptor migration corridors in the world. Each fall, thousands of raptors are observed traveling south along the ridge. The ridge is used to a lesser degree as a travel corridor for northward migration in the spring (Audubon PA 1999b, 1). Raptors are primarily daytime migrants that use visual cues such as Kittatinny Ridge as a travel guide for migration. The birds are also able to conserve energy by gaining lift from updrafts and thermals along the cliffs (NJ Audubon 2010a). A case study by Kerlinger determined that at Kittatinny Ridge, raptors tend to fly at a constant height in relation to the ridge, from a few feet to several hundred feet above the ridge. The birds fly at a speed of 20 to 35 miles per hour, depending on the strength of the updrafts. By changing flight speed and altitude, raptors are able to maximize the distance traveled while minimizing the amount of energy expended (Kerlinger 1995, 136–137). Depending on the strength of the updrafts at any given time, the proposed towers could be directly in the flight path of the raptor migration. DEWA supports many raptor species as permanent residents and these species may also be observed as seasonal migrants through the area, especially along Kittatinny Ridge. Other migrating raptors that are only observed as true migrants include golden eagle (*Aquila chrysaetos*), rough-legged hawk (*Buteo lagopus*), merlin (*Falco columbarius*), short-eared owl (*Asio flammeus*), and northern saw-whet owl (*Aegolius acadicus*). Hawk migration along Kittatinny Ridge is closely monitored through visual surveys at Raccoon Ridge within Worthington State Forest north of Upper Yards Creek Reservoir in New Jersey; at Bake Oven Knob north of Allentown, Pennsylvania, approximately 43 miles southwest from DEWA Headquarters in Bushkill, Pennsylvania; and at Hawk Mountain Sanctuary farther west in Kempton, Pennsylvania, about 15 miles farther southwest along Kittatinny Ridge. Raptor migration counts have been ongoing at Raccoon Ridge since the 1930s, at Bake Oven Knob since 1961, and at Hawk Mountain since 1934 (HMANA 2010; Hawk Mountain Sanctuary 2007; Lehigh Gap Nature Center 2010). At Raccoon Ridge an average of 6,528 raptors were recorded each year from 2002 to 2010 (HMANA 2011). An average of 15,806 raptors per year were counted at Bake Oven Knob from 1998 to 2007; during the same time period at Hawk Mountain Sanctuary, the average number of raptors was 20,311 (Bake Oven Knob 2008; Hawk Mountain Sanctuary 2010). The most abundant species at all sites were broad-winged hawk (*Buteo platypterus*), sharp-shinned hawk (*Accipiter striatus*), and red-tailed hawk. Peak migration for these birds occurs between September and November (HMANA 2010).

Migrating Waterfowl: Many species of waterfowl (ducks, geese, swans) use the Delaware River for resting and foraging during their seasonal migrations in the spring and fall. Migratory species such as the common merganser (*Mergus merganser*), ring-neck duck (*Aythya collaris*) and common goldeneye (*Bucephala clangula*) may also winter along the Delaware River and other areas of open water within the study area. Other waterfowl species may be year round or summer residents that use the corridor for nesting and breeding, including the common merganser, mallard duck (*Anas platyrhynchos*), and Canada goose (*Branta canadensis*) (PEEC 2008).





Legend

- Substation
- Hawk Watch Site
- Alternative 1, 2, 2b
- Alternative 3
- Alternative 4
- Alternative 5
- Appalachian National Scenic Trail
- Kittatinny Ridge
- Middle Delaware National Scenic and Recreation River
- Delaware River
- Delaware Water Gap National Recreation Area
- Worthington State Forest
- CVNWR Boundary
- County Line

Note: Designated boundary of CVNWR is depicted, not all property is owned within the boundary

0 3 6
Miles

Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 42
Alternative Overview Map
Migratory Birds Kittatinny Ridge

Source: ESRI Streetmap 2006, Penn State 2010, ESRI ArcGISonline Map Service 2010, PennDOT 2011, USGS 2006, NJ DEP 2008

Projection: NAD 83 UTM Zone 18N
Date: July, 2012

Alternative 1 (No Action), Alternative 2, and Alternative 2b

Inside the study area, the alignment for alternatives 1, 2, and 2b would cross Kittatinny Ridge and pass through the Upper Delaware Scenic River IBA in Pennsylvania and the Old Mine Road IBA in New Jersey. As previously stated, the diverse habitats within the IBAs support many species of Neotropical migrants during spring and fall migration (McNaught 2004, 2), and numerous raptors use the migration corridor along Kittatinny Ridge. In addition, many Neotropical migrants and raptors use the habitats along the ridge for breeding, feeding, and wintering. The alignment for alternatives 1, 2, and 2b would cross an area that contains a known bald eagle winter roost. The existing transmission lines are in the flight path between the roost and foraging areas (Ambler 1996, 1–6); however, the transmission lines are barely above the tree canopy and upon leaving the roost, the eagles fly over the lines to foraging areas. The alignments for alternatives 1, 2, and 2b would also cross the Delaware River and riparian corridor, which are both within the Atlantic flyway route used by migratory waterfowl such as ducks, geese, and swans as discussed in the paragraph above. Waterfowl use the Delaware River and other areas of open water in the study area during migration for resting and foraging; some species also use this corridor for nesting and breeding as well.

Generally, the alternative 1, 2, and 2b alignment contains deciduous, coniferous, and mixed forests, wetlands, and scrub shrub within the study area, providing a wide range of habitats. Passerines observed during 2010 summer vegetation surveys include species that would be found around forest edges and the scrub shrub of the ROW: eastern wood-pewee, which uses any of the forested areas; Carolina wren (*Thryothorus ludovicianus*) and red-eyed vireo (*Vireo olivaceus*), which prefer open woodlands; and common yellowthroat (*Geothlypis trichas*) and northern waterthrush (*Seiurus noveboracensis*) within wetland areas (NPS 2011b). These observations should be considered cursory because they were incidental sightings during vegetation surveys; however, the species observed are representative of the habitats along the alignment. Although not observed during vegetation surveys, Blackburnian warbler, a hemlock/conifer specialist, and blue-winged warbler, which uses scrub shrub habitat, are known to be found within DEWA (PEEC 2008). A raptor survey along the alignment for alternatives 1, 2, and 2b revealed red-tailed hawk, northern goshawk, and barred owl (EcolSciences 2010b, 11–12), and red shouldered hawk and barred owl were observed during raptor nest surveys (NPS 2011b). A red-tailed hawk was also seen during a bald eagle survey (Mellon 2009, 3). The raptors observed in these three studies could be either migratory species or resident species. All bird species observed along the route of alternatives 1, 2, and 2b during vegetation surveys between 2008 and 2010 are presented in appendix G.

Alternative 3

Inside the study area the proposed transmission line expansion route under alternative 3 would cross DEWA, MDSR, and APPA. The alternative 3 alignment would also cross the Kittatinny Ridge in the Upper Delaware Scenic River IBA in Pennsylvania and the Old Mine Road IBA in New Jersey as discussed under alternatives 1, 2, and 2b. The alternative 3 ROW would cross Raccoon Ridge along APPA near Yards Creek. The alignment for alternative 3 would also cross the Delaware River and riparian corridor, which are both within the Atlantic flyway route used by waterfowl. Waterfowl use the Delaware River and other areas of open water in the study area during migration for resting and foraging. Some species also use this corridor for nesting and breeding, as discussed under alternatives 1, 2, and 2b. The alternative 3 alignment would traverse a variety of habitats, including deciduous woodlands, wetlands, agricultural fields, and forested areas of talus. Expected species include least flycatcher (*Empidonax minimus*) and black-and-white warbler in deciduous forests; black-throated blue warbler (*Dendroica caerulescens*) and northern parula (*Parula americana*) in mixed forests; and yellow warbler (*Dendroica petechia*) and common yellowthroat in wetland habitats. In addition, black-throated green warbler and blue-headed vireo, hemlock-obligate species known to be present within DEWA, are expected to use the hemlock stands within the alternative 3 alignment (Quimby 1996, 4; PEEC 2008). A

Cooper's hawk was observed along alternative 3 during raptor nest surveys (NPS 2011b). Species such as sharp-shinned hawk, bald eagle, and broad-winged hawk are expected to use Kittatinny Ridge during fall migration. Bald eagles, golden eagles, and other raptor species have been observed during counts at Raccoon Ridge. All the birds observed along the alternative 3 alignment during vegetation surveys for this project are presented in appendix G.

Alternative 4

Inside the study area, the alternative 4 transmission line route would cross through DEWA and APPA. As a result, the alternative 4 alignment would cross Kittatinny Ridge in the Upper Delaware Scenic River IBA in Pennsylvania and the Old Mine Road IBA in New Jersey. The forests along the alternative 4 ROW within the study area are dominated by deciduous forests and also contain shrub-dominated rocky summit outcrop areas and several wetlands. These habitats could provide resting and foraging areas for many migratory bird species. A few examples of expected species include ovenbird (*Seiurus aurocapilla*) and scarlet tanager within the forests and yellow warbler and hooded warbler in wetland habitats. Wetlands are found within 0.25 mile of the alternative 4 alignment. Bird species identified during the wetlands survey included the following Neotropical migrants: American redstart (*Setophaga ruticilla*), blue-gray gnatcatcher (*Polioptila caerulea*), hooded warbler, ovenbird, veery, and Louisiana waterthrush; this survey was conducted after spring migration in June and July of 2004 and 2005 (Sheehan and Master 2008, 68). During raptor nest surveys, red shouldered hawks were observed near Bushkill Creek along the portion of the alternative 4 alignment that follows the B-K Line. Additionally, individuals of the migratory raptor species documented along Kittatinny Ridge at Bake Oven Knob and Hawk Mountain would be expected to use Kittatinny Ridge during fall migration. All the birds observed along the alternative 4 alignment during vegetation surveys for this project are presented in appendix G.

Alternative 5

Inside the study area, alternative 5 would follow the same path as alternative 4, except for the portion that follows the B-K Line. Therefore, the information for migratory birds is the same as discussed for alternative 4 with the exception of the red shouldered hawk observation. All the birds observed along the alternative 5 alignment during vegetation surveys for this project are presented in appendix G.

Outside the Study Area

Outside the study area in Pennsylvania, the S-R Line could pass through Carbon, Lackawanna, Luzerne, Monroe, Northampton, Pike, and Wayne counties. The amount of undeveloped area ranges from approximately 79% to 95% in these counties. The S-R Line could also cross nine designated IBAs outside the study area. These undeveloped areas, IBAs, and the rare and unique communities discussed later in this chapter contain a variety of habitats including wetlands, scrub shrub, artificial lakes, and deciduous and coniferous woodlands, including riparian woodlands. These areas provide habitat suitable for breeding populations of passerines, waterfowl, wading birds, and raptors, as well as habitat suitable for passerines during spring and fall migration. Raptors using a route along Kittatinny Ridge are not likely to deviate from their route, but may on occasion rest and forage within habitats along the route; as daytime migrants, raptors would also roost for the night along the ridge. However, several of the IBAs support resident populations of raptors such as barred owl, sharp-shinned hawk, and osprey (Audubon PA 1999b). Although birds tend to be found in higher numbers along Kittatinny Ridge during spring and fall migration, they could be found throughout the region wherever suitable habitat is present.

Outside the study area in New Jersey, the S-R Line would traverse Sussex, Warren, and Morris counties. Depending on the final route selected for the S-R Line, the alignment could cross any of the 32 IBAs in these counties. In general, Warren, Sussex, and Morris counties remain largely undeveloped and contain a

variety of natural habitats ranging from grasslands to wetlands to old-growth forests. Several of the IBAs in New Jersey, including Wantage Grasslands and Delaware Water Gap and Valley, provide essential habitat for passerine species during spring and fall migration and are heavily used by migrants. The Kittatinny Camp/Van Ness Road IBA provides valuable scrub shrub habitat for golden-winged warbler, which is state listed as threatened in New Jersey (NJ Audubon 2010b, 1). The Stokes State Forest and High Point State Park IBA also support golden-winged warbler as well as cerulean and black-throated green warblers, both of which are species of concern in New Jersey (NJ Audubon 2010c, 1). IBAs also provide breeding and wintering habitat for raptor species, such as bald eagles, red shouldered hawks, northern goshawks, barred owls, sharp-shinned hawks, and broad-winged hawks. In addition to habitat, IBAs contain features that aid raptors with migration, such as ridges and cliffs where the birds can use thermals to reduce the amount of energy used for migration.

INVASIVE WILDLIFE SPECIES

An invasive species is defined as "an alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health" by Executive Order 13112, "Invasive Species." Alien or nonnative species are those that have been either accidentally or purposely introduced into an area in which they do not naturally live. These species generally lack natural predators in their new environment and can aggressively compete with native species for life requirements within habitats. Other invasive wildlife species can alter a population or habitat through direct predation. The National Invasive Species Council was established by Executive Order 13112, "Invasive Species," in 1999 to ensure that federal programs and activities to prevent and control invasive species are coordinated, effective, and efficient; as an agency of the Department of the Interior, the NPS manages invasive species within park lands, including APPA, MDSR, and DEWA. Within DEWA, 28 invasive animal species have been documented (NPS 1998a, 1).

Terrestrial invasive wildlife species are known to be present in the parks and are primarily invertebrate species that adversely affect terrestrial vegetation within the parks: the hemlock woolly adelgid (*Adelges tsugae*), elongate hemlock scale (*Fiorinia externa*), and European gypsy moth (*Lymantria dispar*) (NPS 2010n, 8–9). More recently described invasive insect species, the emerald ash borer (*Agrilus planipennis*) and the brown marmorated stink bug (*Halyomorpha halys*), may also affect park vegetation. Lastly, white-nose syndrome in bats is likely caused by a fungus (*Geomyces destructans*) that is aggressively spreading throughout the northeast and mid-Atlantic bat populations (NPS 2009f, 1).

The hemlock woolly adelgid, an Asian species believed to have arrived in shipments from Asia, was first reported in the western United States in 1924 and in the eastern United States in 1952. All stages of the hemlock woolly adelgid feed on young twig tissue to obtain nutrients from stored starches. Dispersal and movement can occur primarily as a result of transportation of infected nursery stock; however, the more natural dispersion occurs during the first larval stage as a result of wind, birds, and other animals that may come into contact with the naturally sticky larvae. Natural predators on hemlock woolly adelgid are not effective at reducing populations enough to prevent mortality of trees (USFS 2005, 1).

The elongate hemlock scale was first observed in New York in 1908 and is believed to have been unintentionally introduced in the United States from Japan (Penn State 2011). Scale insects feed on the fluid within the hemlock needles, starting from the bottom limbs and working toward the crown of the tree. Hemlock scale is dispersed by wind and birds and can be carried large distances. Effects of the elongate hemlock scale are worse on trees that are stressed by drought or parasitism by hemlock woolly adelgid (Penn State 2011; University of Kentucky 2003). Natural predators of the elongate hemlock scale include two small wasp parasitoids, the twice-stabbed ladybeetle (*Chilocorus stigma*), and several species of lacewings (Penn State 2011).

The European gypsy moth was accidentally introduced in Massachusetts in 1869 and has spread west to Ohio, north to Quebec, Canada, and south to North Carolina. Periodic outbreaks of gypsy moth caterpillars can cause extensive defoliation of deciduous forests, frequently along the boundaries between forests and urban areas. Infestations often occur along dry ridges and steep slopes that have shallow soils. Caterpillars are known to eat the leaves of more than 500 species of trees and generally attack trees that are already stressed (by drought or human-caused disturbance). Outbreaks, which result in extensive defoliation, tend to occur in cycles and last for 1 to 2 years. As with other invasive insects, natural predators are not capable of reducing or controlling population levels during outbreaks (NPS 2010n, 1).

Emerald ash borer was introduced into the United States in 2002 and probably entered in wooden packing material from Asia. The emerald ash borer attacks only ash trees (*Fraxinus* spp.), and as larvae burrow into the tree after hatching and feed on the phloem layer within the tree; adults emerge through D-shaped holes after overwintering as mature pupae. In forested areas, the emerald ash borer tends to attack upper trunks and limbs of larger trees, slowly weakening the trees and facilitating mass attack by emerald ash borers on the main trunks, which can result in tree death within 5 years (USFS 2010, 1). Pennsylvania and New Jersey are actively participating in emerald ash borer surveys under the Emerald Ash Borer National Management Program. This survey will monitor known emerald ash borer infestations and try to locate other unknown beetle populations (USDA 2011).

Brown marmorated stink bugs were first identified in Allentown, Pennsylvania in 1998. This species was most likely introduced accidentally to Pennsylvania from its native range in eastern Asia. The brown marmorated stinkbug is primarily an agricultural plant pest that pierces fruit and leaves of host plants to feed. In Pennsylvania, it has been observed feeding on ornamental plants, weeds, and trees, including black cherry (*Prunus serotina*). It is currently unknown whether the species will become a widespread pest (PADCNR 2010a, 1).

White-nose syndrome was first identified in bats near Albany, New York, in 2007 and has spread rapidly. Bats with white-nose syndrome exhibit abnormal behaviors, such as leaving their hibernacula during the winter months or clustering near the mouth of their hibernacula (a hibernaculum is a site where bats hibernate over the winter and generally includes caves or abandoned mines). These behaviors, which cause the bats to lose fat reserves that they need to survive the winter, usually result in death (USFWS 2009b). Infections in winter hibernacula in Pennsylvania have resulted in nearly 95% mortality to the bat populations in winter hibernacula 2 years after initial infection (PGC 2010a). DEWA was the first national park system unit to document the presence of white-nose syndrome. To date, there are four national park system units that have documented the presence of the syndrome. DEWA and the NPS are providing guidance on management of white-nose syndrome, including recommendations to close wild caves or requiring decontamination of caving gear following the USFWS Cave Advisory dated March 26, 2009, as well as providing educational information and support of research (NPS 2009f, 1).

Alternatives 1 through 5

Hemlock woolly adelgid and elongate hemlock scale were observed during field reconnaissance surveys (inside the study area for alternatives 1, 2, and 2b). The spread of and defoliation from hemlock woolly adelgid and elongate hemlock scale, as well as gypsy moths, are monitored throughout DEWA as part of the Eastern Rivers and Mountains Network program to monitor the condition of vegetation communities within the park (NPS 2010j, 8–9). White-nose syndrome has been documented in bats in DEWA. It is likely that outbreaks of these invasive wildlife species may occur in deciduous woodlands in the parks as well as outside the study area to Susquehanna and/or Roseland; such outbreaks are therefore considered likely to occur under the appropriate conditions in appropriate habitats under all alternatives.

SPECIAL-STATUS SPECIES

Special-status species are plants and animals that are legally protected under state regulations and the federal Endangered Species Act of 1973 or other regulations, and that are considered sufficiently rare by the scientific community to qualify for such status. In this section, the presence of federally and state-listed threatened and endangered species and potential habitat to support these species, as well as candidate species and any designated critical habitat (although no critical habitat has been designated within the study area at this time), is described by alternative. Presence data were compiled as a result of agency consultation, the collection of existing electronic data layers, the review of natural resource reports, and the results of field surveys conducted within the project area.

Consultation History: Consultation with the National Oceanic and Atmospheric Administration (NOAA) Fisheries was formally initiated with a letter sent to request information on the potential for the presence of federally listed aquatic species that are endangered, threatened, candidate, or species of concern. Additional information on the presence of designated critical habitat for listed aquatic species was also requested in the consultation letter. NOAA Fisheries responded in a letter dated July 22, 2010, that shortnose sturgeon (*Acipenser brevirostrum*), a federally listed endangered fish species, is the only species known to be present in the project vicinity. NOAA Fisheries further noted that the shortnose sturgeon is present in the Delaware River below Lambertville, New Jersey, more than 90 river miles below DEWA. NOAA Fisheries concluded that because there were no federally listed species within the project area, no further consultation with NOAA Fisheries would be necessary unless project plans or new information became available (NOAA Fisheries 2010).

Responding to initial consultation correspondence, the USFWS provided a list of federally listed species that included Indiana bat (*Myotis sodalis*), bog turtle (*Glyptemys muhlenbergii*), and the freshwater mussel dwarf wedgemussel (*Alasmidonta heterodon*). The plant swamp pink (*Helonias bullata*) was also identified as a federally listed species that could grow in the eastern portions of some of the alternatives outside the study area. USFWS also requested that the bald eagle continue to be considered because of the existence of active bald eagle nests and wintering and foraging habitat within the project area (USFWS 2010b). Responding to follow-up consultation correspondence, the USFWS provided a list of protected species by alternative that may be present within the study area.

Consultations with the Pennsylvania Fish and Boat Commission (PFBC) and the NJDEP Division of Fish and Wildlife were initiated concurrently with NOAA Fisheries and USFWS consultation. PFBC provided information that indicated bog turtle, timber rattlesnake (*Crotalus horridus*), and several state-listed fish and freshwater mussel species are known to be present in portions of the project area. The freshwater mussel and fish species may be in portions of the Middle Delaware River and adjacent drainages within proposed alternative alignments; however, no details on specific species of fish or freshwater mussels were provided. Information on special-status aquatic species that may be present along the alternative alignments in Pennsylvania was developed from county lists provided on the Pennsylvania Natural Heritage Program (PNHP) website. The Pennsylvania Department of Conservation and National Resources (PADCNR) responded with a letter listing a total of 16 plant species and four natural communities (PADCNR 2010b).

New Jersey Endangered and Nongame Species Program (NJENSP) responded with information limited to New Jersey and NPS-owned lands from their species presence area database. Because the proposed routes of the alternative alignments have not been finalized outside the study area, consultation and discussion of species of special status that are present or have the potential to be found outside the study area in New Jersey is limited to state-owned and NPS-owned lands and a database search of species presence in areas that intersect with the proposed ROWs. As a result, special-status species known to be present or having

the potential to be found along the proposed transmission line routes in New Jersey include 3 freshwater mussel, 3 butterfly, 7 reptile and amphibian, 14 bird, and 3 mammal species (NJENSP 2010a).

Initial consultation with federal and state agencies resulted in a compiled list of species known to be present or that have the potential to be found within the project area. Because of the limited ability to develop a special-status species list for areas outside the study area in New Jersey and Pennsylvania, it would be incumbent on the applicant to coordinate with state and federal agencies when a final alternative is chosen.

The following discussion of all special-status species known to be present within the study area is subdivided into aquatic and terrestrial wildlife and terrestrial vegetation. All species that are present or have the potential to be found are listed in the following sections in tables 12 through 20 and are based on existing data from consultation as well as previous surveys and reports. For species that have the potential to be present and have not been observed or otherwise documented, brief descriptions of the life requirements for those species are provided in appendix G.

AQUATIC FEDERALLY AND STATE-LISTED SPECIES

Based on information from DEWA, freshwater mussels within DEWA include eight species, six of which are endangered, threatened, or of special concern in New Jersey or Pennsylvania, including the dwarf wedgemussel, triangle floater (*Alasmidonta undulata*), brook floater (*A. varicosa*), alewife floater (*Anodonta implicata*), creeper (*Strophitus undulatus*), and yellow lampmussel (*Lampsilis cariosa*). All six species are known to be found within DEWA (NPS 2007c). In addition, four fish species that are endangered, threatened, or of special concern in New Jersey or Pennsylvania could also be present within DEWA and/or MDSR. These listed species include bridle shiner (*Notropis bifrenatus*), ironcolor shiner (*Notropis chalybaeus*), eastern mudminnow (*Umbra pygmaea*), and banded sunfish (*Enneacanthus obesus*). No critical habitat for aquatic species has been proposed or designated within the project area.

No other special-status aquatic species have the potential to be found or are known to be present within the proposed alternative alignments based on consultation information provided. The names and designated conservation status of special-status aquatic species that are known to be present or have potential to be found within the study area are presented in table 12. In addition to the species in table 12, sheepnose mussel (*Plethobasus cyphyus*) and rabbitsfoot (*Quadrula cylindrica cylindrica*) are candidate species for federal listing; however, because these species occur in the Allegheny River Basin and not the Delaware River drainage (USFWS 2011a), they are not discussed further.

Dwarf Wedgemussel (*Alasmidonta heterodon*): The dwarf wedgemussel is considered critically imperiled and listed as federally and state (New Jersey and Pennsylvania) endangered. The dwarf wedgemussel is a small freshwater mussel that requires muddy sand, sand, and gravel/pebble substrates in rivers and creeks with slow to moderate currents, good water quality, and little silt deposition (USFWS 1993, 1). Glochidial (larval) host fish include tessellated darter (*Etheostoma olmstedi*), mottled sculpin (*Cottus bairdi*), and juvenile Atlantic salmon (*Salmo salar*) (NJDEP 2002a, 3). The dwarf wedgemussel once lived in 15 major drainage basins along the Atlantic slope, including 3 in New Jersey: the Delaware, Hackensack, and Passaic rivers (NatureServe 2009). There are only four known active dwarf wedgemussel areas remaining in Sussex and Warren counties, New Jersey: Paulins Kill, Pequest River, Flat Brook, and Little Flat Brook (NJDEP 2002a, 2). During consultation, PFBC indicated that several rare mussel species live in the Delaware River within the alignments for alternatives 1, 2, 2b, and 3; however, the species were not identified (PFBC 2010a, 1).

TABLE 12: SPECIAL-STATUS AQUATIC SPECIES IDENTIFIED THROUGH AGENCY CONSULTATION

Species	Federal Status	PA State Status	NJ State Status
Freshwater Mussels			
Dwarf wedgemussel (*Alasmidonta heterodon*)	E	E	E
Triangle floater (*Alasmidonta undulata*)		N	T
Brook floater (*Alasmidonta varicosa*)	SC	E	E
Alewife floater (*Anodonta implicata*)		CU	
Yellow lampmussel (*Lampsilis cariosa*)	SC	CU	T
Creeper (*Strophitus undulatus*)			SC
Fish			
Eastern mudminnow (*Umbra pygmaea*)		C	
Ironcolor shiner (*Notropis chalybaeus*)		E	
Bridle shiner (*Notropis bifrenatus*)		E	
Banded sunfish (*Enneacanthus obesus*)		E	

Source*:* USFWS 2010b, 1; 2010c, 1; PNHP 2010a, 1.

Status Codes: E = endangered, T = threatened, C = candidate; CU = condition undetermined—insufficient data; N = no status—under study for future listing; CP = potential that species is present but no records exist; SC = species of special concern.

Triangle Floater (*Alasmidonta undulata*): The triangle floater is considered vulnerable in Pennsylvania (NatureServe 2009) and has been listed by the state of New Jersey as threatened. This mussel is small with a roughly triangular shape. The triangle floater is a geographically widespread species found from Nova Scotia to Florida. Considered a habitat generalist, the triangle floater can be found in a variety of aquatic habitats and is more tolerant of standing water conditions found in ponds, lakes, and canals than other *Alasmidonta* species. However, it prefers low-gradient rivers with sand and gravel substrates (PNHP 2010a, 1). Triangle floater has a variety of larval host fish species, including blacknose dace (*Rhinichthys atratulus*), longnose dace (*R. cataractae*), fantail darter (*Etheostoma flabellare*), fallfish (*Semotilus corporalis*), common shiner (*Notropis cornutus*), largemouth bass (*Micropt erus salmoides*), pumpkinseed (*Lepomis gibbosus*), slimy sculpin (*Cottus cognatus*), and white sucker (*Ameiurus catus*) (PADCNR 2010c). During consultation, PFBC indicated that several rare mussel species live in the Delaware River within the alignments for alternatives 1, 2, 2b, and 3; however, the species were not identified (PFBC 2010a, 1).

Brook Floater (*Alasmidonta varicosa*): The brook floater is listed as endangered in both Pennsylvania and New Jersey. The brook floater is a small mussel found only in streams and rivers with consistently flowing clean water, where it prefers areas of riffles and substrates with gravel or a mix of sand and gravel. Potential hosts for the brook floater include blacknose dace, longnose dace, golden shiner (*Notemigonus crysoleucas*), pumpkinseed, slimy sculpin, yellow perch (*Perca flavescens*), and margined madtom (*Noturus insignis*) (PADCNR 2010d). In Pennsylvania, this species is known to live in the Middle Delaware River-Mongaup-Brodhead River Watershed and is considered imperiled; in New Jersey it is found in the Delaware River watershed in Morris, Sussex, Somerset, and Warren counties. During consultation, PFBC indicated that several rare mussel species live in the Delaware River within the alignments for alternatives 1, 2, 2b, and 3; however, the species were not identified (PFBC 2010a, 1).

Alewife Floater (*Anodonta implicata*): The status of the alewife floater in under review in Pennsylvania and the species is secure in New Jersey (NatureServe 2009). The alewife floater is an elongate freshwater mussel that is variable in color and may grow up to 7 inches in length. It is found in streams, rivers, ponds, and lakes with a variety of substrates and migratory spawning runs of anadromous clupeids

(herring), especially alewife, a host fish species. The presence of alewife generally determines the range for alewife floater; however, other documented host fish species include white sucker, threespine stickleback (*Gasterosteus aculeatus*), pumpkinseed, and white perch (*Morone americana*) (NatureServe 2009). In Pennsylvania, the alewife floater is known to be present in Luzerne, Monroe, Pike, and Wayne counties. During consultation, PFBC indicated that several rare mussel species live in the Delaware River within the alignments for alternatives 1, 2, 2b, and 3; however, the species were not identified (PFBC 2010a, 1).

Yellow Lampmussel (*Lampsilis cariosa*): The yellow lampmussel, a bright yellow, medium-sized freshwater mussel, is a federal species of special concern. It is considered vulnerable in Pennsylvania (NatureServe 2009) and listed as threatened in New Jersey (NJDEP 2002a, 4). Benthic substrates preferred by the yellow lampmussel consist of sand/silt. The host species for this mussel has not been identified; however, alewife (*Alosa pseudoharengus*) is the suspected host (NJDEP 2002a, 4). The yellow lampmussel prefers large rivers with large watersheds and ranges from Canada to Georgia. In New Jersey, the yellow lampmussel is restricted to the Delaware River (NJDEP 2002a, 4). The NJENSP identified the yellow lampmussel as potentially present along the alignment for alternatives 1, 2, and 2b (NJENSP 2010a, 2). During consultation, PFBC indicated that several rare mussel species live in the Delaware River within the alignments for alternatives 1, 2, 2b, and 3; however, the species were not identified (PFBC 2010a, 1).

Creeper (*Strophitus undulatus*): The creeper is apparently secure in Pennsylvania (NatureServe 2009) and listed as a species of special concern in New Jersey. As a habitat generalist with a wide-ranging distribution, the creeper is found in all drainages of the Delaware River Basin, preferring sand and gravel substrates in low-gradient rivers with low to moderate water flows but tolerating a wide range of habitat conditions. The creeper has a wide range of host fish species. It is often found in association with triangle floater, dwarf wedgemussel, and brook floater. NJENSP identified the creeper as potentially present along the alignment for alternatives 1, 2, and 2b (NJENSP 2010a, 2). During consultation, PFBC indicated that several rare mussel species live in the Delaware River within the alignments for alternatives 1, 2, 2b, and 3; however, the species were not identified (PFBC 2010a, 1).

Eastern Mudminnow (*Umbra pygmaea*): The eastern mudminnow is considered vulnerable in Pennsylvania and considered secure in New Jersey. The eastern mudminnow is known to be present in Luzerne, Pike, and Wayne counties in Pennsylvania; it has been documented in the Middle-Delaware-Mongaup-Brodhead watershed (NatureServe 2009; PNHP 2010b). The eastern mudminnow is found in quiet, mud-bottomed, often heavily vegetated streams, sloughs, swamps, and ponds, where it prefers the margins of sand, mud, and debris where soft substrate is available for burrowing to escape predators. The species is also able to tolerate low levels of oxygen (NatureServe 2009; PNHP 2010b). Fish surveys of the Delaware River and tributaries along the alternative 3 alignment within DEWA from 2004 to 2006 included collection of eastern mudminnow (NPS 2008c).

Bridle Shiner (*Notropis bifrenatus*): In Pennsylvania, bridle shiner is listed as endangered and in New Jersey, it is listed as apparently secure (NatureServe 2009); however, this status is expected to change to imperiled or vulnerable (PNHP 2010c). The bridle shiner is found in mud or detritus bottom pools of vegetated warmwater streams or lakes (PNHP 2010c). A historical record of several bridle shiners shows collections occurred from the Delaware River near the mouth of Van Campen Brook in DEWA (NPS 2008c); however, new specimens were not captured in recent surveys. In Pennsylvania, bridle shiner is known to be present in Monroe County; it has been documented in the Middle-Delaware-Mongaup-Brodhead watershed (NatureServe 2009). Fish inventories conducted in 2004–2006 included collection of bridle shiner in or near the Upper Delaware River and in tributaries and a pond near Flat Brook in DEWA, near the alignment for alternatives 1, 2, and 2b (NPS 2008c, 75).The ironcolor shiner and bridle

shiner have historically been documented in the Cherry Creek watershed near the alignments for alternatives 4 and 5 (USFWS 2008).

Special-status aquatic species analysis are shown in table 13.

TABLE 13: SPECIAL-STATUS AQUATIC SPECIES ANALYSIS BY ALTERNATIVE WITHIN THE STUDY AREA

Special-status Species	Alternatives					
	1	2	2b	3	4	5
Aquatic Species						
Freshwater mussels	X	X	X	X	—	—
Bridle shiner	X	X	X	—	—	—

X = species is known to be present or could be found based on presence of habitat.
— = species is not likely to be present based on absence of habitat.

Outside the study area in Pennsylvania, the proposed S-R Line could pass through Carbon, Lackawanna, Luzerne, Monroe, Pike, Northampton, and Wayne counties and could cross several tributaries to the Delaware River and Susquehanna River. PFBC did not specify the location of any known presence of special-status aquatic species but noted that state-listed species of freshwater mussels have been found in the Delaware River and a state-endangered fish in Marshalls Creek (PFBC 2010a, 1). The USFWS indicated that the dwarf wedgemussel has been recorded in the Delaware River outside the proposed study area (USFWS 2010b, 4).

Outside the study area in New Jersey, the S-R Line could traverse Warren, Sussex, and Morris counties and could cross several tributaries to the Delaware and Passaic rivers. NJENSP identified the presence of yellow lampmussel, creeper, and triangle floater within state land (NJENSP 2010a, 3). Consultation with the USFWS indicated that the dwarf wedgemussel is known to be present in the Pequest River, which could be intersected by the proposed S-R Line (USFWS 2010b, 4). Paulins Kill is also known to provide habitat for the dwarf wedgemussel. NOAA Fisheries identified a population of endangered shortnose sturgeon in the Delaware River downstream of Lambertville, New Jersey (NOAA Fisheries 2010, 1).

FEDERALLY AND STATE-LISTED TERRESTRIAL WILDLIFE SPECIES

The study area provides a diversity of topography and habitat that in turn provides life requirements for a diversity of terrestrial wildlife species, including special-status species. Special-status terrestrial wildlife species that are known to be present or have the potential to be present as determined through agency consultation are discussed in this section and listed in table 14. In addition to the species listed in table 14, red knot (*Calidris canutus rufa*) and eastern Massasauga rattlesnake (*Sistrurus catenatus catenatus*) are candidate species for federal listing. However, the eastern Massasauga rattlesnake is only known to occur in Butler, Crawford, Mercer and Venango Counties, Pennsylvania (USFWS 2011a) and the red knot is not known to occur in the study area and was not observed during surveys in 2010 and 2011. Therefore, the eastern Massasauga rattlesnake and the red knot are not discussed further.

TABLE 14: SPECIAL-STATUS WILDLIFE SPECIES IDENTIFIED THROUGH AGENCY CONSULTATION

Species	Federal Status	PA State Status	NJ State Status
Invertebrates			
Arogos skipper (*Atrytone arogos arogos*)	SC		E
Mitchell's satyr (*Neonympha mitchellii mitchellii*)	E		E
Cobblestone tiger beetle (*Cicindela marginipennis*)	SC		
Superb jewelwing (*Calopteryx amata*)			T
Harpoon clubtail (*Gomphus descriptus*)			T
Kennedy's Emerald (*Somatochlora kennedyi*)			T
Gray petaltail (*Tachopteryx thoreyi*)			E
Brook snaketail (*Ohpiogomphus asperses*)			T
Birds			
Great blue heron (*Ardea herodias*)			SC[a]
Osprey (*Pandion haliaetus*)		T	T[a]
Bald eagle (*Haliaeetus leucocephalus*)		T	E[a]/T[b]
Northern harrier (*Circus cyaneus*)			E[a]
Cooper's hawk (*Accipiter cooperii*)			SC[a]
Northern goshawk (*Accipiter gentilis*)			E[a]
Red shouldered hawk (*Buteo lineatus*)			E[a]
Peregrine falcon (*Falco peregrinus*)		E	E[a]
American kestrel (*Falco sparverius*)			T
Barred owl (*Strix varia*)			T
Short-eared owl (*Asio flammeus*)			E[a]
Long-eared owl (*Asio otus*)			T
Cliff swallow (*Petrochelidon pyrrhonota*)			SC[a]
Veery (*Catharus fuscescens*)			SC[a]
Golden-winged warbler (*Vermivora chrysoptera*)	SC		E[a]/SC[b]
Black-throated green warbler (*Dendroica virens*)			SC[a]
Cerulean warbler (*Dendroica cerulea*)			SC
Vesper sparrow (*Pooecetes gramineus*)			E[a]
Horned lark (*Eremophila alpestris*)			T[a]
Reptiles and Amphibians			
Bog turtle (*Glyptemys muhlenbergii*)	T	E	E
Wood turtle (*Clemmys insculpta*)			T
Eastern box turtle (*Terrapene carolina carolina*)			SC
Northern copperhead (*Agkistrodon contortrix mokasen*)			SC
Timber rattlesnake (*Crotalus horridus horridus*)		C	E
Northern fence lizard (*Sceloporus undulatus*)		SC	
Blue-spotted salamander (*Ambystoma laterale*)		E	E

Species	Federal Status	PA State Status	NJ State Status
Longtail salamander (*Eurycea longicauda*)			T
Mammals			
Bobcat (*Lynx rufus*)			E
Indiana bat (*Myotis sodalis)*	E	E	E
Small-footed bat (*Myotis leibii*)	SC	T	
Northern myotis (*Myotis septentrionalis*)	SC	SC	

Status Codes*:* E = endangered; T = threatened; C = candidate; SC = species of special concern.

[a] Breeding population

[b] Non-Breeding population

Invertebrate Species

Arogos skipper (*Atrytone arogos arogos*): The Arogos skipper is state listed by New Jersey as endangered and is a federally listed as a species of special concern. This butterfly species inhabits xeric to dry–mesic grasslands containing its host plant, little bluestem (*Schizachyrium scoparius*), in the northern portion of New Jersey. The Arogos skipper can be difficult to identify due to its resemblance to the more abundant Delaware skipper (*Anatrytone logan*) (NJDFW 2010a). The habitat requirements for Arogos skipper include fallow agricultural fields and little bluestem communities, which are typically found in power line ROWs. There are no fallow agricultural fields in the study area, but actively farmed agricultural fields that could support this species are found along all of the alternative alignments. The specific community described as Northern Appalachian acidic rocky summit/little bluestem/Pennsylvania sedge opening, which could support the arogos skipper, does not exist within DEWA along the alignment for alternatives 1, 2, and 2b (Mellon 2010a). In contrast, vegetation mapping of DEWA presents sparsely forested lands that includes a community of little bluestem beyond APPA along the alignment for alternatives 1, 2, and 2b (PNHP 2006) that could support the Arogos skipper. An invertebrate survey of the alignment for alternatives 1, 2, and 2b did not note observations of the Arogos skipper but stated that the alternative 1, 2, and 2b alignment may serve as a migratory and movement corridor for invertebrates, including butterflies, due to the linear nature of the clearing along the ROW (EcolSciences 2009a). Therefore, alternatives 1, 2, and 2b could potentially provide habitat for the Arogos skipper. Suitable habitat is not found along the alignments for alternatives 3, 4, and 5; however, the ROWs could serve as migratory corridors for Arogos skipper. Even so, Arogos skipper is unlikely to occur along the alignments for alternatives 3, 4, and 5.

Mitchell's satyr (*Neonympha mitchellii mitchellii*): Mitchell's satyr is a federally endangered and New Jersey State listed butterfly that has historically been found from New Jersey to Michigan and Indiana. Habitat loss and pesticides have contributed to the decline of Mitchell's satyr (USFWS 2010d). Today, Mitchell's satyr is extirpated from New Jersey and is currently restricted to a few locations in Michigan and Indiana. Suitable fen habitat exists in Pennsylvania and New Jersey, but Mitchell's satyr is not known to be present in these states (USFWS 2010d). Specifically, suitable habitat exists along the alignment for alternatives 1, 2, and 2b. An invertebrate survey of the corridor for alternatives 1, 2, and 2b did not note observations of Mitchell's satyr but stated that the alignment for alternatives 1, 2, and 2b may serve as a migratory and movement corridor for invertebrates, including butterflies, due to the linear nature of the clearing along the ROW (EcolSciences 2009a). Therefore, alternatives 1, 2, and 2b could potentially provide habitat for the Mitchell's satyr. Suitable habitat is not found along the alignments for alternatives 3, 4, and 5; however, the ROWs could serve as migratory corridors for Mitchell's satyr. Even so, Mitchell's satyr is unlikely to occur along the alignments for alternatives 3, 4, and 5. Special-status invertebrate species analyses are shown in table 15.

TABLE 15: SPECIAL-STATUS INVERTEBRATE SPECIES ANALYSIS BY ALTERNATIVE WITHIN THE STUDY AREA

Special-status Species	Alternatives					
	1	2	2b	3	4	5
Invertebrate Species						
Arogos skipper	X	X	X	—	—	—
Mitchell's satyr	X	X	X	—	—	—

X = species is known to be present or could be found based on presence of potential habitat.

— = species is not likely to be present based on absence of potential habitat, even though ROWs in general can serve as migratory corridors.

Bird Species

Great Blue Heron (*Ardea herodias*): The great blue heron is listed by New Jersey as a species of concern but only for the breeding population. The great blue heron is the most widespread heron species in North America and relies on both freshwater and saltwater environments, where it can be found along the edge of inland bodies of water and along seacoasts. This species generally nests in colonies but occasionally nests in lone pairs and constructs stick nests in trees and occasionally on the ground. Foraging occurs mainly in water and food items consist mostly of fish and other invertebrates; peak activity occurs before dawn and at dusk (Terres 1991, 499). The great blue heron could be found almost anywhere in the study area where preferred habitat is found. Wetlands within the ROW for alternatives 1, 2, and 2b provide breeding and nesting habitat for the great blue heron. Forested and emergent wetland areas as well as riparian areas adjacent to the Delaware River are present along the alignments for alternatives 1, 2, 2b, and 3 and provide breeding and nesting habitat for the great blue heron. A great blue heron rookery is on Hogback Ridge near the alternative 1, 2, and 2b alignment. This species was observed along the alignments for alternatives 1, 2, 2b, and 3 (NPS 2011b, PSE&G 2010a), and, during consultation, NJENSP indicated that the great blue heron is known to be present along the alignments for alternatives 1, 2, 2b, and 3 (NJENSP 2010a, 2).

Osprey (*Pandion haliaetus*): The osprey is currently listed in New Jersey as a threatened species (the breeding population only) and is listed in Pennsylvania as threatened. The species was listed in New Jersey in 1974 when dichlorodiphenyltrichloroethane (DDT) and habitat loss caused population declines. In 1979, biologists in New Jersey began an osprey reintroduction program. Populations have slowly increased since then, and in 1985, the osprey was downlisted from endangered to threatened (NJDFW 2010b). The osprey feeds solely on fish and is found near bodies of water that support adequate fish populations, usually rivers, marshes, bays, and lakes. Nesting can occur on almost any structure near available fish foraging areas. Potential habitat for the osprey is found along the alignments for alternatives 1, 2, 2b, and 3, and osprey were observed along the alignment for alternatives 1, 2, and 2b in New Jersey (PSE&G 2010a).

Bald Eagle (*Haliaeetus leucocephalus*): The bald eagle is currently state-listed by Pennsylvania as threatened, by New Jersey as endangered for the breeding population, and threatened for the non-breeding population. The bald eagle was originally listed as endangered in New Jersey in 1974, in Pennsylvania in 1978, and was listed federally in the lower 48 states in 1978. The decline in bald eagle populations was mostly due to the use of DDT, which was assimilated by bald eagles during feeding. DDT ultimately caused eggshell thinning, resulting in poor reproductive success, and subsequent population decline. The federal government banned DDT several years before listing the bald eagle, and since then bald eagle numbers have increased. The bald eagle was removed from federal listing in 2007, although it is still protected by the Migratory Bird Treaty Act and Bald Eagle and Golden Eagle Protection Act. The number

of nests and fledglings has grown steadily in New Jersey and Pennsylvania since its listing. Protection, restrictions on pesticide use, and recovery efforts have been successful.

The bald eagle is found throughout North America. Ideal habitat includes areas with clean water and undisturbed land with large trees in which individuals roost, perch, and nest. This species prefers undisturbed areas near large lakes and reservoirs, marshes and swamps, or stretches along rivers where it can find open water for foraging. The bald eagle generally nests near coastlines, rivers, and large lakes where there is an adequate food supply. This species nests in mature or old growth trees, snags (dead trees), cliffs, and rock promontories. In forested areas, the bald eagle often selects the tallest trees with limbs strong enough to support a nest. Nest sites typically include at least one perch with a clear view of the water where individuals forage, because they are visual hunters. Recently, and with increasing frequency, this species has been nesting on artificial structures, such as power poles and communication towers (USFWS 2010e). The bald eagle begins migrating southward in the fall to areas where water remains open and food resources are typically reliable. This species is territorial during breeding season, but wintering individuals often congregate at communal roost trees at night. The same roost trees are often used for several years. Roost locations are often protected from the wind by vegetation or terrain and communal roosting may help eagles find food in the winter (USFWS 2010e).

The bald eagle is known to nest, roost, and forage along the Delaware River. Individuals have been using the Delaware River in DEWA as a wintering area since the late 1970s. Studies indicate that 15 to 20 bald eagles spend the winter in DEWA with additional migrants bolstering their numbers during periods of harsh winter weather. Over 50 individual bald eagles were recorded in DEWA during the 2010 Annual Midwinter Bald Eagle Survey. Research in the 1980s and early 1990s identified two communal winter night roosts within DEWA. Individuals are known to roost in riparian habitat along the Delaware River, and the alignment for alternatives 1, 2, and 2b bisects an important communal wintering eagle roost (USFWS 2010b). No other communal winter roost sites for bald eagles have been documented in the southern portion of DEWA. Surveys conducted in 2010 indicated that this night roost was still being used by large numbers of eagles. The first observations of bald eagles attempting to nest in DEWA were in 1999, and the first successful nesting was recorded in 2002. One successful nest was recorded in 2003 and 2004, approximately 2 miles upstream of the alignment for alternatives 1, 2, and 2b. The nest tree was felled by a winter storm in 2005, and the new nest site for this pair has not been found (NPS 2006b, 41). The USFWS stated in a 2010 letter that several active bald eagle nests exist along the alignment for alternatives 1, 2, and 2b (USFWS 2010b, 5). In addition, there is the potential for inactive or alternate nests (not used for breeding by eagles in a given breeding season) (USFWS 2007a, 17). USFWS also indicated that an active bald eagle nest is within 0.2 mile of the alternative 3 alignment (USFWS 2010b, 5). NJENSP indicated during consultation that bald eagles are known to be found along the alignment for alternatives 1, 2, and 2b (NJENSP 2010a, 2). All the alternatives cross foraging habitat mapped by the NJDEP Landscape Project (USFWS 2010b, 5). A bald eagle was observed along the alignment for alternatives 1, 2, and 2b in New Jersey (PSE&G 2010a).

Northern Harrier (*Circus cyaneus*): The breeding population of the northern harrier is listed in New Jersey as an endangered species. The northern harrier inhabits tidal marshes, emergent wetlands, fallow fields, grasslands, meadows, airports, and agricultural areas. Nesting occurs in brackish or saline marshes among the high marsh in salt hay (*Spartina patens*), marsh elder (*Iva frutescens*), or reed grass (*Phragmites australis*) or in freshwater tidal marshes that contain phragmites, sedges (*Carex* spp.), or other emergent wetland plants. Foraging occurs over much the same habitat, with males venturing out farther in search of food (NJDFW 2010c). Foraging habitat for migratory and resident northern harriers may be present in or along the alignments for alternatives 1, 2, 2b, and 3.

Cooper's Hawk (*Accipiter cooperii*): The Cooper's hawk is listed in New Jersey as a species of special concern. This species is considered an uncommon hawk from southern Canada over most of the United

States south to Florida and Texas. The Cooper's hawk inhabits a wide variety of woodland types, favoring extensive deciduous, coniferous, and mixed forests, and conifer plantations for nesting; this species is also found in suburban and urban habitats. In northern New Jersey, pine plantations appear to be favored nesting sites. Forest edge habitat is an important component of their home range for breeding pairs and may serve as primary hunting sites. In the breeding season, the home range of the Cooper's hawk is estimated at 990 to 4,450 acres (400 to 1,800 hectares). Cooper's hawks have been observed along the alignments for alternatives 1, 2, 2b, and 3 (NPS 2011b; PSE&G 2010a); in addition, potential habitat for the Cooper's hawk has been identified along the alignments for alternatives 3, 4, and 5. NJENSP indicated during consultation that the Cooper's hawk is present along the alignment for alternative 3 in New Jersey (NJENSP 2010a, 2).

Northern Goshawk (*Accipiter gentilis*): The northern goshawk is listed as endangered for the breeding population in New Jersey. The northern goshawk nests in mature, contiguous forests that may be dominated by coniferous, deciduous, or mixed canopy tree species and that include large trees, a closed canopy, and an open understory. Nests may be in either deciduous or coniferous trees, although deciduous trees are used more frequently by goshawks nesting in New Jersey. Breeding territories are preferentially selected in areas where individuals are protected from human activity and development. In the Highlands region of New Jersey and New York, northern goshawk nests were, on average, more than 3,280 feet (1,000 meters) from paved roads or areas of human habitation (NJDFW 2010d). Nests are constructed in a crotch in the lower canopy layer of a large, canopy-sized tree, such as an American beech, black birch, oak, maple, white pine, red pine, or hemlock (EcolSciences 2010b, 1–3). Individuals have been observed along the alignment and/or access roads for alternatives 1, 2, and 2b in New Jersey (PSE&G 2010a); in addition, potential habitat for the northern goshawk has been identified along the alignments for alternatives 3, 4, and 5. The New Jersey Landscape Project identified potential habitat along the alignments for alternatives 1, 2, 2b, and 3 (Niles et al. 2008).

Red shouldered Hawk (*Buteo lineatus*): The red shouldered hawk is listed as endangered for breeding populations in New Jersey. This species inhabits moist woodlands, swamps, and wooded riparian areas. Individuals generally avoid human influences, nesting away from residences, roads, and development. The red shouldered hawk prefers large tracts of forest, between 250 acres and 620 acres. During the nonbreeding season, this species occupies smaller forested tracts (NJDFW 2010e). Pairs maintain the same nesting territory for many years (Terres 1991, 483–484). This species has been observed within the alignments for alternatives 1, 2, 2b, 4, and 5 (NPS 2011b; PSE&G 2010a); in addition, potential habitat for red shouldered hawk has been identified along the alignments for alternatives 3, 4, and 5. The red shouldered hawk is listed in New Jersey as endangered, and NJENSP indicated during consultation that the red shouldered hawk is present along the alignment for alternative 3 in New Jersey (NJENSP 2010a, 2). The New Jersey Landscape Project identified potential habitat along the alignments for alternatives 1, 2, 2b, and 3 (Niles et al. 2008).

Peregrine falcon (*Falco peregrinus*): The peregrine falcon is listed in both New Jersey (only breeding populations) and Pennsylvania as an endangered species. This species prefers open areas such as marshes, beaches, and open water for foraging, and cliffs and rock outcrops for nesting. The peregrine falcon was listed as endangered federally in 1970, in Pennsylvania in 1972, and in New Jersey in 1974 (NJDEP n.d.; PGC 2009). The decline of the peregrine falcon in North America is attributed to egg collectors, falconers, loss of habitat, and the use of DDT. This species was removed from the federal endangered species list in 1999 (NJDEP n.d.). Recent nesting attempts have been recorded near the alignments for alternatives 4 and 5 and suitable foraging habitat exists along all alignments.

American kestrel (*Falco sparverius*): The American kestrel is currently listed as state threatened in New Jersey. The American kestrel is the smallest falcon in North America occupying large open areas with short vegetation. The kestrel is often attracted to human altered or managed areas such as farmland,

parkland, and livestock pastures. Females tend to use similar habitats during the non-breeding and overwintering season; however, male kestrels typically occupy more forested areas during this period. Kestrels hunt for insects and small vertebrates from perches including branches and utility lines. American kestrels use cavities in trees facing open areas that are either naturally occurring or excavated by woodpeckers for nests. Lack of suitable nesting is one reason for the decline of American kestrels (NJDFW n.d.a, 1-3). American kestrels are breeding summer residents within the parks; however, they were not observed along the alignments for the proposed alternatives during field surveys. Potential habitat for this species occurs within alternatives 1, 2, 2b, and 3.

Barred Owl (*Strix varia*): New Jersey listed barred owls as threatened in 1979. The barred owl is typically found in remote wetland forests with an open understory. In northern New Jersey, this species inhabits hemlock ravines, mixed deciduous wetlands, and oak hardwood forests. Resident individuals establish territories that they defend year-round. Populations of barred owls are currently declining due to development and fragmentation of forests (NJDFW 2010f). The barred owl is known to use a nest site for many years and maintain a territory of approximately 1 square mile throughout the year, relocating when food resources become scarce (Terres 1991, 664–665). This species has been observed in the alignment for alternatives 1, 2, and 2b (NPS 2011b; PSE&G 2010a); in addition, potential habitat for the barred owl has been identified along the alignments for alternatives 3, 4, and 5. NJENSP indicated during consultation that the barred owl is present along the alignments for alternatives 1, 2, 2b, and 3 in New Jersey (NJENSP 2010a, 2). The New Jersey Landscape Project identified potential habitat along the alignments for alternatives 1, 2, 2b, and 3 (Niles et al. 2008).

Short-eared owl (*Asio flammeus*): The breeding population of short-eared owls is listed as an endangered species in New Jersey. The short-eared owl is typically found in large open areas including fallow fields, hay fields, grasslands, and sedge meadows. The short-eared owl occupies similar habitats year round. Wintering roosts are formed on the ground within open areas and are occasionally shared with long-eared owls (*Asio otus*). Short-eared owls are also found to inhabit coastal tidal and brackish marsh areas where they roost, forage, or nest in the drier portions of the marsh (NJDFW n.d.b, 1-2). This species is often found sharing foraging and roosting habitat with Northern harriers during the winter. The short-eared owl was not observed during field surveys along the alignments for the proposed alternatives; however, short-eared owls are likely winter residents or transient throughout the park. Potential habitat for this species occurs along the alignments for alternatives 1, 2, 2b, and 3.

Veery (*Catharus fuscescens*): The veery breeding population is listed in New Jersey as a species of special concern. The veery is a species in the thrush family that inhabits damp, deciduous forests and riparian habitats, where it forages for insects on the forest floor. Nesting occurs on the ground or in shrubs close to the ground (Cornell 2009). This species has been observed within the alignment and/or access roads for alternatives 1, 2, and 2b in New Jersey (PSE&G 2010a); in addition, potential habitat for the veery has been identified along the alignments for all alternatives. During consultation, NJENSP identified the veery as present along the alignment for alternatives 1, 2, and 2b (NJENSP 2010a, 2). The New Jersey Landscape Project identified potential habitat along the alignments for alternatives 1, 2, 2b, and 3 (Niles et al. 2008).

Golden-winged Warbler (*Vermivora chrysoptera*): The USFWS is conducting a status review of the golden-winged warbler in response to a petition to list this species under the Endangered Species Act. The golden-winged warbler is also state listed in New Jersey as a species of special concern for the non-breeding population. The breeding population in New Jersey is listed as endangered. The golden-winged warbler prefers early successional habitats of patchy scrub shrub or along the forest edge, constructing nests near the ground or on the ground. Foraging occurs in a similar habitat but in the upper half of nearby trees and shrubs. It is believed that populations are declining because of loss of early successional habitat due to reforestation and hybridization with the blue-winged warbler (Cornell 2009). The golden-winged

warbler has been identified by NJENSP as potentially present along the alignment for alternatives 1, 2, and 2b (NJENSP 2010a, 2) and the New Jersey Landscape Project has identified potential habitat for the golden-winged warbler along the alignments for alternatives 1, 2, 2b, and 3 (Niles et al. 2008); potential habitat could also be present along the alignments for alternatives 4 and 5.

Black-throated Green Warbler (*Dendroica virens*): The black-throated green warbler breeding population is listed in New Jersey as a species of special concern. The black-throated green warbler breeds from east-central British Columbia and Manitoba to central Ontario and Newfoundland south to Pennsylvania and northern New Jersey, as well as along the Appalachians to Georgia. General habitat includes large stands of mature open mixed woodlands (especially northern hardwood/hemlock stands), northern coniferous forests, and larch bogs (DeGraaf and Rappole 1995, 428–429). Overall populations appear to be stable; however, logging of coniferous forests negatively affects the species (Cornell 2009). This species has been observed in the alignment and/or access roads for alternatives 1, 2, and 2b in New Jersey (PSE&G 2010a); in addition, potential habitat for the black-throated green warbler has been identified along the alignments for alternatives 1, 2, 2b, and 3 by the New Jersey Landscape Project (Niles et al. 2008), and potential habitat could also be present along the alignments for alternatives 4 and 5. During consultation, NJENSP identified the presence of this species along the alignment for alternatives 1, 2, and 2b (NJENSP 2010a, 2).

Cerulean Warbler (*Dendroica cerulea*): The cerulean warbler is listed in New Jersey as a species of special concern. This species prefers extensive (generally at least 620 acres) mature floodplain and bottomland forests and shaded, mature upland woods with sparse understories and tall trees (DeGraaf and Rappole 1995, 442–443). Within the Delaware River area, this species tends to use mature deciduous stands of oaks, tulip poplar, and sycamores as its prime habitat. An extension of the Delaware River population has colonized the Stokes State Forest, High Point State Park, the Flatbrook-Roy Wildlife Management Area, and the Walpack Wildlife Management Area. The cerulean warbler is also found in isolated spots in forested dry ridgetops, often associated with forest openings, although use is infrequent and singing males are more scattered from each other than in habitat used along riparian corridors (Rosenberg, Barker, and Rohrbaugh 2000, 30–32, 38–39). This warbler is sensitive to habitat fragmentation and is declining throughout its range (DeGraaf and Rappole 1995, 442–443). The cerulean warbler is a common breeder along the riparian corridor of the Delaware River on both Pennsylvania and New Jersey sides of the river from the Delaware Gap north to Port Jervis, New York (Rosenberg, Barker, and Rohrbaugh 2000, 30). As a result, the cerulean warbler has the potential to be present within the alignments for all alternatives near the Delaware River and along upland ridges for all proposed alternatives. This species has been observed in the alignment and/or access roads for alternatives 1, 2, and 2b in New Jersey (PSE&G 2010a); in addition, potential habitat for the cerulean warbler has been identified along the alignments for all alternatives. During consultation, NJENSP identified the presence of cerulean warbler along the alignment for alternatives 1, 2, and 2b (NJENSP 2010a, 2).

Vesper sparrow (Pooecetes gramineus): The breeding population of the vesper sparrow is state-listed as endangered in New Jersey. Vesper sparrow habitats are typically sparsely vegetated with patches of bare ground, low vegetation, and scattered shrubs. This species can be found in cultivated fields, grasslands, and pastures. Farmed areas adjacent to fallow fields provide nesting habitat, cover, foraging sites, and singing perches, and are considered preferred habitat for this species (CWFNJ 2012, 1-2). This species typically breeds in the inner Coastal Plain of South New Jersey and the Piedmont, Highlands, and Ridge and Valley regions of northern and central New Jersey. Nesting occurs in the north-west area of the state. This species could occur within the parks during the summer breeding season, but they are more likely found in migration as transient in open areas of mowed grasslands. The vesper sparrow was not observed along the alignments for the proposed alternatives during field surveys; however, potential habitat does occur along the alignments for alternatives 1, 2, 2b, and 3.

Horned lark (*Eremophila alpestris*): The breeding population of the horned lark is state-listed as threatened in New Jersey. The horned lark is a small songbird occurring in open habitats with short, sparse grasses and wildflowers, bare ground, and few shrubs. As vegetation grows thicker, the horned lark is known to abandon sites quickly. Females build nests in small depressions on the bare ground next to clusters of grass or other plants with egg-laying beginning in February (CWFNJ 2012, 1-2). This species is known to occur in the parks; however, the horned lark was not observed along the alignments for the proposed alternatives during field surveys. Potential habitat for the horned lark occurs along the alignments for alternatives 1, 2, 2b, and 3.

Special-status bird species analysis are shown in table 16.

TABLE 16: SPECIAL-STATUS BIRD SPECIES ANALYSIS BY ALTERNATIVE WITHIN THE STUDY AREA

Special-status Species	Alternatives					
	1	2	2b	3	4	5
Bird Species						
Great blue heron	X	X	X	X	—	—
Osprey	X	X	X	X	—	—
Bald eagle	X	X	X	X	X	X
Northern harrier	X	X	X	X	—	—
Cooper's hawk	X	X	X	X	X	X
Northern goshawk	X	X	X	X	X	X
Red shouldered hawk	X	X	X	X	X	X
Peregrine falcon	X	X	X	X	X	X
American kestrel	X	X	X	X		
Barred owl	X	X	X	X	X	X
Short-eared owl	X	X	X	X		
Veery	X	X	X	X	X	X
Golden-winged warbler	X	X	X	X	X	X
Black-throated green warbler	X	X	X	X	X	X
Cerulean warbler	X	X	X	X	X	X
Vesper sparrow	X	X	X	X		
Horned lark	X	X	X	X		

X = species is known to be present or has potential to be found based on presence of habitat.
— = species is not likely to be present based on absence of habitat.

Reptile and Amphibian Species

Bog Turtle (*Glyptemys muhlenbergii*): The bog turtle is listed as endangered in Pennsylvania and New Jersey. The bog turtle is one of smallest turtles in North America and is separated taxonomically into two geographically distinct populations. The federally threatened northern population ranges from Massachusetts to Maryland and is found in the intermountain valleys and rolling hills of the Piedmont Physiogeographic Province, occupying suitable wetland habitat that is often found as transitional strips between drier upland areas and more thickly vegetated, wetter, wooded swamp or marsh. As a result, the wetland areas are a mosaic of microhabitats that include dry pockets, saturated areas, and periodically flooded areas. Seeps or spring-fed emergent wetlands associated with streams, often at or near the

headwaters of streams or small tributaries, are the bog turtle's primary habitat. The diversity of microhabitats provides this species with areas for foraging, nesting, basking, hibernation, shelter, and other needs. Individuals also use more densely vegetated areas for hibernation. Unlike other turtle species, the bog turtle's range is small, with the turtles rarely leaving the marsh for upland foraging. In a survey of 200 colonies, most habitat areas were found to be less than 2 acres (EcolSciences 2010c). The bog turtle is highly susceptible to habitat loss, degradation, and fragmentation. Individuals were formerly known to be present in 18 counties in New Jersey and 17 in Pennsylvania; they now are found in 13 in New Jersey and 14 in Pennsylvania. Most are found in the Delaware and Susquehanna river watersheds (USFWS 2001, 11, 12). DEWA is part of the Delaware Recovery Unit for the bog turtle, which includes the following minimum, long-term protection measures (USFWS 2001):

- The habitat areas used by a population are under conservation management and are protected against adverse effects (e.g., wetland draining, ditching, filling or excavation; drawdown by water supply wells; pollution from point and non-point sources; succession to woody vegetation; invasive plant species), and

- Recharge areas and buffer zones are protected by conservation to prevent adverse hydrological alterations (such as stream diversions, mining, wells, roads, and impervious surfaces).

Projects in and adjacent to bog turtle habitat can cause habitat destruction, degradation, and fragmentation. Therefore, bog turtle conservation zones have been designated with the intent of protecting and recovering known bog turtle populations within the northern range of this species. The conservation suggestions for each zone guide the evaluation of activities that may affect high-potential bog turtle habitat, potential travel corridors, and adjacent upland habitat that may serve to buffer bog turtles from indirect effects. The following bog turtle zones have been described in the recovery plan for this species (USFWS 2001, A-1 through A-3):

- **Zone 1**: includes the wetland and visible spring seeps occupied by bog turtles. Bog turtles rely upon different portions of the wetland at different times of year to fulfill various needs; therefore, this zone includes the entire wetland (the delineation of which will be scientifically based), not just those portions that have been identified as, or appear to be, optimal for nesting, basking or hibernating. In this zone, bog turtles and their habitat are most vulnerable to disturbance; therefore, the greatest degree of protection is necessary.
- **Zone 2**: The boundary of this zone extends at least 300 feet from the edge of Zone 1 and includes upland areas adjacent to Zone 1. Activities in this zone could indirectly destroy or degrade wetland habitat over the short or long-term, thereby adversely affecting bog turtles. In addition, activities in this zone have the potential to cut off travel corridors between wetlands occupied or likely to be occupied by bog turtles, thereby isolating or dividing populations and increasing the risk of turtles being killed while attempting to disperse.
- **Zone 3**: includes upland, wetland, and riparian areas extending either to the geomorphic edge of the drainage basin or at least one-half mile beyond the boundary of Zone 2. Despite the distance from Zone 1, activities in these areas have the potential to adversely affect bog turtles and their habitat. This particularly applies to activities affecting wetlands or streams connected to or contiguous with Zone 1, because these areas may support undocumented occurrences of bog turtles and/or provide travel corridors.

In January 2012, a Phase I bog turtle habitat suitability assessment was performed within eight separate wetland complexes: wetlands 3, 4, 5, 6, 8, and 10 along alternative 3, and wetlands 1 and 2 along alternatives 4 and 5. Hydrology, soils, and vegetation were assessed within the project ROW to determine habitat suitability. The result of the Phase I bog turtle habitat suitability assessment concluded that wetlands

3, 4, 5, 6, and 8 of alternative 3 and wetlands 1 and 2 of alternatives 4 and 5 do not contain either the necessary hydrology, soils, and/or vegetation to support the bog turtle. Wetland 10 of alternative 3 does contain suitable hydrology, soils, and vegetation to support the bog turtle. Although suitable, the existence of a dense monoculture of common reed in portions of wetland 10 and sporadic areas underlain by cobble contribute to reduce the habitat value for the bog turtle within this wetland. However, wetland 10 is connected to wetlands outside of the proposed ROW area that may have the potential to host the bog turtle, which renders wetland 10 part of an interconnected habitat mosaic (NPS 2012a, 12).

During consultation, agencies stated that the bog turtle is present in wetlands along the alignment for alternatives 1, 2, and 2b and that potential habitat is found along the alignments of alternatives 1, 2, 2b, and 3 inside the study area (USFWS 2010b; PFBC 2010a, 1). Future coordination with appropriate federal and state agencies would clarify the extent to which adverse effects to listed species would be likely to occur and would determine whether a biological assessment (BA) would be required.

Wood Turtle (*Glyptemys insculpta*): The wood turtle is listed in New Jersey as threatened. The wood turtle uses habitats that include both wetlands and uplands. Aquatic habitats are required for mating, feeding, and hibernation, while terrestrial habitats are used for egg laying and foraging. Freshwater streams, brooks, creeks, or rivers with good water quality within undisturbed uplands such as fields, meadows, or forests are preferred habitat areas. Open fields and thickets of alder (*Alnus* spp.), greenbrier, or multiflora rose are favored basking habitats. Lowland, mid-successional forests dominated by oaks, black birch, and red maple may also be used (NJDEP 2010a, 1). This species may also be found on abandoned railroad beds or agricultural fields and pastures (NJDEP 2010a, 1). During consultation, NJENSP identified the presence of wood turtles along the alignment for alternatives 1, 2, and 2b (NJENSP 2010a, 2). The New Jersey Landscape Project identified habitat for the wood turtle along the alignments for alternatives 1, 2, 2b, and 3 (Niles et al. 2008). Individuals were observed along the alignment for alternatives 1, 2, and 2b (NPS 2011b; PSE&G 2010a).

A multi-phased wood turtle study within the proposed ROW for alternative 2 was conducted in 2010 and 2011. During the study, numerous wood turtles and wood turtle hibernacula, nesting sites, and foraging habitat were observed within the proposed ROW. Surveys included opportunistic searches, which resulted in the capture of 17 wood turtles within the proposed ROW. Ten additional wood turtles were captured within 2,000 feet of the proposed ROW (EcolSciences 2011, 4). To document the movement of adult wood turtles within the proposed ROW along alternative 2, a radio-telemetry survey was conducted from June 2010 through September 2011. Turtles used locally available habitats including upland hardwood forests, upland conifer forests, forested, scrub shrub, and emergent wetlands, stream corridors, riparian areas, and successional fields. Five of the ten wood turtles tracked were initially captured in or confirmed to use or cross the proposed ROW for alternative 2 (EcolSciences 2011, 4). Six wood turtles were tracked during the winter of 2010 and 2011 to evaluate the presence of hibernacula within the proposed ROW. Five of the tracked turtles used locations upstream of the proposed ROW and one turtle used a location downstream and adjacent to the proposed ROW (EcolSciences 2011, 5). The tracked turtle hibernated within the channel of a stream or under banks, roots, logjams, or rock structures within a stream. In the spring of 2011, the proposed ROW for alternative 2 was surveyed for suitable wood turtle nesting habitat. Three suitable nest sites were identified within the vicinity of the proposed ROW and included upland soil berms within the ROW, successional fields, and dry portions of the channel and banks along a stream. Wood turtle hatchlings were tracked using radio telemetry and were found to use the proposed ROW and adjacent habitats for dispersal (EcolSciences 2011, 10). Overall, this study confirmed that wood turtles use the proposed ROW for foraging and for juvenile dispersal. In addition, wood turtles used the areas adjacent to the proposed ROW for foraging, breeding, hibernating, and nesting (EcolSciences 2011, 11).

Eastern Box Turtle (*Terrapene carolina carolina*): The eastern box turtle (*Terrapene carolina carolina*) is the only species of box turtle in New Jersey, where it is listed as a species of special concern. This

species occupies forests or meadows and will seek out muddy areas or shallow pools in times of heat. The box turtle can also be found under rotting logs or other decaying vegetation and is typically active from April through September (NJENSP 2001a). During consultation, NJENSP identified the presence of eastern box turtles along the alignment for alternative 3 (NJENSP 2010a, 2). The New Jersey Landscape Project identified habitat for the eastern box turtle along the alignments for alternatives 1, 2, 2b, and 3 (Niles et al. 2008). Individuals have been observed along the alignment for alternatives 1, 2, and 2b (NPS 2011b; PSE&G 2010a).

Northern Copperhead (*Agkistrodon contortrix mokasen*): The northern copperhead is state listed in New Jersey as a species of special concern. This species can exist in a variety of habitats, including suburban areas, but typically uses rock outcrops or rocky areas with talus slopes for cover, feeding, and as entranceways to subterranean hibernating quarters. During the warm months individuals may occupy a variety of habitats, such as emergent wetlands, areas along streams, and upland areas. Overwintering and basking areas are usually located where individuals can receive maximum sunlight exposure. The northern copperhead may overwinter alone or with other species, such as the timber rattlesnake. The northern copperhead is the most widely distributed reptile species from New England to Florida in the eastern United States and can be locally abundant in appropriate habitat in the northern counties of Pennsylvania and New Jersey (PFBC 2010b; NJDEP 2002b). The copperhead can be active in Pennsylvania from mid-April to late October, and depending on the air temperature and latitude, into November. This species has been known to eat small mammals, reptiles, such as other snakes and skinks, amphibians (frogs, salamanders), and even insects. Foraging and the pursuit of mates can lead individuals up to 2 miles from their overwintering habitat (PFBC 2010b). During consultation, NJENSP identified the presence of northern copperhead along the alignments for alternative 1, 2, 2b, and 3 (NJENSP 2010a, 2). The New Jersey Landscape Project identified habitat for the northern copperhead along the alignments for alternatives 1, 2, 2b, and 3 (Niles et al. 2008). Individuals have been observed along the alignment for alternatives 1, 2, and 2b (PSE&G 2010a).

Timber Rattlesnake (*Crotalus horridus*): The timber rattlesnake is listed in New Jersey as an endangered species, and in Pennsylvania, this species is a candidate for listing. In northern New Jersey and Pennsylvania, this species occupies deciduous upland habitats consisting of hemlock forests, seeps, open fields, floodplains, talus slopes, or rock outcrops. Dens are typically on rocky wooded slopes facing southeast to southwest. Population declines are believed to be from loss of habitat and killings (NJENSP 2010b, 2). The timber rattlesnake's pattern of movement through the summer range is loop-like, starting at the den with the spring emergence. Individuals will forage periodically over a small area before moving to another area, gradually covering a territory of approximately 2 miles from the den and returning to the den in the fall. Mature individuals will typically travel along a similar pathway and through the same general area during each active season of its life (PADCNR 2010e). For hibernation, northern New Jersey populations of timber rattlesnake use communal den sites in rock outcroppings and talus slope areas associated with major ridges. Studies using transmitter-implanted timber rattlesnakes have found that this species also hibernates within the forest among boulder fields and small clusters of rocks. Migration back to the winter dens begins as the weather cools between mid-September and late October. Mature and juvenile individuals then follow scent trails back to their dens (EcolSciences 2009b, 4, 5). Suitable basking, foraging, and transient timber rattlesnake habitats exist along the entire length of the alignment for alternatives 1, 2, and 2b; however, potential hibernacula exist only in the New Jersey portion of these alignments (EcolSciences 2009b, 15). There is one known timber rattlesnake den location within alternatives 2 and 2b ROW inside the study area (Boder et al. 2005). The den is located close to the construction zone for a proposed tower. During consultation, agencies identified the presence of timber rattlesnakes along the alignments of alternatives 1, 2, 2b, and 3 (NJENSP 2010a, 2; PFBC 2010b, 1). The New Jersey Landscape Project identified habitat for the timber rattlesnake along the alignment for alternatives 1, 2, and 2b (Niles et al. 2008). In addition, individuals were observed along the alignments

and/or access roads for alternatives 1, 2, 2b, and 3 (NPS 2011b; PSE&G 2010a). Potential habitat also exists along the alignments for alternatives 4 and 5, because these alignments contain talus slope areas.

Northern Fence Lizard (*Sceloporus undulates*): The northern fence lizard is listed in Pennsylvania as a species of special concern. The northern fence lizard is arboreal and uses trees for hunting, resting, and safety when threatened. This species prefers open wooded areas and sunny, grassy areas where rotting logs or rocky outcrops can be found (NJDFW 2002, 1; PFBC 2011, 31). The northern fence lizard requires extended periods for basking, often in rocky outcroppings, and is well camouflaged within these environments (Sheils 2011, 1). The northern fence lizard is found in several areas of New Jersey and in a few areas of Pennsylvania; it is the only species of spiny lizard that is found in Pennsylvania and New Jersey. Within DEWA, individuals are often found along ridges with pitch pines in the Pennsylvania portion of the park (NJDFW 2002, 1). Vegetation surveys in 2010 and 2011 documented the northern fence lizard at one location in the Pennsylvania portion of the alignments for alternatives 1, 2, 2b, at one location along the alignment for alternative 3 as well as at one location along the alignments for alternatives 4 and 5 (NPS 2011b).

Longtail Salamander (*Eurycea longicauda*): The longtail salamander is listed in New Jersey as threatened due to habitat loss and pollution of larval ponds (NJENSP 2001b). The longtail salamander is usually closely associated with calcareous spring-fed seepages, fens, or abandoned mines or caves that contain calcareous groundwater in upland deciduous forests. A groundcover of rotting logs, stones, moss, and leaf litter provides cover for this species. The New Jersey Landscape Project identified habitat for the longtail salamander along the alignments for alternatives 1, 2, 2b, and 3 (Niles et al. 2008). Special-status reptile and amphibian species analysis are shown in table 17.

TABLE 17: SPECIAL-STATUS REPTILE AND AMPHIBIAN SPECIES ANALYSIS BY ALTERNATIVE WITHIN THE STUDY AREA

Special-status Species	Alternatives					
	1	2	2b	3	4	5
Reptile and Amphibian Species						
Bog turtle	X	X	X	X		
Wood turtle	X	X	X	X	—	—
Eastern box turtle	X	X	X	X	—	—
Northern copperhead	X	X	X	X	—	—
Timber rattlesnake	X	X	X	X	X	X
Northern fence lizard	X	X	X	X	X	X
Longtail salamander	X	X	X	X	—	—

X = species is known to be present or has potential to be found based on presence of habitat.

— = species is not likely to be present based on absence of habitat.

Mammal Species

Bobcat (*Lynx rufus*): In New Jersey, the bobcat is listed as endangered. The bobcat can survive in a variety of habitats as long as there is a food source; individuals feed on a variety of prey from insects and small rodents to rabbits and hares. The bobcat requires natural cover but can survive in areas of limited natural cover among agricultural fields. In New Jersey, individuals inhabit forested areas and use rock outcroppings or caves for cover and rearing young. If rock outcroppings are not available, the bobcat will adapt to areas of thick vegetation that provide good cover (NJDFW 2010g). The bobcat is considered a crepuscular mammal since it is most active in both the early evening and early morning hours; however,

bobcats may move around at anytime during the day or night. During consultation, NJENSP identified the presence of bobcats along the alignments for alternatives 1, 2, 2b, and 3 (NJENSP 2010a, 2). This species was observed in the alignment and/or access roads for alternatives 1, 2, and 2b on the New Jersey side (PSE&G 2010a); potential habitat for the bobcat has been identified along the alignments for all alternatives.

Indiana Bat (*Myotis sodalis*): The Indiana bat is federally listed as endangered and is also listed as endangered in both Pennsylvania and New Jersey. The Indiana bat is an insectivorous migratory bat that hibernates in mines and caves in winter and spends the summer in woodlands. In spring, reproductive females migrate to wooded areas and form maternity colonies, where they bear young. Males and nonreproductive females usually stay close to hibernation sites (hibernacula) but may migrate to summer roosts. Summer roosts are typically found behind exfoliating bark of large, often dead, trees. Both males and females return to hibernacula in late summer or early fall to mate and enter hibernation (USFWS 2007b, 1). Migration routes could be found within any of the alternative alignments due to available forested habitat. No potential Indiana bat hibernacula were found within the corridor for alternatives 1, 2, and 2b during surveys within the study area (Sanders Environmental, Inc. [Sanders] 2009). The USFWS has stated in an agency coordination letter that the Indiana bat is present along the alignment for alternatives 1, 2, and 2b and that the New Jersey portions of the alignments for alternatives 3 through 5 (including outside the study area) are all within the geographic range of this species. The eastern portions of the alignment for alternative 5 crosses known migratory corridors, swarming habitat associated with known hibernacula, and foraging habitat associated with known maternity colonies (USFWS 2010b, 2). Following this agency response, the geographic information system (GIS) data layers depicting known Indiana bat habitat were acquired from the NJENSP. Based on the NJENSP data, it was determined that the alignments for alternatives 1, 2, 2b, and 3 are within summer habitat for the Indiana bat.

In February 2012 an Indiana bat habitat assessment was performed along the proposed ROW for alternatives 3, 4, and 5. One-half acre sub plots per every 5 acres were surveyed throughout the proposed ROW to qualitatively identify suitable winter and summer habitat for the Indiana bat. Caves and abandoned mines were assessed for winter habitat using USFWS Indiana Bat Survey Protocol for Assessing Use of Potential Hibernacula (USFWS 2011c). A deep mine portal was located in the vicinity of alternatives 4 and 5, however; this portal was assessed and deemed not suitable for winter populations of Indiana bats. Indiana bat summer habitat was characterized by determining the distribution, density, and quality of roost trees in the project area. Suitable roosting and foraging habitat is present within and adjacent to alternatives 3, 4, and 5. Alternative 3 has greater number and diversity of potential roost trees than alternatives 4 and 5. Potential roost tree density would average approximately 8.86 potential roost trees per acre along alternative 3 and 4.5 potential roost trees per acre along alternatives 4 and 5 (NPS 2012b, 13).

Small-footed Bat (*Myotis leibii*): USFWS is conducting a status review of the small-footed bat in response to a petition to list this species under the Endangered Species Act. This species is listed as threatened in Pennsylvania. This species is one of the smallest bats in North America and resembles the little brown bat but has a distinctive black mask and ears. From Ontario, Quebec, and New England south and west to Arkansas, Kentucky, and Virginia, distribution is very spotty, and the largest populations are in New York, Pennsylvania, West Virginia, and Virginia. The small-footed bat uses hilly or mountainous areas in or near deciduous or evergreen forest. In Pennsylvania, this species is found mostly in heavy hemlock forests in the foothills of mountains. Summer roosts include caves, coal mines, buildings, rock crevices, and bridges over rivers (in expansion joints). Warm-season roosts include buildings, hollow trees, and spaces under loose bark, among others (NatureServe 2009). No potential bat hibernacula were found within the alignment for alternatives 1, 2, and 2b during surveys in the study area; however, 14 small-footed bats were captured between May 27 and August 12, 2009, along the alignment for alternatives 1, 2, and 2b in Pennsylvania outside the study area (Sanders 2009). In addition, talus slopes

are potential small-footed bat habitat and this habitat exists along each of the alternatives as discussed in the "Rare and Unique Communities" section of this chapter. The alignments for alternatives 3 through 5 have not been specifically surveyed for bats at this time. Potential small-footed bat habitat could be found within any of the alternative alignments due to available forested habitat and talus slopes along alternatives 1 through 5.

Northern Myotis (*Myotis septentrionalis*): The USFWS is conducting a status review of the Northern myotis in response to a petition to list this species under the Endangered Species Act. This species is also listed as a species of special concern in Pennsylvania. This is a nocturnal species that feeds along small ponds, in forest clearings, and along the edges of forests, where individuals forage for a variety of night-flying insects. The northern myotis hibernates in caves and underground mines, but uses tree cavities and buildings for maternity roosts (PNHP 2011, 1). The range of the northern myotis extends through much of Canada and the eastern United States. Potential habitat for the northern myotis could be present along the alignments for all alternatives. The Pennsylvania Game Commission has stated that the alignments for alternatives 1, 2, 2b, and 3 are outside the buffers (habitat that could support the bat) of northern myotis but the alignments for alternatives 4 and 5 are within the buffers of the northern myotis (PGC 2010a, 2). Individuals were collected during mist net surveys conducted from May to August of 2009 in the ROW for alternatives 1, 2, and 2b (Sanders 2009).

Outside the Study Area

Outside the study area in Pennsylvania, the proposed S-R Line could pass through Carbon, Lackawanna, Luzerne, Monroe, Pike, Northampton, and Wayne counties. PFBC indicated that the timber rattlesnake, bog turtle, and blue-spotted salamander have the potential to be present outside the study area to Susquehanna in appropriate habitat (PFBC 2010a, 1). Timber rattlesnake individuals were observed within Pike, Monroe, and Lackawanna counties during a habitat assessment (NPS 2011b, 12). Small-footed bat individuals were caught during mist-netting surveys within Monroe, Pike, and Lackawanna counties (Sanders 2009, 6). In addition to these observations, any of the species discussed in this section could be found within these counties, provided the proper habitat exists.

Outside the study area in New Jersey, the S-R Line could traverse Warren, Sussex, and Morris counties. During consultation, NJENSP reviewed state-owned and NPS lands. NJENSP identified the following species as present outside the study area: Mitchell's satyr, arogos skipper, bald eagle, osprey, red shouldered hawk, barred owl, Cooper's hawk, northern harrier, long-eared owl, great blue heron, cerulean warbler, cliff swallow, timber rattlesnake, northern copperhead, eastern box turtle, bog turtle, wood turtle, longtail salamander, blue-spotted salamander, bobcat, and Indiana bat (NJENSP 2010a, 2–4). The USFWS also indicated that habitat for the bog turtle exists outside the study area (USFWS 2010b, 4), and potential bog turtle habitat was identified within Sussex and Morris counties (EcolSciences 2008, 8–15). In addition, any of the species listed in table 18 could be found within these counties, provided the proper habitat exists.

Two additional terrestrial listed species, the long-eared owl and cliff swallow, have the potential to be present outside the study area and were not analyzed for presence inside the study area.

TABLE 18: SPECIAL-STATUS MAMMAL SPECIES ANALYSIS BY ALTERNATIVE WITHIN THE STUDY AREA

Special-status Species	Alternatives					
	1	2	2b	3	4	5
Mammal Species						
Bobcat	X	X	X	X	X	X
Indiana bat	X	X	X	X	X	X
Small-footed bat	X	X	X	X	X	X
Northern myotis	X	X	X	X	X	X

X = species is known to be present or has the potential to be found based on presence of habitat.

— = species is not likely to be present based on absence of habitat.

Long-eared Owl (*Asio otus*): Currently, the long-eared owl is listed in New Jersey as a threatened species. The long-eared owl is a widely distributed, year-round resident in the northern United States and Canada, only visiting other portions of the United States in the winter. This species inhabits dense vegetation adjacent to open habitats such as fields and scrub shrub where it can actively hunt for small mammals and occasionally birds. Roosting and nesting sites may be within dense stands of either natural or ornamental evergreens, such as Scotch pine (*Pinus sylvestris*), Austrian pine (*P. nigra*), Virginia pine (*P. virginiana*), eastern red cedar, Norway spruce (*Picea abies*), arborvitae (*Thuja orientalis*), eastern hemlock, red pine (*Pinus resinosa*), and white pine. The long-eared owl has historically been one of the rarest New Jersey regularly breeding birds, and there are scattered historical records of breeding individuals from Salem, Burlington, Morris, Essex, Hunterdon, and Middlesex counties. Declines in long-eared owl populations in New Jersey are likely due to development (Cornell 2009; Terres 1991, 669). The long-eared owl has been identified by NJENSP as a potentially present species along the alignment for alternatives 1, 2, and 2b outside the study area (NJENSP 2010a).

Cliff Swallow (*Petrochelidon pyrrhonota*): The cliff swallow is listed in New Jersey as a species of concern. The cliff swallow is a migratory bird, spending the summer months in the United States and Canada. Nesting occurs on cliffs, near water, and typically in a colony. Nesting can also occur on buildings and under bridges (Cornell 2009). The cliff swallow has been identified by NJENSP as a potentially present species along the alignment for alternative 3 outside the study area (NJENSP 2010a).

FEDERALLY AND STATE-LISTED PLANT SPECIES

Surveys for special-status plant species were conducted in 2009 along the alignment for alternatives 1, 2, and 2b in Pike County, Pennsylvania, as well as in Pike and Monroe counties, Pennsylvania, and Warren County, New Jersey (Mellon 2010a, 1; 2010b, 2); surveys were completed to a width of approximately 200 feet and did not include all NPS lands along the alignment. Vegetation surveys of all the proposed alternative routes were conducted in 2010 and 2011 (NPS 2011b); these studies covered a width of approximately 400 feet and only included NPS lands, not privately owned lands. These two surveys within NPS lands differ in the amount of area surveyed. As a result of the surveys, four special-status plant species were documented: prickly-pear cactus (*Opuntia humifusa*), stiff club moss (*Lycopodium annotinum*), pasture rose (*Rosa virginiana*), and netted chainfern (*Woodwardia areolata*). One additional species, reed meadowgrass (*Glyceria grandis*), which was not on the special-status plant lists provided during consultation, was identified from vegetation surveys conducted in 2009 (Mellon 2010a, 12). Table 19 presents the state- and federally listed plant species identified through consultation that are present or have the potential to be found within the study area. New Jersey consultation did not provide a list of plant species. In addition to the species listed in table 19, bog asphodel (*Narthecium americanum*) and

Hirsts' panicgrass (*Dichanthelium hirstii*) are candidate species for federal listing; however, because these species do not occur along any of the alternative alignments, they are not discussed further.

TABLE 19: SPECIAL-STATUS PLANT SPECIES IDENTIFIED THROUGH AGENCY CONSULTATION

Species	Federal Status	PA State Status	NJ State Status
Mosses, Ferns, and Fern Allies			
Netted chainfern (*Woodwardia areolata*)		NL, PT	
Clinton's wood fern (*Dryopteris clintoniana*)		NL, PT	
Stiff club moss (*Lycopodium annotinum*)			E
Sedges, Grasses, and Herbaceous Species			
Northern arrowhead (*Sagittaria cuneata*)			E, HL
A-sedge (*Carex tetanica*)		T	
Yellow sedge (*Carex flava*)		T	
Long's sedge (*Carex longii*)		TU, PT	
Matted-spikerush (*Eleocharis intermedia*)		T	HL
Northeastern bulrush (*Scirpus ancistrochaetus*)	E	E, PT	
Reed meadowgrass (*Glyceria grandis*)			E
Small-headed rush (*Juncus brachycephalus*)		T	HL
Small-whorled pogonia (*Isotria medeoloides*)	T	E	E
Bog goldenrod (*Solidago uliginosa*)		NL, PT	HL
White heath aster (*Symphyotrichum ericoides*)		TU, PT	
Brook lobelia (*Lobelia kalmii*)		E	
Marsh bedstraw (*Galium palustre*)			HL
Downy willow-herb (*Epilobium strictum*)		E, PR	HL
Shrubby cinquefoil (*Potentilla fruticosa*)		E	
Carolina grass-of-Parnassus (*Parnassia glauca*)		E	
Swamp pink (*Helonias bullata*)	T		E, HL
American bittercress (*Cardamine rotundifolia*)			E, HL
Shore aster (*Symphyotrichum tradescantii*)			HL
Trees and Shrubs			
Pasture rose (*Rosa virginiana*)		TU	
Swamp dog-hobble (*Leucothoe racemosa*)		TU, PT	
American holly (*Ilex opaca*)		T	
Susquehanna sand cherry (*Prunus pumila* var. *susquehannae*)		NL, PT	HL
Canadian serviceberry (*Amelanchier canadensis*)		NL, PE	
Cactus			
Prickly-pear cactus (*Opuntia humifusa*)		R	

Note: Species identified during surveys are in **BOLD**.

Status Codes: E = endangered, T = threatened, TU = tentatively undetermined, NL = not currently listed, R = rare; SC = special concern; P = proposed; HL = protected by the Highlands Protection and Planning Act.

Netted Chainfern (*Woodwardia areolata*): The netted chainfern is currently not listed but proposed for state listing as a threatened species in Pennsylvania. The netted chainfern is deciduous and is usually found in wet woods and shaded swamps (CBS 2005a). The netted chainfern was observed in the corridor of alternative 3 (NPS 2011b), and suitable habitat for this species is found throughout the study area for alternative 3.

Clinton's woodfern (*Dryopteris clintoniana*): Clinton's woodfern is currently not listed but is proposed for listing as a threatened species in Pennsylvania. Clinton's woodfern grows in swampy woodlands ranging from northeastern Canada to the Great Lakes and east to the mid-Atlantic region. It grows from 1.5 to 3 feet tall. Individuals are deciduous and have reproductive spores on the undersides of their leaves (NRCS 2010b). Generally, the habitat for Clinton's woodfern is described as swampy woods, especially red maple swamps (NPS 2002a, 5). This species is found most frequently in limy red maple swamps and there are a number of areas of limestone geology in DEWA (NPS 2002a, 3–5). Suitable habitat for Clinton's woodfern is found in wetlands along the alignment for alternatives 1, 2, and 2b (NPS 2002a, 3–5).Although numerous wetlands that are dominated by red maple have been delineated in the parks, Clinton's woodfern was not observed during the vegetation surveys conducted in 2010 and 2011 (NPS 2011b; Mellon 2010a). PADCNR identified this species as present along the alignment for alternatives 1, 2, and 2b during consultation (PADCNR 2010a, 2).

Stiff Club Moss (*Lycopodium annotinum*): The stiff club moss is listed in New Jersey as an endangered plant. The stiff club moss is a native perennial club moss with long, creeping, forked, erect branches that grows as a clone. It inhabits moist woodlands, thickets, bogs, and meadows that are typically shaded and cool with acidic, well-drained to poorly drained soils (Matthews 1993). During vegetation studies, stiff club moss was observed in a seep and within the ROW corridor for alternatives 1, 2, and 2b (NPS 2011b); however, potential habitat is present along all the alternative alignments.

A-sedge (*Carex tetanica*): The A-sedge, also known as rigid sedge (NRCS 2010b), is threatened in Pennsylvania. This sedge species is generally found in calcareous fens, bogs, and swales from the Dakotas south to North Carolina and north into Canada. Suitable habitat for A-sedge has been identified along the alignment for alternatives 1, 2, and 2b (NPS 2011b; Mellon 2010a). During consultation, PADCNR identified the presence of A-sedge along the alignment for alternatives 1, 2, and 2b (PADCNR 2010a, 2).

Reed Meadowgrass (*Glyceria grandis*): Reed meadowgrass, also known as American manna grass, is state listed by New Jersey as an endangered plant species. Reed meadowgrass grows on banks and in the water of streams, ditches, ponds, and wet meadows, from Alaska to Newfoundland and south in the mountains to California, Arizona, and New Mexico in the western United States, and to Virginia and Tennessee in the eastern United States. This species flowers during the months of July and August (NRCS 2010b). Reed meadowgrass was observed during rare plant surveys conducted in 2010 along the alignment for alternatives 1, 2, and 2b (Mellon 2010a, 2010b). This species was observed within the ROW, tucked in a seepage area with other herbaceous wetland plants.

Small-headed Rush (*Juncus brachycephalus*): The small-headed rush is listed by Pennsylvania as a threatened species and is protected by the Highlands Protection and Planning Act. The small-headed rush is found in wetland habitats such as calcareous marshes, wet meadows, and wetland shores. Fruiting occurs in summer and early fall (NRCS 2010b). Small-headed rush was not observed during any of the vegetation surveys (NPS 2011b; Mellon 2010a), but this special-status wetland plant species has the potential to be present in appropriate wetland habitats along the alignment for alternatives 1, 2, and 2b (PADCNR 2010a, 2).

Bog Goldenrod (*Solidago uliginosa*): Bog goldenrod is not currently state listed by Pennsylvania, but it is proposed for listing as a threatened species; it is protected by the Highlands Protection and Planning Act. Bog goldenrod is a wetland-obligate species found in most states east of Minnesota. Flowering occurs from July to September. Height is variable depending on conditions but typically ranges from 1 foot to 5 feet (NRCS 2010b). Suitable habitat for bog goldenrod has been identified along the alignment for alternatives 1, 2, and 2b within the ROW (Mellon 2010a). In addition, PADCNR identified the presence of this species along the alignment for alternatives 1, 2, and 2b during consultation (PADCNR 2010a, 2).

White Heath Aster (*Symphyotrichum ericoides*): White heath aster is state listed by Pennsylvania as tentatively undetermined, but it is proposed for listing as a threatened plant species. The white heath aster is a small, daisy-like native plant that grows in dry soils. Its white flowers bloom from September to November. The native population of white heath aster is distributed from Pennsylvania to Maine and north into Canada and from Mississippi to Mexico. It can be found in dry prairies and along roadsides (UT 2010). The white heath aster has been documented along the Delaware River (NPS 1986, 106) and although this species is reported to be rare, it has been found to be locally common in dry spots along the Delaware River, particularly in limestone ledge areas (NPS 1986, 106). This species has been observed on limestone rocks along the alignment for alternatives 1, 2, and 2b (Mellon 2010a, 13). However, communications with DEWA park staff indicated the presence of white heath aster near, but not within, the study area (Mellon 2010a, 8). White heath aster was not detected during the vegetation surveys (Mellon 2010a; NPS 2011b); however, farther north along the Delaware River but outside the DEWA study area, a previously reported stand of white heath aster was observed (Mellon 2010a, 9). In addition, during consultation PADCNR identified the presence of this species along the alignment for alternatives 1, 2, and 2b (PADCNR 2010a, 2).

Brook Lobelia (*Lobelia kalmii*): Brook lobelia is listed in Pennsylvania as endangered. It is a wetland-obligate species that can be found across the northern United States. Plants vary in height from 4 inches to 16 inches. Blue-and-white flowers appear from July to October (NRCS 2010b). Suitable habitat for brook lobelia has been identified along the alignment for alternatives 1, 2, and 2b within the B-K Line ROW (Mellon 2010a). Although brook lobelia was not observed during vegetation surveys conducted in 2010 and 2011 (NPS 2011b), this special-status wetland plant species has the potential to be present within the corridor in appropriate wetland habitats along the alignment for alternatives 1, 2, and 2b (PADCNR 2010a).

Marsh Bedstraw (*Galium palustre*): Marsh bedstraw is protected by the Highlands Protection and Planning Act in New Jersey (NJNHP 2010). A member of the madder family, marsh bedstraw is found in swamps, along streambanks, and in wet meadows. It flowers from June to August (CBS 2005b). In New Jersey there are 21 to 100 known populations. Marsh bedstraw, a rare species in New Jersey, was identified in Pennsylvania and New Jersey during 2010 and 2011 vegetation surveys along the alignments for alternatives 1, 2, 2b, 4, and 5 (NPS 2011b). Suitable habitat also exists along the alternative 3 alignment.

Downy Willow-herb (*Epilobium strictum*): Downy willow-herb is currently listed in Pennsylvania as an endangered species; however, a change to rare status is proposed. Downy willow-herb is a wetland species found in fens, marshes, and sedge meadows throughout northeastern Canada and the United States from Minnesota to Maine and south to Virginia. Blooming occurs from July to early September, with fruiting occurring from late July to early October (NRCS 2010b). Suitable habitat for downy willow-herb has been identified within the B-K Line ROW for alternatives 1, 2, and 2b (Mellon 2010a). In addition, PADCNR identified the presence of this species along the alignment for alternatives 1, 2, and 2b during consultation (PADCNR 2010a, 2).

Shrubby Cinquefoil (*Potentilla fruticosa*): Shrubby cinquefoil is listed in Pennsylvania as an endangered species. It is a small perennial shrub that is generally found in bogs, fens, and near interdunal ponds, but it can be found in upland areas as well. Flowers are yellow, solitary or a few in a cluster, and approximately an inch across and appear in early summer (NRCS 2010b). Shrubby cinquefoil was observed during the 2010 and 2011 vegetation surveys along the alignment for alternatives 1, 2, and 2b (NPS 2011b). Suitable habitat for shrubby cinquefoil has been identified within the B-K Line ROW for alternatives 1, 2, and 2b (Mellon 2010a). In addition, PADCNR identified the presence of this species along the alignment for alternatives 1, 2, and 2b during consultation (PADCNR 2010a, 2).

Carolina Grass-of-Parnassus (*Parnassia glauca*): Carolina grass-of-Parnassus is listed in Pennsylvania as an endangered species. The Carolina grass-of-Parnassus is a wetland species, typically found in wet meadows throughout the northeastern United States from the Dakotas to Maine and up into Canada. It produces small, 1-inch-wide flowers from July to October (NRCS 2010b). Suitable habitat for Carolina grass-of-Parnassus has been identified within the B-K Line alignment for alternatives 1, 2, and 2b (Mellon 2010a). In addition, PADCNR identified the presence of this species along the alignment for alternatives 1, 2, and 2b during consultation (PADCNR 2010a, 2).

American Bittercress (*Cardamine rotundifolia*): American bittercress is listed in New Jersey as endangered, and it is also protected by the Highlands Protection and Planning Act. It is a small herbaceous plant (8 to 18 inches in height) with white flowers in a terminal cluster and elongated seed pods that are pointed at the apex. The basal leaves are kidney-shaped and each leaf exists on a long leaf petiole. American bittercress is found along cold springs, brooks, and wet, forested areas. NPS records have indicated that American bittercress has been documented near the alternative 3 alignment. Although American bittercress was not observed during vegetation surveys conducted in 2010 and 2011 (NPS 2011b), this special-status plant species does have the potential to be present within the corridor for alternative 3.

Shore Aster (*Aster tradescantii*): Shore aster is protected by the Highlands Protection and Planning Act. Shore aster is a perennial herbaceous plant in the aster family that often grows in clumps. Flower heads are white and relatively small and leaves are narrow. Shore aster inhabits damp, rocky, and gravelly shores, silt- or loam-filled cracks in rocky rapids of streams, or areas along freshwater estuaries. NPS records have indicated that the shore aster has been documented outside the study area along the alignment for alternative 3. Although the shore aster was not observed during vegetation surveys conducted in 2010 and 2011 (NPS 2011b), this special-status plant species does have the potential to be present within the corridor for alternative 3.

Pasture Rose (*Rosa virginiana*): Pasture rose (or Virginia rose) currently has an undetermined status and is a species that is believed to be in danger of decline in Pennsylvania. A native species, pasture rose is found in thickets and meadows, where it blooms from May to July (NRCS 2010b). Pasture rose was observed in Pennsylvania within the alignments of alternatives 1, 2, 2b, 4, and 5 during seasonal vegetation surveys conducted in 2010 and 2011 (NPS 2011b). Suitable habitat also exists along the alternative 3 alignment.

Swamp Dog-hobble (*Leucothoe racemosa*): Swamp dog-hobble is currently listed in Pennsylvania as tentatively undetermined, but is proposed for listing as a threatened species. Swamp dog-hobble is found mostly in coastal states from Massachusetts to Texas, inhabiting wetlands, swamps, and wet thickets. Flowers are white, bell-shaped, grouped clusters that appear in May or June. As of 2007, there were 30 documented populations in the state of Pennsylvania (PNHP 2010d). Although swamp dog-hobble was not observed during vegetation surveys (NPS 2011b), this special-status plant species does have the potential to be present along the alignments for alternatives 4 and 5 (PATNC 2005a, 131). In addition,

PADCNR identified the presence of this species along the alignments for alternatives 4 and 5 during consultation (PADCNR 2010a, 2).

American Holly (*Ilex opaca*): American holly is listed in Pennsylvania as threatened. This species is found west from Texas to Florida and north to Maine. It is easily distinguishable by its thick, alternating, evergreen leaves with sharp spines on the tip and margins. Small red berries appear on female plants after approximately 4 to 7 years of maturity. Although American holly is adapted to grow in a variety of site conditions, it grows best on well-drained, sandy soils. The plant will tolerate somewhat poorly drained soils but does not handle sea spray well (NRCS 2010b). Although American holly was not observed during vegetation surveys (NPS 2011b), according to agency consultation, this special-status plant species does have the potential to be present along the alignments for alternatives 4 and 5 (PATNC 2005a, 131), and PADCNR identified the presence of this species along the alignments for alternatives 4 and 5 (PADCNR 2010a, 2).

Susquehanna Sand Cherry (*Prunus pumila* var. *susquehannae*): Susquehanna sand cherry is currently not listed in Pennsylvania, but is proposed for listing as a threatened species; it is also protected by the Highlands Protection and Planning Act. Susquehanna sand cherry grows in dry, sandy soils. This species blooms with white, conspicuous flowers (NRCS 2010b). Susquehanna sand cherry was not observed during vegetation surveys conducted in 2010 and 2011 (NPS 2011b). During agency consultation, this special-status plant species was identified as having the potential to be present along the alignments for alternative 4 and 5 (PATNC 2005a, 131), and PADCNR identified this species as present along the alignments for alternatives 4 and 5 (PADCNR 2010a, 2).

Prickly-pear Cactus (*Opuntia humifusa*): Prickly-pear cactus is widely distributed across North America, but it is listed in Pennsylvania as a rare species. Prickly-pear cactus can flourish under a great range of conditions, including elevation, moisture regime, and soil type (Taylor 2005). This cactus is known to be present at Shoemakers Barren, which is considered a regionally rare community and is discussed in more detail in the “Rare and Unique Communities” section of this chapter. The alignment for alternatives 1, 2, and 2b would pass approximately 475 feet west of the acidic rocky summit community known as Shoemakers Barren. Due to the distance of this site from the study area, the site is not anticipated to be affected by the proposed project and prickly-pear cactus is not discussed further under alternatives 1, 2, or 2b. However, PADCNR has suggested that the prickly-pear cactus has the potential to be present within the alignment for alternative 3, although neither this plant nor potential habitat within the corridor was observed during the vegetation surveys conducted in 2010 and 2011 (NPS 2011b).

Small-whorled Pogonia (*Isotria medeoloides*): The small-whorled pogonia is listed as federally threatened, as well as state-listed by Pennsylvania as endangered. This species, a member of the orchid family (*Orchidaceae*), is sparse but widely distributed, with a range extending from southern Maine and New Hampshire to northern Georgia and southeastern Tennessee. The small-whorled pogonia occurs on upland sites in mixed deciduous or mixed deciduous/coniferous forests that are generally second- or third-growth successional stages. Habitat characteristics include sparse to moderate ground cover, relatively open understory, and proximity to features that create long-persisting breaks in forest canopy (USFWS 1992, 1). Deer browsing, fragmentation, and possibly alterations in soil moisture were identified as threats to the small-whorled pogonia. Species within the northern range emerge from leaf litter in May and flower in June. An individual plant may stay in flower from 4 days to nearly 2 weeks (USFWS 1992, 20). Small-whorled pogonia was not observed during any of the field surveys (NPS 2011b; Mellon 2010a) and there are no records of this species occurring within the study area for this project. Because small-whorled pogonia was not observed within the alignment for any of the alternatives and there are no records of occurrence, this plant species was dismissed from further analysis.

Swamp Pink (*Helonias bullata*): Swamp pink is a federally threatened species and is state-listed by New Jersey as endangered, which is also protected by the Highlands Protection and Planning Act. Swamp pink is a perennial herbaceous plant with a small pink flower and oblong, dark-green leaves; the evergreen leaves of swamp pink can be seen year-round, and flowering occurs between March and May (USFWS 2011b). Swamp pink is a wetland plant species and occurs in a variety of palustrine forested wetlands, including swampy forested wetlands bordering meandering streamlets, headwater wetlands, sphagnous Atlantic white-cedar swamps, and spring seepage areas (USFWS 2011b). The primary threats to swamp pink are the indirect effects of off-site activities and development, such as pollution, introduction of invasive species, and subtle changes in groundwater and surface water hydrology (USFWS 2011b). The USFWS, New Jersey Field Office, responded in an October 21, 2010, letter that a survey should be conducted to document the presence or absence of swamp pink in all forested wetlands along alternatives that have since been dismissed (USFWS 2010b, 4). Therefore, this plant species is not discussed in further analysis.

Outside the study area, the proposed S-R Line could pass through Carbon, Lackawanna, Luzerne, Monroe, Pike, Northampton, and Wayne counties in Pennsylvania and Warren, Sussex, and Morris counties in New Jersey. The special-status plant species that have been listed by consulting agencies as having the potential to be present within the proposed alternative alignments could be present in these counties if the appropriate habitat exists. In addition, any of the species listed in table 20 could be found in these counties, provided the proper habitat exists.

RARE AND UNIQUE COMMUNITIES

A rare or unique community is a subset of an ecosystem that is recognized for its contribution to biological diversity—locally, regionally, or globally. Rare or unique communities include sites identified by the DEWA general management plan (GMP) (NPS 1987), county natural areas inventories, and state natural heritage programs. Often, the physical characteristics of an area create a specific set of unusual conditions that foster rare or unique communities. The geology, hydrology, and soil conditions of a site can determine the vegetation that grows there, which in turn influences the wildlife that use the habitat. Because these conditions create microclimates with unusual conditions, these communities are often globally or state ranked for rarity. Rare and unique communities often contain a high number of rare, threatened, or endangered species, because these species are adapted to thrive in the specific conditions found in the communities. Because of the rarity of such areas and the higher number of species of special status they often harbor, rare and unique communities should be considered in a holistic manner, rather than by looking at the importance of the geology, vegetation, or wildlife alone. Nearly half of the 69 vegetation associations within DEWA can be considered state or globally rare or unique. The state and global importance of some of these areas has led to them being classified as natural heritage areas. Additionally, several rare and unique communities within DEWA have been identified as outstanding natural features due to their unique ecological values. Communities given this designation receive the highest level of protection and preservation efforts. These sites are open for visitor use, but this use may be limited to protect these areas from degradation. Development, such as trails, interpretive waysides, exhibits, and parking areas, is kept to a minimum in areas of outstanding natural features (NPS 1987, 18).

The rare and unique communities that are present or have the potential to be found within the study area for the S-R Line are presented in table 21 and are described in the following sections.

TABLE 20: SPECIAL-STATUS PLANT SPECIES ANALYSIS BY ALTERNATIVE WITHIN THE STUDY AREA

Special-status Species	Alternatives					
	1	2	2b	3	4	5
Plant Species						
Netted chainfern	—	—	—	X	—	—
Clinton's woodfern	X	X	X	—	—	—
Stiff club moss	X	X	X	X	X	X
A-sedge	X	X	X	—	—	—
Reed meadowgrass	X	X	X	—	—	—
Small-headed rush	X	X	X	—	—	—
Bog goldenrod	X	X	X	—	—	—
White heath aster	X	X	X	—	—	—
Brook lobelia	X	X	X	—	—	—
Marsh bedstraw	X	X	X	X	X	X
Downy willow-herb	X	X	X	—	—	—
Shrubby cinquefoil	X	X	X	—	—	—
Carolina grass-of-Parnassus	X	X	X	—	—	—
American bittercress	—	—	—	X	—	—
Shore aster	—	—	—	X	—	—
Pasture rose	X	X	X	X	X	X
Swamp dog-hobble	—	—	—	—	X	X
American holly	—	—	—	—	X	X
Susquehanna sand cherry	—	—	—	—	X	X
Prickly-pear cactus	—	—	—	X	—	—

X = species is known to be present or has potential to be found based on presence of habitat.

— = species is not likely to be present based on absence of habitat.

TABLE 21: RARE AND UNIQUE COMMUNITIES PRESENT WITHIN THE STUDY AREA

Community	Global Rank	NJ Rank	PA Rank	Alternatives					
				1	2	2b	3	4	5
Arnott Fen[a]	Imperiled to critically imperiled	—	Critically imperiled	X	X	X			
Hogback Ridge[a]	—	—	—	X	X	X			
Hemlock Forests									
Eastern hemlock forest	Secure	Not ranked	Apparently secure	X	X	X		X	
Eastern white pine forest	Secure	Not ranked	Apparently secure	X	X	X			
Eastern hemlock/northern hardwood forest	Apparently secure (?)	Vulnerable	Apparently secure	X	X	X	X		
Dry eastern hemlock/oak forest	Apparently secure to vulnerable (?)	Not ranked	Apparently secure	X	X	X	X		
Lichens	—	—	—	X	X	X	X	X	X
Riparian Corridors									
Delaware River riparian corridor[a]	—	—	—	X	X	X	X		
Van Campen Brook riparian area	—	—	—	X	X	X			
Kittatinny Ridge[a]	—	—	—	X	X	X	X	X	X
Talus Slopes									
Sandstone talus	Apparently secure	Vulnerable	Vulnerable	X	X	X	X		
Oak/birch talus	Apparently secure to vulnerable	Vulnerable (?)	Vulnerable	X	X	X	X	X	X
Natural Heritage Sites									
Totts Gap and Totts Gap Swamp	—	—	—					X	X
Bear Swamp	Unknown	—	Imperiled to vulnerable					X	X
Minsi Lake vernal pools	Unknown	—	Vulnerable						

a. Indicates an outstanding natural feature.

— = Community not ranked, or not found in state.

Ranking Definitions: **Critically imperiled**: At very high risk of extinction due to extreme rarity (often 5 or fewer populations), very steep declines, or other factors.

Imperiled: At high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors.

Vulnerable: At moderate risk of extinction due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors.

Apparently secure: Uncommon but not rare; some cause for long-term concern due to declines or other factors.

Secure: Common; widespread and abundant.

Not ranked: Conservation status not yet assessed.

Unknown: Possibly in peril range-wide but status uncertain; need more information.

CALCAREOUS WETLANDS

DEWA contains a number of calcareous wetland communities, including seeps and fens. These wetlands typically have a very limited geographic range and a unique combination of plant species, thereby gaining recognition for their global rarity. A fen is a nutrient-rich marshy area associated with limestone and calcareous siltstone where calcareous groundwater discharges to the surface. The soils of a calcareous fen vary from silt loams to shallow mucky peat. Generally, such wetlands have little cover, contain mainly grasses or shrubby vegetation, and include plant species such as silky dogwood, poison sumac (*Toxicodendron vernix*), shrubby cinquefoil, and steeplebush. Several calciphytic (calcium-loving) plant species, including Ontario lobelia (*Lobelia kalmii*) and rigid sedge, grow in the herbaceous layer (NPS 2007b, 313–315). Six rare plant species have been identified within the calcareous wetlands of DEWA. Additionally, 29 taxa of lichens have been found in this habitat type in the park (TNC 2000, 9).

Arnott Fen: Arnott Fen is a calcareous wetland close to Bushkill, Pennsylvania. A calcareous fen arises out of the unique geological conditions that foster a unique biological community. Calcareous fens form in areas with limestone bedrock. The geologic formation underlying Arnott Fen is Buttermilk Falls Limestone through Esopus formation, undivided. This includes four formations; Buttermilk Falls Limestone, Palmerton Sandstone, Schoharie, and Esopus formations. The Schoharie Formation is calcareous, with a significant portion of the interstitial material containing calcium carbonate (PADCNR 2009, 15, 17–18).

Calcareous groundwater is discharged at Arnott Fen as a result of the calcareous geologic formations, which support calciphytic vegetation. A calcareous fen like Arnott Fen can only be found on areas of highly calcareous rock, which is necessary to provide the calcium needed to support calciphytic vegetation (Mellon 2010a, 11). Generally, calcareous wetlands are grassy or shrubby, with little cover. Sedges are often a prominent vegetation type. Arnott Fen is classified as a poison sumac/red-cedar/bayberry fen. This community type exists in areas with base-rich water, often with a pH ranging from 7.0 to 8.1, and usually contains a rich organic layer (Fike 1999, 42). This plant community is considered globally imperiled, ranked as G1G2, and is the only community of its kind in Pennsylvania (NPS 2009g, 4). The unusual conditions present support six known Pennsylvania special-status plant species and one plant that is a proposed threatened species for Pennsylvania but is not yet listed (NPS 1983a, 43). Within DEWA, 29 taxa of lichens have also been found in this habitat type (TNC 2000, 9). These rare plant communities support rare wildlife species that depend on the hydrologic conditions found at Arnott Fen and the surrounding wetland complex. The fen with surrounding wetlands and forest compose a unique ecosystem that supports diverse breeding bird, reptile, and amphibian populations, including species of conservation concern.

The larger wetland that encompasses Arnott Fen has been altered by beaver and human activity. Since the initial discovery of special-status species in the fen, beaver activity has altered water levels, flooding much of the area for several years. Remnant dams are still present and functioning in some parts of the wetland complex. In other areas, woody species are encroaching and succession has become a concern. Historical impacts on the wetland from beaver and humans have not been documented, nor have the changes been compared over time. The threat of encroachment of shrubby species and saplings may also affect the wetland and fen (TNC 2000, 1).

OUTSTANDING NATURAL FEATURES

An outstanding natural feature is defined in the DEWA GMP as one that has a high intrinsic or unique value. The NPS-identified outstanding natural features are open for visitor use; however, these areas are also managed to prevent degradation (NPS 1987, 18).

Hogback Ridge: A hogback ridge is a bedrock ridge with steep sides. The geology of Hogback Ridge is Devonian Buttermilk Falls Limestone (NPS 1983a, 4). The ridge runs roughly northeast to southwest in DEWA and drops off steeply on the southeastern side. The northern slope of the ridge contains eastern hemlock/northern hardwood forests, as well as extensive wetland areas.

Hogback Ridge is important to the conservation of biodiversity in Pennsylvania (PATNC 1991a, 14–25). The Hogback Ridge is an outstanding natural feature in the park, and its hemlock forest, which is a rare community type in DEWA, contributes significantly to the biological diversity of the state and county.(NPS 1987, 18; PATNC 1991a, 14–25). A unique community type in DEWA, the hemlock forest is dominated by eastern hemlock in the canopy, with sweet birch (*Betula lenta*) and sugar maple as codominant canopy species (NPS 2009g, 4). Canopy cover is thick—generally more than 70%. The dense cover of the canopy creates a densely shaded understory. This lowers air and water temperatures in these forests, as well as providing specific habitat and soil nutrients for a host of species. Many species rely on the conditions found in these forests. The eastern hemlock/northern hardwood forest along Hogback Ridge also supports several species of native wildflowers and rare plants (NPS 2009g, 4). It is also holds an abundance of lichen species and is an area where new species are currently being discovered (Harris and Lendemer 2005, 4–6; 2006, 69–71).

A few bird species are hemlock specialists, meaning that they require a limited set of conditions found within hemlock forests for survival, and can be found exclusively in hemlock stands such as the stand on Hogback Ridge. Hemlock-specialist bird species include the black-throated green warbler, blue-headed vireo (*Vireo solitarius*), and northern goshawk. The red shouldered hawk, barred owl, Acadian flycatcher, winter wren (*Troglodytes troglodytes*), and hermit thrush (*Catharus guttatus*) are also highly associated with hemlock ecosystems (Ross et al. 2004, 4). Pennsylvania state-threatened bald eagles are known to roost in trees on the ridge with easy access to foraging points along the Delaware River. Several bird species of concern also nest in the area (NPS 2009f, 4). These species are not common breeders in DEWA.

The cooler and darker conditions found in hemlock forests such as those found along the northern side of Hogback Ridge support a higher abundance of aquatic species as well. Brook trout and benthic invertebrates are often found in greater numbers in streams under hemlock stands (USGS 2003, 2.17, 3.3). The large forest block provided by Hogback Ridge has benefits for forest-interior species. The conditions found in the eastern hemlock/northern hardwood forest also support many of the reptile and amphibian species found in DEWA (NPS 2009f, 4).

Hogback Ridge contains several wetland areas along higher elevations (500–600 feet AMSL) that run between limestone ridges. Although many of these wetlands have been affected by beaver activity, a small population of a proposed Pennsylvania state-threatened reptile species was observed at the edge of one of the linear wetlands on Hogback Ridge. The wetlands on Hogback Ridge also support special status plants, and the beavers have created habitat for the great blue heron and red-headed woodpeckers, two uncommon breeders in DEWA.

HEMLOCK FORESTS

Eastern hemlocks are found within four forest types within the study area: eastern hemlock forest, eastern hemlock/northern hardwood forest, dry eastern hemlock/oak forest, and eastern white pine forest. Hemlock forests provide densely shaded areas that aid in lowering surrounding air and water temperatures, provide habitat structure, and affect soil nutrients, providing important habitat for several plant, animal, and insect species. Several bird species are found exclusively in hemlock stands (black-throated green warbler, blue-headed vireo, and northern goshawk) or are highly associated with them (red-shouldered hawk, barred owl, Acadian flycatcher, winter wren, and hermit thrush) (Ross et al. 2004,

4). In riparian areas, the streams associated with hemlock stands generally contain more taxa than those with hardwood forest associations. Fish, such as brook trout, and many benthic invertebrates are found in greater abundance in streams underneath hemlock stands (USGS 2003, 2.17, 3.3). Aquatic diversity is predicted to decline with the loss of hemlock forests based on a study in DEWA (Snyder et al. n.d., i–ii). Hemlock forests are threatened by the spread of the hemlock woolly adelgid, which is discussed in the "Invasive Wildlife Species" section of this chapter.

Eastern Hemlock Forest: Eastern hemlock forests are found in dry–mesic conditions on steep slopes throughout the DEWA. These forests are dominated by eastern hemlocks or eastern white pine and grow in rocky soils. The understory is sparse and could include American witch-hazel, mountain laurel, and lowbush blueberry; the herbaceous layer is also sparse and species could include Indian cucumber and New York fern.

Eastern White Pine Forest: Eastern white pine forests are similar to eastern hemlock forests, with the exception of the abundance of eastern hemlocks in the canopy. In eastern hemlock forests, hemlocks constitute approximately 50% to 90% of the canopy, whereas only 50% or less of the canopy of eastern white pine forests consists of eastern hemlocks (NPS 2007b, 9–12, 15–18).

Eastern Hemlock/Northern Hardwood Forest: Eastern hemlock/northern hardwood forests are found in acidic soils on steep ravines and along north-facing lower slopes throughout DEWA. Eastern hemlocks make up 25% to 50% of the canopy of these forests, with sweet birch and sugar maple as codominant species. The bedrock that underlies eastern hemlock/northern hardwood forests varies from shale to calcareous shale and limestone. The shrub layer in these forests ranges from open to dense, while the herbaceous layer is usually sparse (NPS 2007b, 173–175).

Dry Eastern Hemlock/Oak Forest: The canopy of dry eastern hemlock/oak forests is codominated by eastern hemlock and oaks, predominantly chestnut oak. Eastern hemlocks compose more than 25% of the canopy. This forest type is found on shale, sandstone, siltstone, and limestone bedrock in extremely stony soils. Both the shrub and herbaceous layers are sparse. Dry eastern hemlock/oak forests are found on steep northeastern to northwestern exposures in DEWA.

LICHENS

Lichens are often used for natural resource assessment because they are responsive to environmental stressors in forests, such as habitat alteration and pollution (Lichen.com 2001). The Forest Inventory and Analysis Program of the U.S. Forest Service monitors lichen communities throughout the United States to evaluate biodiversity, air quality, and climate (USFS 2008, 4–7). Lichens provide food for animals such as deer and provide nesting materials for small mammals and birds. DEWA is considered one of the most diverse areas in the United States for lichen flora (Harris and Lendemer 2006, 75) and supports over 320 species of lichens (NPLichen 2010).

RIPARIAN CORRIDORS

Riparian corridors are vegetated areas that grow along streams, lakes, rivers, wetlands, and bays. Riparian corridors naturally consist of trees and grasses, and are predominately forested in the study area. These corridors protect water resources by removing contaminants from runoff water and providing habitat for riparian and aquatic organisms (Gilliam, Osmond, and Evans 1997).

Delaware River Riparian Corridor: The north-to-south orientation of the Delaware River riparian corridor provides crucial habitat for migratory bird species, particularly migratory songbirds, waterfowl, and wading bird species. The bottomlands associated with this riparian corridor provide important habitat

for breeding and foraging for many bird species, including songbirds, raptors, and waterfowl (NPS 2009g, 5).

Van Campen Brook Riparian Area: Van Campen Brook and wetland complex is a high-value aquatic area on the New Jersey side of DEWA, off County Road 606. The brook itself is categorized as a category one stream, which is afforded the highest level of state water protection (NPS 2009c, 4). Category one streams are defined by the NJDEP as waters protected from any measureable changes in water quality because of their exceptional ecological significance, exceptional recreational significance, exceptional water supply significance, or exceptional fisheries resources. The waters of Van Campen Brook and wetland complex support several aquatic species and are considered trout-producing for the native brook trout. The aquatic areas of the Van Campen Brook and associated wetlands are also important suitable habitat for many listed amphibian and trout species.

Within the Van Campen Brook area, Van Campen Glen is a steep hemlock ravine with a popular hiking trail. The ravine runs along Van Campen Brook, on the western side of Kittatinny Mountain, and the glen is an outstanding natural feature of DEWA that contributes to the uniqueness of the Van Campen Brook riparian corridor. A species of filmy fern found within the glen represents the only known population of this species in New Jersey. This species is found in deep recesses of crevices of the rocky sides of the ravine (NPS 1986, 125). The location of this species is such that it would not be affected by activities in the B-K Line ROW.

In the ROW near the Watergate Recreation Site, the floodplain of Van Campen Brook is generally dominated by hairyfruit sedge. This species is often associated with high pH soils. Other species found in this area include blue vervain (*Verbena hastata*), arrow-leaved tearthumb, woolgrass, giant goldenrod (*Solidago gigantea*), soft rush (*Juncus effusus*), rough-leaved goldenrod (*Solidago rugosa*), monkeyflower (*Mimulus rigens*), and mild water pepper (*Polygonum hydropiperoides*) (Mellon 2010a, 11).

Wetland areas along the B-K Line ROW near the Van Campen Brook wetland complex and Watergate Recreation Site include seepage wetlands and old ponds. These wetland areas were found to have a high diversity and abundance of plant species. Plants found included marsh fern (*Thelypteris palustris*), sensitive fern, yellow birch, Morrow's honeysuckle, autumn olive, and multiflora rose, among many others.

MIGRATORY BIRD FLYWAYS

Birds migrate between breeding and wintering locations in order to benefit from the ability to inhabit two different areas during seasons when each region provides favorable conditions (Lincoln, Peterson, and Zimmerman 1998, 13). Flyways generally contain several primary migration routes, many important tributaries, and suitable resting and feeding habitats where birds can stop during migration (Boere and Stroud 2006, 40). There are four major migratory flyways in North America: the Atlantic, Mississippi, Central, and Pacific flyways. The Atlantic Flyway spans more than 3,000 miles and stretches from the Arctic Tundra to the Caribbean (Kramer 2006, 1). The states that lie within the Atlantic Flyway in the United States are home to over 500 species of birds and contain a variety of habitats, including forests, coastal habitats, and wetlands. Kittatinny Ridge, DEWA, and APPA are within the Atlantic Flyway. The Delaware River is also a part of the Atlantic flyway, and provides important migratory habitat for waterfowl.

Kittatinny Ridge: Kittatinny Ridge (Blue Mountain in Pennsylvania and Kittatinny Mountain in New Jersey) runs through DEWA in both Pennsylvania and New Jersey. Within Kittatinny Ridge, Kittatinny Mountain is a priority site for the protection of New Jersey biodiversity (NPS 2009c, 3). Kittatinny Ridge supports a vast diversity of plant communities and wildlife, including endangered species, along its length. Kittatinny Ridge is identified as a priority site by the New Jersey Natural Heritage Program (NJNHP). It is also identified as an IBA by the Audubon Society in both Pennsylvania and New Jersey and a petition has been submitted to designate the ridge as a national raptor migration corridor (Audubon PA 1999b; NJ Audubon 2010d; Heintzelman 2009).

With its north–south orientation, Kittatinny Ridge is a globally significant fall migration corridor used by many thousands of raptors every year. Audubon Pennsylvania has named Kittatinny Ridge as the largest of the state's IBAs (Audubon PA 2006, 7). The unique geology of the ridge results in the creation of wind currents that raptors and other species use to migrate. It is estimated that between 14,000 and 20,000 hawks and other raptors migrate through Kittatinny Ridge yearly (Heintzelman 2009, i). Aside from the benefits of the wind currents, the forested habitats along Kittatinny Ridge provide breeding, resting, and foraging areas for bird species. Information on the use of the ridge by bird species and the IBAs along Kittatinny Ridge is outlined in the "Migratory Birds" section of this chapter.

Other wildlife species can be found in the diversity of habitats along the ridge. The woodlands along Kittatinny Ridge provide critical, high quality interior-forest habitat for 143 breeding bird species, 55 fish species, 49 species of amphibians/reptiles, 83 butterfly species, 78 dragonfly/damselfly species, 292 woody plant species, 19 plant communities, and 33 mammal species (TNC 2009).The Kittatinny Ridge talus slopes, hemlock ravines, and conifer and hardwood swamps support a rare ecosystem within the parks. The varied habitats along Kittatinny Ridge provide habitat for many endangered or rare wildlife, including raptors, mammals, amphibians, and reptiles (NPS 2009c, 3). In addition, high-elevation ponds within Kittatinny Ridge provide important breeding habitat for dragonflies and damselflies (Shreiner 2008, 11).

TALUS SLOPES

Talus describes an area with large, boulder-like rocks found at the bottom of steep slopes, usually resulting from slides or rockfalls from unstable cliffs. The soils in this type of community are thin and dry. The vegetation grows on the face of the rock rubble or in the weakly developed soils between the rock fragments on steep slopes. With little soil in the field of boulders, talus areas are generally sparsely vegetated and moderately unstable. Within DEWA, talus slope communities are found along Kittatinny Ridge. Kittatinny Ridge maintains two unusual vegetation associations in Kittatinny talus.

Sandstone Talus: Sandstone talus is found on the steep southern and southeastern slopes of the Kittatinny Ridge in coarse, sandstone-based talus. Lichen cover is common on the boulders. Vegetation cover in sandstone talus ranges from 0% to 50% cover and is dominated by drought-resistant species such as sweet birch and chestnut oak. Other plant species common to this type of habitat include oak and hickory species, mountain laurel, poison ivy, and summer grape. The height of the canopy species ranges from 16.4 to 65.6 feet (5 to 20 meters). The shrub layer is usually sparse and the herbaceous layer is usually sparse to absent (NPS 2007b, 343–345).

Oak/Birch Talus Forest: In areas where vegetation cover is greater than 50% on talus slopes, the vegetation is considered oak/birch talus forest. Oak/birch talus forests can be found on the southeastern-facing parts of the Kittatinny Ridge, where the sandstone boulders are large and coarse with only small amounts of soil rock crevices. Oak/birch talus forests differ from sandstone talus in that the canopy cover ranges from 50% to 80% and the height of the canopy could reach 49.2 to 98.4 feet (15 to 30 meters). The dominant canopy cover is black birch, particularly in the less stable areas of the talus, although chestnut oak is also characteristic in the canopy. Other oaks, hickory, and two pine species, white pine and pitch pine, are also occasionally found in the canopy. Shrub species include American witch-hazel and mountain laurel, with early lowbush blueberry and other berry species in the shorter shrub layer. Poison ivy, Virginia creeper, and other vines grow on the boulders; however, the herbaceous layer tends to be barren (NPS 2007b, 197–199).

NATURAL HERITAGE SITES

Natural heritage sites are areas identified by PNHPs and NJNHPs as being significant natural areas that support species of special concern, exemplary natural communities, or larger areas supportive of the biodiversity of native species within the state. Inventories of these sites have helped to provide information on special-status species and natural communities threatened by extinction on a local or global level, and have helped to develop management and protection guidelines for these sites.

Acidic Broadleaf Swamps

Acidic broadleaf swamps are characterized by a tall shrub layer of highbush blueberry, with associate species of swamp azalea, red maple, and maleberry. The canopy is sparse, with a cover of less than 10%. Canopy species could include pitch pine, red maple, and black spruce. These communities are bog-like and the vegetation grows on organic soils, often on a floating mat (NPS 2007b, 251–254).

Totts Gap Swamp: The Totts Gap Natural Heritage Site is composed of Totts Gap and Totts Gap Swamp, both ranked as 5 in Northampton County, indicating that the two sites are the lowest priority for protection (PATNC 2005a, 43). Totts Gap Swamp is an acidic broadleaf swamp. The canopy is dominated by black gum, red maple, and yellow birch, with a fairly open canopy. The understory is dense, and dominated by great laurel, spicebush, winterberry, and highbush blueberry. The swamp is known to contain a Pennsylvania proposed threatened plant species, which is found along the edge of the swamp (PATNC 2005a, 131).

Rocky Summit Outcrops

Rocky summit outcrop communities are dominated by low shrubs with grasses, sedges, and a few herbaceous species forming a secondary component. These communities are open areas found on rocky summits of hills and mountains where bedrock is exposed, where vegetation is confined to cracks in the rocks or to areas of shallow soil between the rock outcrops. Vegetation in these communities can include scrub oak, blueberry varieties, pitch pine, and oaks (Commonwealth of Massachusetts [Commonwealth of MA] 2007, 1–2).

Totts Gap: The Totts Gap Natural Heritage Site is composed of Totts Gap and Totts Gap Swamp, both ranked as 5 in Northampton County, indicating that the two sites are the lowest priority for protection (PATNC 2005a, 43). The vegetation along the ridge of Totts Gap is generally shrubby in rocky summit outcrop areas, which are xeric in nature. These outcroppings are dominated by scrub oak, blueberry, black huckleberry, and black chokeberry. Interspersed within the shrubby vegetation, a few pitch pines can be found. The herbaceous layer includes hairgrass, little bluestem, and dewberry. Populations of a

Pennsylvania state-threatened plant species and a proposed Pennsylvania state-threatened plant species can be found within Totts Gap (PATNC 2005a, 131).

Circumneutral Broadleaf Swamps

Circumneutral broadleaf swamps are also known as buttonbush wetlands. These wetlands experience prolonged or semipermanent flooding throughout most of the growing season. The wet areas are dominated by buttonbush (*Cephalanthus occidentalis*). Other shrub species could include highbush blueberry, silky dogwood, and red maple seedlings. The tree canopy may reach 25% coverage and canopy species could include sugar maple and pin oak (NPS 2007b, 247–250).

Bear Swamp: Bear Swamp is part of the Minsi Lake Corridor, which also contains Minsi Lake vernal pools. This corridor represents a collection of forestlands and other natural areas that link and protect valuable wildlife habitat spanning several thousand acres. Bear Swamp is a circumneutral broadleaf swamp natural community that lies in two separate lobes along two separate tributaries of Martins Creek and occupies approximately 200 acres (PATNC 2005a, 31).

Ephemeral/Fluctuating Natural Pools

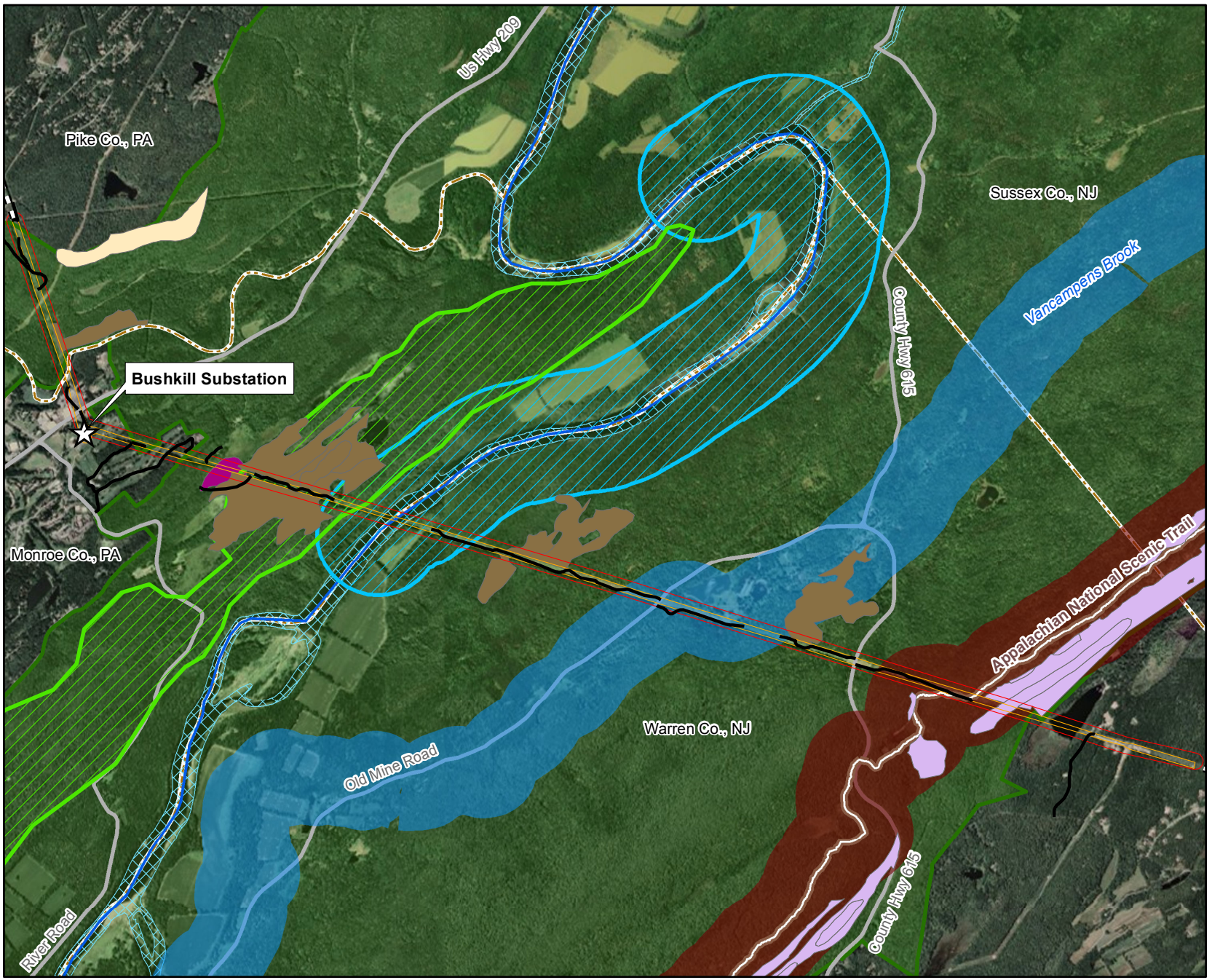
Vernal pools or ephemeral/fluctuating wetlands are natural wet areas that contain water during fall, winter, and spring months, but dry out during the summer due to evaporation. Because of the absence of water in the summer, these pools do not support fish species, but they do provide important breeding grounds for a number of amphibian species. Several special-status salamanders rely on ephemeral wetlands for metamorphosis from larva to adult (Indiana University–Purdue University Fort Wayne 2011, 1–2).

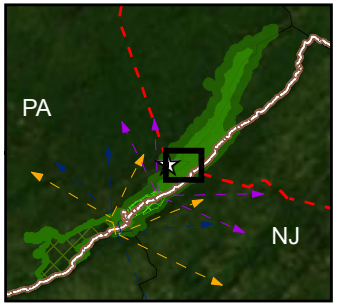
Minsi Lake Vernal Pools: The Minsi Lake vernal pools, together with Bear Swamp (described above), compose the Minsi Lake Corridor. The vernal pools contain a collection of more than 100 ponds of varying sizes scattered throughout several hundred acres of dry–mesic forest, as well as several streams and springs (PATNC 2005a, 128). The varied habitats of the Minsi Lake Corridor support a wide range of both plant and animal species, including those that are adapted to a dry phase, as the vernal pools dry up each fall (TNC 2011a). These varying wet areas support diverse plant species and create excellent breeding habitat for amphibians, including marbled and spotted salamanders. The Minsi Lake Corridor contains one of the largest collections of vernal pools in Pennsylvania (TNC 2011b). Additionally, the Minsi Lake vernal pools combined with Bear Swamp include some of the most extensive forests remaining within Northampton County, Pennsylvania, and could be used by forest-interior breeding species such as the cerulean warbler (PATNC 2005a, 128).

Alternative 1 (No Action), Alternative 2, and Alternative 2b

The alignment for alternatives 1, 2, and 2b would intersect three park-managed outstanding natural features (Arnott Fen, Hogback Ridge, and Kittatinny Ridge), and five rare and unique vegetation communities (Delaware River riparian corridor, hemlock forests, lichens, talus slopes, and Van Campen Brook riparian area) (table 21; figures 43 and 44).

The alignment for alternatives 1, 2, and 2b would pass directly through Arnott Fen and would bisect Hogback Ridge; these two communities are only present within the alignment for alternatives 1, 2, and 2b.





Legend

- Substation
- Outside Study Area
- Existing ROW in Study Area
- 350 ft Corridor
- Appalachian National Scenic Trail
- Delaware River
- Road
- Delaware Water Gap National Recreation Area
- Middle Delaware National Scenic and Recreational River
- County Line

Rare and Unique Communities

- Arnott Fen
- Delaware River Riparian Corridor
- Eastern Hemlock Forests
- Hogback Ridge Woodlands
- Kittatinny Ridge
- Shoemakers Barren Natural Hertitage Site
- Talus Slopes
- Vancampens Brook

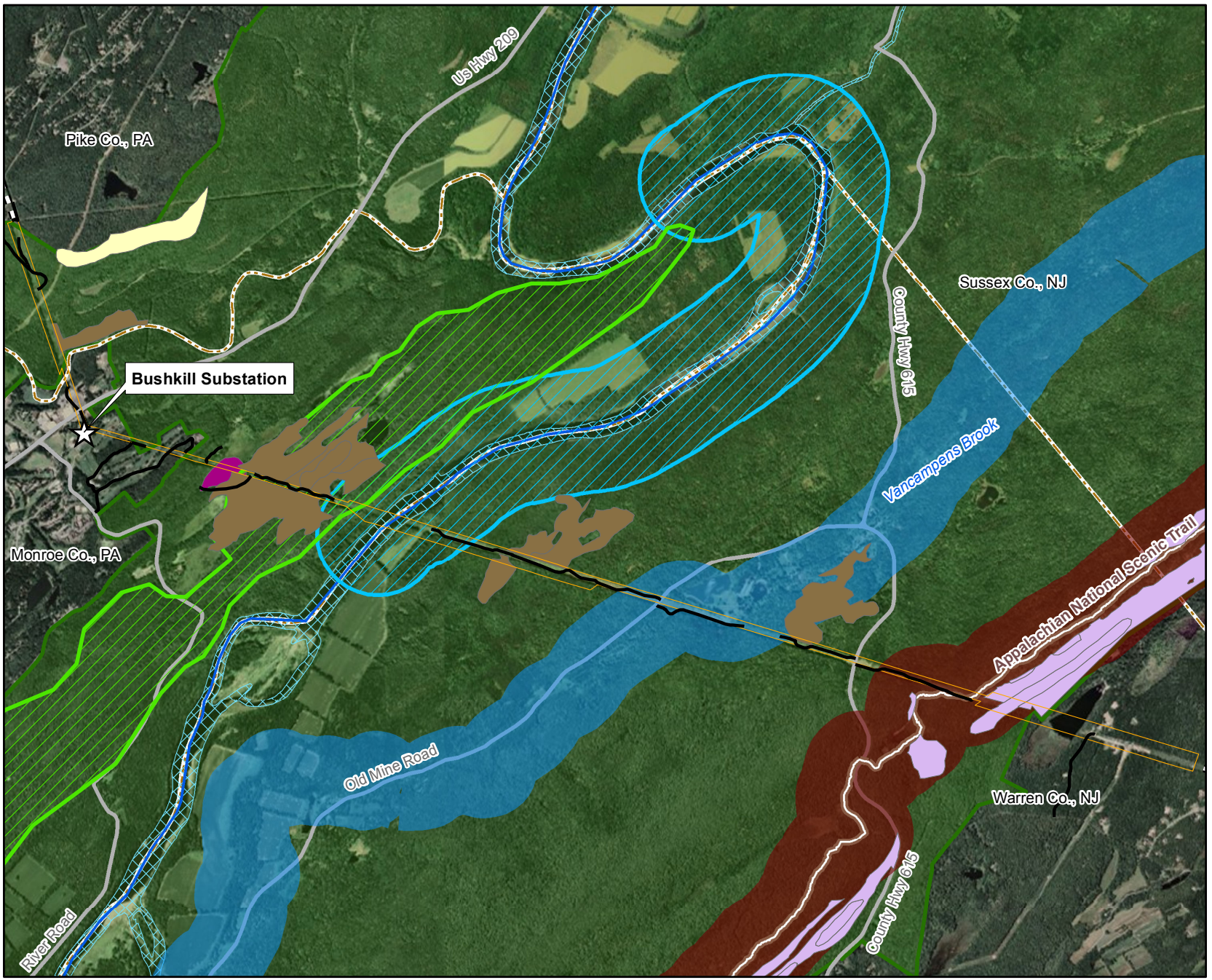
0 1,500 3,000
Feet

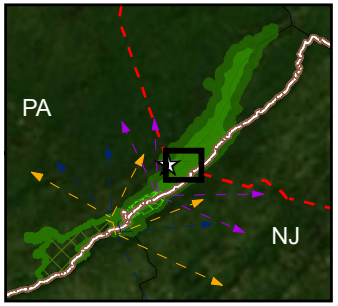
Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 43
Alternative 2 Rare and Unique Communities

Source: ESRI Streetmap 2006, Penn State 2010, ESRI ArcGISonline Map Service 2010, PennDOT 2011, USGS 2006, NJ DEP 2008

Projection: NAD 83 UTM Zone 18N
Date: October, 2011





Legend

- Substation
- Outside Study Area
- Alternative 2b Corridor
- Appalachian National Scenic Trail
- Delaware River
- Road
- Delaware Water Gap National Recreation Area
- Middle Delaware National Scenic and Recreational River
- County Line

Rare and Unique Communities

- Arnott Fen
- Delaware River Riparian Corridor
- Eastern Hemlock Forests
- Hogback Ridge Woodlands
- Kittatinny Ridge
- Shoemakers Barren Natural Hertitage Site
- Talus Slopes
- Vancampens Brook

0 1,500 3,000
Feet

Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 44
Alternative 2b Rare and Unique Communities

Source: ESRI Streetmap 2006, Penn State 2010, ESRI ArcGISonline Map Service 2010, PennDOT 2011, USGS 2006, NJ DEP 2008

Projection: NAD 83 UTM Zone 18N
Date: July 2012

Four hemlock forest types are found along alternatives 1, 2, and 2b: eastern hemlock forests, eastern hemlock/northern hardwood forests, dry eastern hemlock/oak forests, and eastern white pine forests. Hogback Ridge is composed mostly of eastern hemlock/northern hardwood forests and also contains dry oak/eastern hemlock forests. Eastern hemlock/northern hardwood forests are found within the Van Campen Brook riparian area in New Jersey. Eastern hemlock/northern hardwood forests and eastern white pine forests are found in an undisturbed area between the Upper and Lower Hamilton Trails. The eastern hemlock forest type is found north of the Bushkill Substation along the banks of Big Bushkill Creek.

Lichens are found throughout the alignment for alternatives 1, 2, and 2b. In a 2005 survey of the lichens in the Pennsylvania side of DEWA, 209 species were collected (Harris and Lendemer 2005, 1). Of these, 133 species were collected from two locations on Hogback Ridge. On a follow-up survey a year later, the survey sites were revisited and 35 new species were collected at one site and 89 new species were collected at the second (Harris and Lendemer 2006, 69–75). Several of the species collected during these surveys were new to science and new to North America (Harris and Lendemer 2005, 1).

The alignment for alternatives 1, 2, and 2b would cross Van Campen Brook and Delaware River riparian corridors. This alignment is the only one that would run along Van Campen Brook and cross it. The Delaware River riparian corridor supports bald eagles, providing foraging, nesting, and roosting habitat. The alignment runs between a communal bald eagle roost and foraging habitat. During the winter, the riparian corridor is used by bald eagles for foraging, because the river provides open water that is free from ice (NPS 2009g, 5).

The alignment for alternatives 1, 2, and 2b would cross Kittatinny Ridge, which contains both sandstone talus and oak/birch talus. The sandstone talus plant community is found on the steep southern and southeastern slopes of the Kittatinny Ridge in coarse, sandstone-based talus. Oak/birch talus can be found on the southeastern-facing parts of the Kittatinny talus, where the sandstone boulders are large and coarse with only small amounts of soil rock crevices (NPS 2007b, 197).

Alternative 3

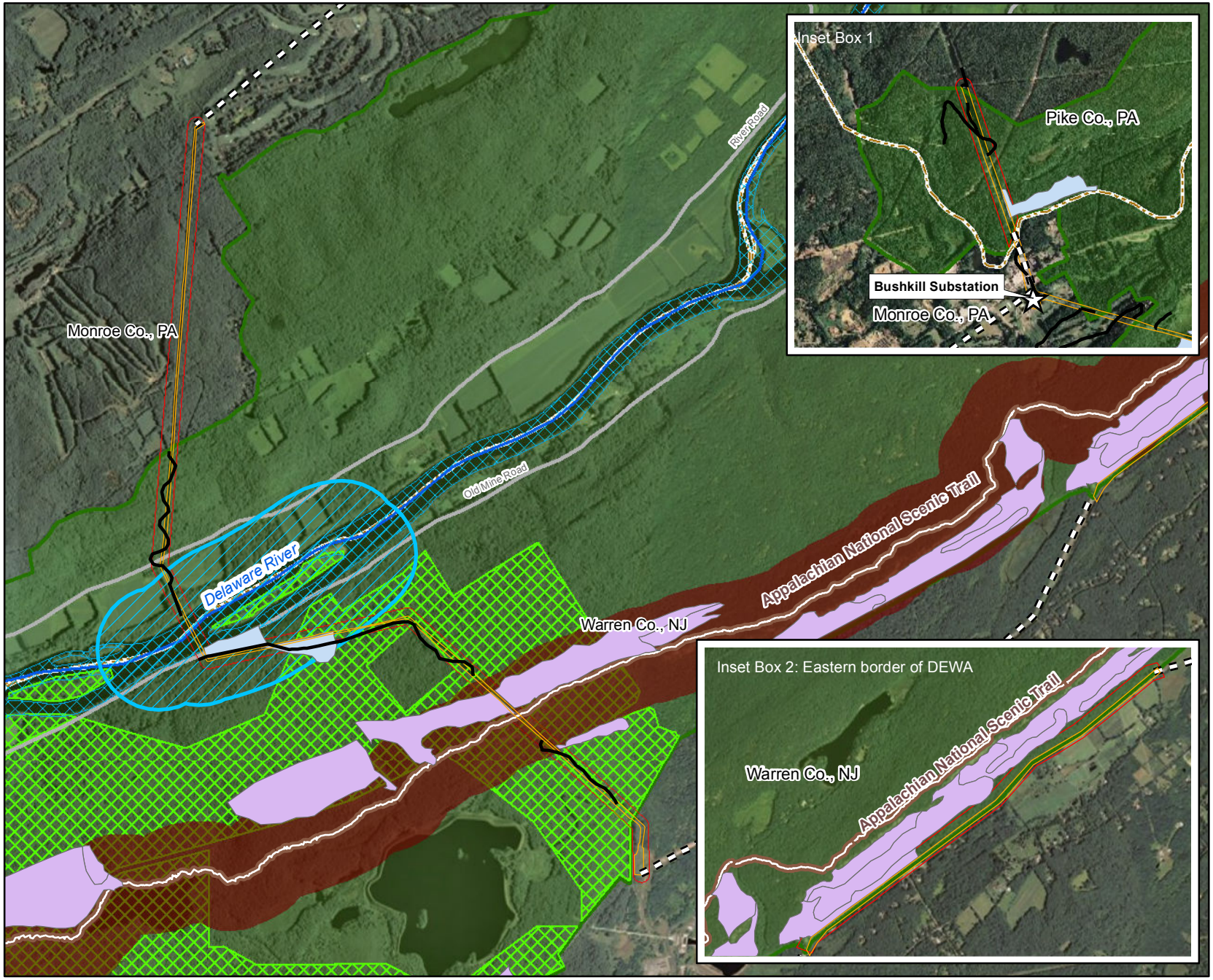
The alternative 3 alignment would intersect one park-managed outstanding natural feature (Kittatinny Ridge), four rare and unique vegetation communities (Delaware River riparian corridor, hemlock forests, lichens, and talus slopes), and one natural heritage site (Shoemakers Barren) inside the study area (table 21; figure 45).

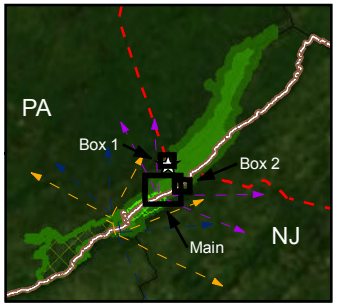
Three types of forests containing eastern hemlocks are found along the alternative 3 corridor: eastern hemlock/northern hardwood, dry eastern hemlock/oak, and eastern hemlock forests. The first two forest types are just west of the Delaware River in New Jersey adjacent to the ROW. Eastern hemlock forests grow along Big Bushkill Creek in this area, as described under alternatives 1, 2, and 2b.

The alternative 3 alignment would cross the Delaware River riparian corridor approximately 5 miles south of alternatives 1, 2, and 2b. The riparian area supports migratory and resident birds by providing foraging and nesting habitat; however, this portion of the Delaware River riparian corridor does not contain a bald eagle winter roost.

Lichens are expected to be found throughout the habitats along the alternative 3 alignment; however, the quantity and number of unique species would likely be less than that found within Hogback Ridge.

The alternative 3 alignment would cross Kittatinny Ridge within DEWA. This portion of the alignment would traverse oak/birch talus forest near APPA. Both oak/birch talus forest and sandstone talus are found in the portion of the alternative 3 alignment that travels parallel to APPA along the DEWA boundary.





Legend

- Substation
- Outside Study Area
- Existing ROW in Study Area
- 350 ft Corridor
- Appalachian National Scenic Trail
- Delaware River
- Proposed Access Road
- Road
- Delaware Water Gap National Recreation Area
- Worthington State Forest
- Middle Delaware National Scenic and Recreational River
- County Line

Rare and Unique Communities

- Delaware River Riparian Corridor
- Eastern Hemlock Forests
- Kittatinny Ridge
- Talus Slopes

0 1,500 3,000
Feet
Scale applies to main frame and inset maps

Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 45
Alternative 3 Rare and Unique Communities

Source: ESRI Streetmap 2006, Penn State 2010, ESRI ArcGISonline Map Service 2010, PennDOT 2011, USGS 2006, NJ DEP 2008

Projection: NAD 83 UTM Zone 18N
Date: July, 2012

Alternative 4

Inside the study area, the alternative 4 alignment would intersect one park-managed outstanding natural feature (Kittatinny Ridge), three rare and unique vegetation communities (hemlock forests, lichens, and talus slopes), and three natural heritage sites (Totts Gap, Minsi Lake vernal pools, and Bear Swamp) (table 21; figure 46).

The alternative 4 alignment would encounter hemlock forests where the alignment follows the B-K Line, as described for alternatives 1, 2, and 2b. Lichens are expected to be present along the alternative 4 alignment. Because the alignment is situated along the edge of DEWA and is more disturbed by development, the lichen flora is expected to be less diverse and plentiful than that found along Hogback Ridge as described for alternatives 1, 2, and 2b. The alternative 4 alignment would cross Kittatinny Ridge and a small portion of oak/birch talus forest habitat. This talus habitat is east of APPA; sandstone talus is not found along the alternative 4 route.

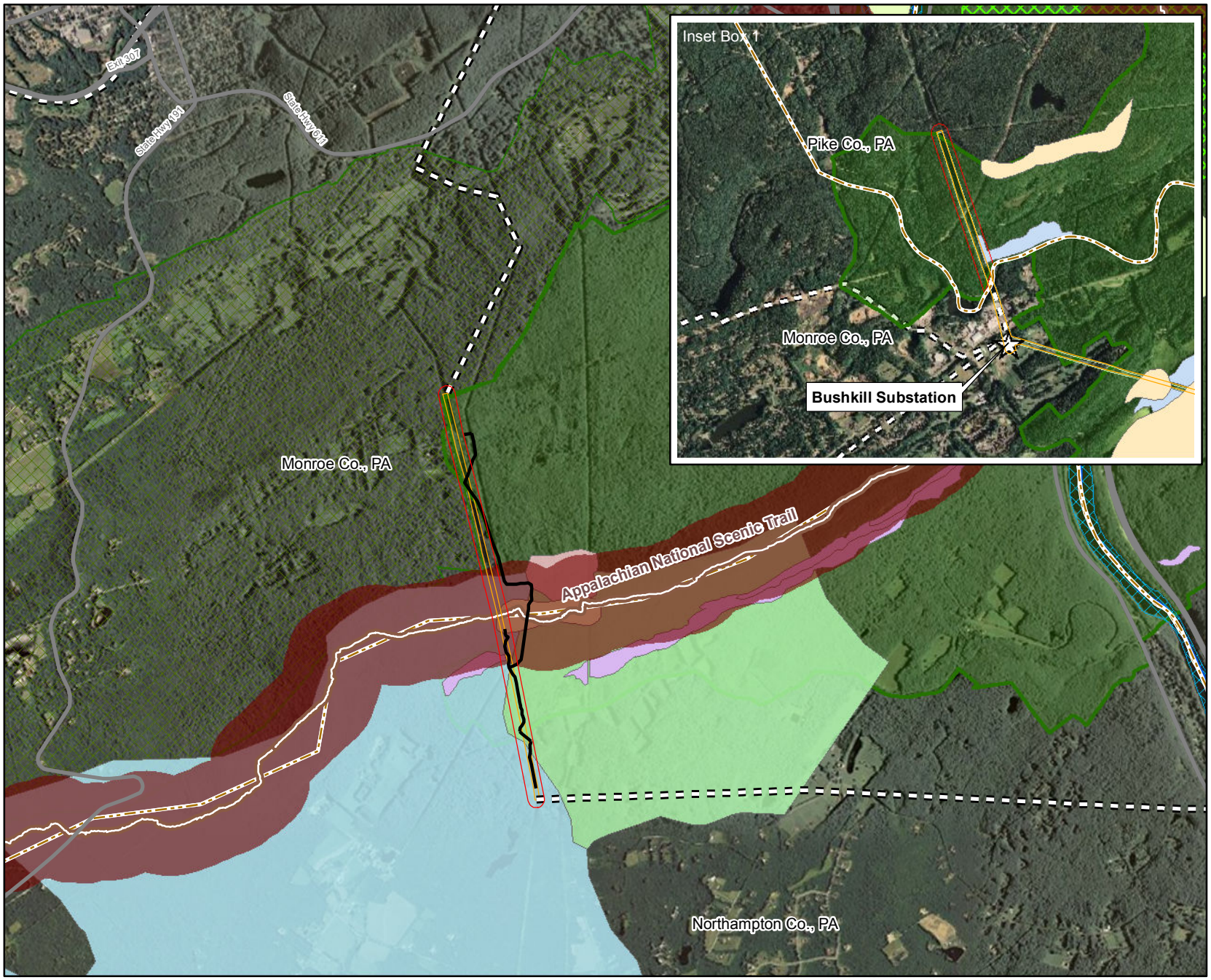
The southern half of alternative 4 within the study area crosses Totts Gap Natural Heritage Site and the Minsi Lake Corridor, which contains Minsi Lake vernal pools and Bear Swamp. These communities abut one another in the southernmost portion of DEWA and the alignment crosses the outermost edges of both (figure 46). These communities support state-listed plant species, as well as sensitive wildlife species.

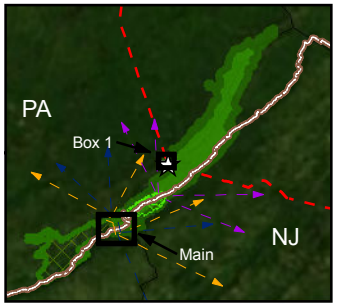
Alternative 5

Inside the study area, alternative 5 would follow the same route through DEWA and APPA as alternative 4 except it would not include any portion of the B-K Line. Therefore, alternative 5 would intersect one park-managed outstanding natural feature (Kittatinny Ridge), two rare and unique vegetation communities (lichens and talus slopes), and three natural heritage sites (Totts Gap, Minsi Lake vernal pools, and Bear Swamp) (table 21; figure 46). The conditions of these communities are the same as those described for alternative 4.

Outside the Study Area

From the study area to the Susquehanna Substation, the S-R Line could pass through Carbon, Lackawanna, Luzerne, Monroe, Northampton, Pike, and Wayne counties in Pennsylvania. These counties contain 58 different types of rare and unique habitats, including a variety of wetlands, barrens, and rocky summits (PNHP 2010e). The rare and unique communities of these seven Pennsylvania counties and their state ranks are presented in appendix G. Rare and unique communities identified by the PNHP range from demonstrably stable to critically imperiled. Pike County contains 26 rare and unique communities, the largest number of any of the counties within the project vicinity in Pennsylvania; Lackawanna County contains the least, with 12 rare and unique community types. Two communities in Pennsylvania are also ranked globally: shrub fen is ranked as globally vulnerable to globally imperiled, and the northern Appalachian calcareous rocky summit community is listed as potentially globally imperiled (PNHP 2010e). The Pennsylvania Science Office of TNC has identified the outstanding or critical natural features in a series of natural area inventory reports. For the counties that may be affected by the S-R Line, the number of outstanding natural features range from 54 in Lackawanna County to 122 in Luzerne County (PATNC 1990, 1991a, 1991b, 1998, 1999, 2005a, 2005b, 2006). The outstanding natural features are presented in appendix G. Additionally, 11 preserves protected by TNC are within the counties that could be involved with the S-R Line outside the study area and are presented in appendix G-8 (TNC 2011c).





Legend

- Substation
- Outside Study Area
- Existing ROW in Study Area
- 350 ft Corridor
- Appalachian National Scenic Trail
- Proposed Access Road
- Delaware Water Gap National Recreation Area
- CVNWR Boundary
- Middle Delaware National Scenic and Recreational River
- County Line

Rare and Unique Communities

- Kittatinny Ridge
- Shoemakers Barren Natural Heritage Ste
- Talus Slopes
- Totts Gap

TNC Designations

- Minsi Lake/Bear Swamp
- Totts Gap
- Totts Gap Swamp

Note: Designated boundary of CVNWR is depicted, not all property is owned within the boundary

0 1,500 3,000
Feet
Scale applies to main frame and inset maps

Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 46
Alternative 4/5 Rare and Unique Communities

Source: ESRI Streetmap 2006, Penn State 2010, ESRI ArcGISonline Map Service 2010, PennDOT 2011, USGS 2006, NJ DEP 2008

Projection: NAD 83 UTM Zone 18N
Date: July, 2012

Outside the study area to Roseland Substation, the S-R Line would traverse Sussex, Warren, and Morris counties on its route from the study area to the Roseland Substation in New Jersey; these counties contain 20, 10, and 4 rare and unique communities, respectively. The NJNHP has identified these communities as ranging from rare or vulnerable to critically imperiled for the state of New Jersey, and many are ranked as very rare globally (NJDEP 2008b, 2008c, 2008d). NJDEP has identified critically important habitat or natural heritage priority sites in Sussex, Warren, and Morris counties. There are 80 natural heritage priority sites in Sussex County, 39 in Warren County, and 22 in Morris County (NJDEP 2007). The outstanding natural features are presented in appendix G. In addition, there are eight preserves owned by TNC that could be encountered in Sussex, Warren, and Morris counties in New Jersey, which are presented in appendix G-8 (TNC 2010).

Depending on the route chosen, the transmission line could encounter one or more of these rare or unique communities, TNC preserves, or natural heritage site communities outside the study area in Pennsylvania and New Jersey.

ARCHEOLOGICAL RESOURCES

This section identifies potential archeological resources that could be affected by the S-R Line. Archeological sites are defined as follows:

> A site is the location of a significant event, a prehistoric or historic occupation or activity, or a building or structure, whether standing, ruined, or vanished, where the location itself maintains historical or archeological value regardless of the value of any existing structure. (36 CFR § 60.3[l])

Further, an archeological resource is a site that has been recognized by the NPS or, pending agency review, could be recognized by the Pennsylvania State Historic Preservation Office (SHPO) or the New Jersey Historic Preservation Office (NJ HPO) as historically and archeologically important and worthy of preservation. Sites include those that meet the eligibility requirements of the National Register of Historic Places (National Register) (36 CFR § 60.4) but can include other properties as well.

The affected environment for archeological resources is defined with reference to the implementing regulations of section 106 of the National Historic Preservation Act of 1966 (NHPA). Under section 106, the affected environment is referred to as the area of potential effects (APE), which is defined as follows:

> Area of potential effects means the geographic area or areas within which an undertaking may directly or indirectly cause changes in the character or use of historic properties, if any such properties exist. The area of potential effects is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking (36 CFR § 800.16[d]).

The federal undertaking for the S-R Line is the granting of permits requested by the applicant.

The S-R Line would involve the regular placement of new towers and intervening electrical transmission lines within identified alternative alignments. Because these features are large in scale and readily visible from great distances, they would have visual impacts on historic properties within the Delaware River valley. Therefore, within the park boundary, the NPS defined an APE that extends 8 miles laterally from each proposed alternative alignment. Outside the park boundary, the NPS defined an APE that extends 0.5 mile laterally from each proposed alternative alignment. The width of the APE is governed by VSLs, points where established alignment segments within the park meet one or more speculative segments that extend to the Susquehanna Substation to the west or Roseland Substation to the east (see appendix M,

figures M-1, M-2 and M-3). The archeology studies focused in areas of proposed ground disturbance, inside the ROW and within access roads.

The entire range of prehistory, from the Paleo-Indian period to the Late Woodland period (approximately 10,500 BC–AD 1600) is represented in the archeological record of DEWA, as well as many proto-historic and historic period sites. Archeological sites in and near the APE were identified in two stages. First, archeologists conducted a Phase IA-level investigation, including existing background publications, documents, and digital information. Sources included NPS GIS information, Pennsylvania SHPO files and NJ HPO files. These data helped to determine the presence and location of previously identified sites and resources, as well as where archeologists might most likely find sites. This research revealed that while numerous historic and prehistoric sites have been recorded on both the Pennsylvania and New Jersey sides of the Delaware, none have been found to be directly within the bounds of the transmission line alternatives. This is because systematic field survey of the transmission line corridors had not been conducted, and the other ways sites are discovered (plowing, erosion, illegal digging, etc.) had not occurred, either.

Subsequently, archeologists conducted a Phase IB archeological survey along all the alignments for alternatives 2 and 2b (Berger 2010b), 3, 4, and 5 (JMA 2011). Archeologists did not survey a short segment of the alternative 3 alignment within the Worthington State Forest due to lack of clearance from the New Jersey DEP. The Phase IB survey involved the hand excavation of shovel test units within the alternative ROWs on areas of high probability (low slope) and surface observation of areas of low probability (slope greater than 15 degrees).

There was a significant difference between the amount of testing on alternative 2/2b and the other alternatives. Because the applicants had substantially determined tower locations, crane pad locations, and the access routes to and from the ROW, they were able to direct Berger archeologists to survey those locations, as well as substantial portions of the APE within the alternative 2/2b ROW. In addition, Phase II archeological evaluation, consisting of hand-excavated units, was conducted on sites identified in Phase I identification surveys. Geophysical trenching took place for alternatives 2 and 2b adjacent to the Delaware River in areas where deeply-buried sites may be present. Because only general construction information is available for the other alternatives, archeologists only conducted centerline testing for alternatives 3, 4, and 5. In both cases, if additional, more specific construction documents are developed, additional Phase I testing may be required to comply with Archaeological Resources Protection Act and NHPA, along with Phase II and Phase III eligibility determinations and mitigation. The APE for archeological resources would not change for any of the alternatives regardless of additional specific construction documents. Archeologists discovered sites on all alternatives, as shown in table 22.

TABLE 22: SUMMARY OF IDENTIFIED ARCHEOLOGICAL SITES WITHIN THE STUDY AREA

Classification	Alternatives					
	1	2	2b	3	4	5
National Register listed	0	0	0	0	0	0
National Register eligible	2	2	2	0	0	0
Unevaluated	0	0	0	1	1	1

ALTERNATIVE 1 (NO ACTION), ALTERNATIVE 2, AND ALTERNATIVE 2B

The intensive Phase I survey identified 25 archeological sites along the alignment for alternatives 1, 2, and 2b that were within the APE. Of these 25 sites, two sites within the APE have the potential to be affected; one site contained both prehistoric and historic components, and the second site contained

prehistoric components only. The applicants have asserted that the remainder would not be affected by construction activities (Berger 2010b) by using strategies of avoidance and/or non-ground-disturbing construction techniques. Phase II archeological investigations at both sites resulted in a recommendation of National Register eligibility for the prehistoric components.

ALTERNATIVE 3

One historic period site was identified along the alternative 3 alignment, on the Pennsylvania side of the river. The site consisted of a cellar hole and an associated surface feature. Artifacts recovered totaled 273. Artifact typology indicates a date range of approximately 1829–1895. The site deposits appear reasonably intact and display good integrity.

ALTERNATIVE 4

One prehistoric site was identified. The site assemblage consists of 46 black chert flakes and shatter. The site is adjacent to a wetland area and appears to be intact, displaying good archeological integrity. Archeologists uncovered no temporally or culturally diagnostic artifacts. Phase II excavations have not been conducted to determine the site's eligibility for the National Register.

ALTERNATIVE 5

The archeological resources along the alternative 5 alignment are the same as those described for alternative 4, because none were identified along the B-K Line portion of the alternative 4 alignment.

HISTORIC STRUCTURES

This section identifies specific historic structures that could be affected by the S-R Line. Historic structures are defined to include buildings, districts, and structures that have been recognized by NPS as listed or eligible for listing in the National Register (36 CFR § 60.4) or, pending agency review, could be recognized by the Pennsylvania SHPO or NJ HPO as eligible for listing in the National Register. Historic structures do not include sites of demolished buildings, districts, or structures.

The affected environment for historic structures is defined with reference to the implementing regulations of section 106 of the NHPA. Under section 106, the affected environment is referred to as the APE (see "Archeological Resources" for the definition of an APE under section 106 and the description of the APE for this analysis). NPS policy states that eligible structures are to be treated in the same manner as listed structures.

Researchers identified historic structures in several ways, depending on their locations. For portions of the APE associated with alternatives 1, 2, and 2b, information was drawn from the results of the cultural landscape investigation and the historic architecture eligibility report (Jacobs et al. 2011; Berger 2012). For portions of the APE associated with alternatives 3, 4, and 5 within the park boundary, where considerable previous surveys had occurred, researchers consulted the DEWA inventory of historic structures. This inventory included a GIS layer and database. The GIS layer contained points identifying the location of each identified resource, and the database contained standardized information about the identity, location, status, type, and age of each resource. For portions of the APE associated with alternatives 3, 4, and 5 outside the park boundary, where little or no previous investigation had occurred, field staff conducted a reconnaissance survey to determine the presence of buildings, districts, and structures that appeared to meet the 50-year age consideration of the National Register. Researchers also

reviewed the Pennsylvania SHPO and NJ HPO survey files to determine the presence and location of previously-identified historic structures (Clark et al. 2011).

The number and distribution of identified historic structures are summarized by National Register status and project alternative in table 23. The identified historic structures are listed by name in chapter 4, along with the determination of effects. Because the APEs for various alternatives intersect, some historic structures are represented more than once in table 23. Regarding National Register status, "listed" indicates that a historic structure is listed on the National Register, "eligible" indicates that either the historic structure has been formally determined to meet National Register requirements or the SHPO or NPS has issued an opinion that the historic structure meets at least one of the National Register eligibility criteria, and "undetermined" indicates that the historic structure has not been evaluated for listing on the National Register.

TABLE 23: SUMMARY OF IDENTIFIED HISTORIC STRUCTURES

National Register Status	Alternatives					
	1	2	2b	3	4	5
Listed/eligible	36	36	36	33	9	9
Undetermined	0	0	0	28	15	15
Total	36	36	36	61	24	24

CULTURAL LANDSCAPES

In this identification and analysis of cultural landscapes there is an application of definitions of the small and easily recognizably individual cultural landscapes that are found within the three park areas. However, DEWA, including the portion of APPA found within it and the MDSR together constitute a cultural landscape. They encompass the Delaware River Valley with all of its architecture, history, pre-history, and traditions and significant natural resources around which that culture is built. DEWA represents the larger cultural landscape containing the smaller component landscapes identified as affected environments. This single large cultural landscape made up of many individual cultural landscapes is the context for the affected environment and the related analysis of impacts.

The proposed project includes the regular placement of new towers and intervening electrical transmission lines within identified alternative alignments. Because these features are large in scale and readily visible from great distances, they would have physical as well as visual effects on the larger cultural landscape of the Delaware Valley, the Delaware River, APPA, historic roads, and the property corridors that surround the roads and historic districts. Action alternatives will also affect the smaller component cultural landscapes that reflect the larger settlement patterns of the valley and are the setting for farmsteads, mining sites, campsites, and resorts and their associated historical features. A cultural landscape could be determined to be eligible for the National Register, but could also be determined not eligible.

The affected environment for cultural landscapes is defined with reference to the implementing regulations of section 106 of the NHPA. Under section 106, the affected environment is referred to as the APE (see the "Archeological Resources" section for the definition of an APE under section 106 and the description of the APE for this analysis). NPS policy states that eligible landscapes are to be treated in the same manner as listed landscapes.

DELAWARE WATER GAP NATIONAL RECREATION AREA

The Upper Delaware Valley, between the Delaware Water Gap and Port Jervis, New York, is located in a geomorphic zone known as the Appalachian Ridge and Valley Province. This zone runs in a northeast-to-southwest direction. The valley geology and geography determined communication networks, affected settlement patterns, and created scenic beauty. The Upper Delaware Valley contains cultural landscapes that reflect the American past. The valley still reflects the setting, feeling, and association of the earliest periods of habitation into the twenty-first century. The earliest known settlement of the area was in 8000 BCE by American Indians. European settlement in the seventeenth century to the twentieth century created impacts that changed the River Valley landscape; these established patterns remain substantially intact and are part of the ongoing process of landscape continuity and change. The overall cultural landscape of DEWA is a combination of significant natural and cultural resources (NPS 1993b, 1996; JMA 2011).

Cultural landscapes can range from thousands of acres of rural tracts of land to small homesteads on less-than-one-acre lots. Cultural landscapes also include historic roads, trails, and river corridors and the associated properties on either side. Like historic buildings and districts, these special places reveal aspects of our country's origins and development through their forms and features and the ways they were used. Cultural landscapes are significant historic resources that reveal information about places that have been part of the everyday lives of successive generations of people (NPS 1996; JMA 2011).

For the purposes of planning and management of cultural resources, *Preservation Brief 36: Protecting Cultural Landscapes, Planning, Treatment and Management of Historic Landscapes* defines a cultural landscape as follows:

> A geographic area, including both cultural and natural resources and the wildlife or domestic animals therein, associated with a historic event, activity, or person or exhibiting other cultural or aesthetic values. (NPS 1994)

Overall, APPA has been determined eligible for listing on the National Register in its entirety and is listed in New Jersey both as a structure and as a cultural landscape. Recent discussions with the Pennsylvania SHPO have suggested that DEWA and MDSR should be evaluated as a singular cultural landscape based on their historical importance in defining the environmental movement in the United States and role in mobilizing people to oppose the damming of the Delaware River, as well as the push by the US Government in the 1960s to the increase the availability and improve the quality of outdoor recreation for citizens and visitors (Safley pers. comm. 2011).

In addition to the parks as unified cultural landscapes, DEWA, MDSR, and APPA are complex in nature, possessing a number of interrelated cultural landscape components and features that could be affected by the proposed transmission lines and corridors. The park units are the large cultural landscapes that form the context for the associated smaller component landscapes, which are best described as historic vernacular landscapes. *Preservation Brief 36* defines a vernacular landscape as follows:

> A landscape that evolved through use by the people whose activities or occupancy shaped that landscape. Through social or cultural attitudes of an individual, family or a community, the landscape reflects the physical, biological and cultural character of those everyday lives. Function plays a significant role in vernacular landscapes. They can be a single property such as a farm or a collection of properties such as a district of historic farms along a road or a river valley. (NPS 1994)

The larger landscapes as well as the component landscapes and road corridors have been documented and evaluated as cultural landscapes and many are either currently in the National Register or found to be eligible for listing in the National Register for contributions to the broad patterns of American history. Numerous landscape resources and features that survive include waterways, landforms and topography, historic roads and road traces, vegetation and agricultural use patterns, outbuildings, farm support structures, houses, recreational features, camp structures, cemeteries, and fence rows. Eligible cultural landscapes sometimes even include nonhistoric (not eligible for the National Register) elements, such as buildings, structures, and landscapes features, that do not contribute to the cultural landscape.

In the 1987 GMP for DEWA, goals were identified for the preservation of cultural landscapes, including the Old Mine Road, APPA, and other historic component landscapes and sites. The GMP states:

> Cultural landscapes will be retained by keeping vegetation and agricultural use patterns near historic structures. Outbuildings, farm support structures, and fence rows will be kept wherever possible to maintain farmsteads and existing landscape configurations. Proposed treatment levels for related structures will depend on their physical condition and the potential need of a structure for agricultural purposes or adaptive uses. Based on the contribution of all features, individual structures could either be kept, or recorded and removed, with their component pieces being used for salvage materials to restore other historic properties.
>
> Many old but nonhistoric structures and features contribute to the cultural landscape of the Delaware Valley. The landscape as a whole, as well as the individual features, will be evaluated as part of the area's landscape management plan to determine whether it is eligible for nomination to the National Register as a rural historic district.
>
> The Old Mine Road, Appalachian National Scenic Trail, and other historic component landscapes and sites will be used for interpretation of historic development and growth of the area, as well as for recreational purposes such as hiking and scenic driving. Any actions that will affect the road or trail and their respective corridors will have to meet requirements for preserving their historical and cultural integrity. (NPS 1987)

Subsequent to the GMP, other studies of historic resources including cultural landscapes were developed by NPS and include the *Preliminary Historic Resource Study* (NPS 1996) and the *Draft Rural Landscape Management Plan* (NPS 1993b). Both studies identified and described the cultural landscape resources under primary areas of historic significance and considered surviving landscape patterns as dominant features. From 1995 to 2005, the park completed comprehensive cultural landscape inventories to evaluate the historic significance and integrity of its 70,000-acre rural landscape. Preliminary integrity determinations were made, and the park's cultural landscape inventory team recognized that consistent and repeating land use patterns were intact throughout the entire valley and were undoubtedly highly significant cultural landscape characteristics.

Within the APE for cultural landscapes, sites were identified in the 1987 GMP, the subsequent resource studies, and the cultural landscape inventory database for DEWA. Other sites were also identified by NPS staff and field checked as potential cultural landscapes.

APPALACHIAN NATIONAL SCENIC TRAIL

All the action alternatives have the potential to affect APPA, which is eligible for the National Register. The entire corridor of the trail is considered for this topic as a cultural landscape, which is consistent with

the NPS description of APPA in the DEWA GMP. The trail is listed as a culturally significant property within DEWA and is described in the GMP as follows:

> Appalachian Trail, N.J. – Local: In addition to its scenic qualities, a 400-foot-wide corridor of the Appalachian National Scenic Trail in New Jersey has been determined historic because of its significance in conservation and outdoor recreation and its longstanding history as a natural area. Established between 1922 and 1937, the trail is usually a simple footpath extending nearly 2,100 miles from Maine to Georgia. (NPS 1987)

All the alternatives cross APPA, either within or outside DEWA boundaries.

ALTERNATIVE 1 (NO ACTION), ALTERNATIVE 2, AND ALTERNATIVE 2b

Alternative 1 is the no-action alternative and represents the existing transmission line corridor that alternatives 2 and 2b would follow. As early as 1966, NPS planners recognized that the existing line—as electrical transmission infrastructure within the park—was incompatible with development of the park for recreation and visitor experience and proposed removing it in the first DEWA Master Plan (NPS 1966).

Cultural landscapes located in the APE for the alignment of alternatives 2 and 2b could potentially be affected by physical and/or visual impacts. Physical impacts could occur due to the location of the proposed alignment directly across cultural landscape corridors (such as roads and trails) or landscape parcels (such as farms and cemeteries). Visual impacts to cultural landscapes could occur due to location of the lines and towers across landscape corridors or parcels and from disruption of viewsheds from more distant landscapes within the APE (JMA 2011). Although the alignment for alternative 2b would be the same as that for alternatives 1 and 2 and would therefore have the same APE and affect the same potential cultural resources, the additional towers needed for alternative 2b would be more intrusive to the cultural landscapes than the number proposed for alternative 2. Please see “Table 24: Identified Cultural Landscapes within the APE for All Alternatives,” for a list of all resources identified, as well as the documentation status for resources along the alternatives.

Alternatives 1, 2 and 2b Crossing the Old Mine Road (Documented in the River Road System, New Jersey Conservation Landscape Initiative)

The existing transmission line (alternative 1) and proposed alternatives 2 and 2b transmission line cross Old Mine Road at mile marker 11. This location of the road is included in the 26-mile section that is part of the Old Mine Road Historic District.

Alternatives 2 and 2b: Existing Transmission Line Crossing the Old Mine Road, Looking East and Looking West.

TABLE 24: IDENTIFIED CULTURAL LANDSCAPES WITHIN THE APE FOR ALL ALTERNATIVES

Tract ID	Cultural Landscape Resource	Date	National Register Status	Alternatives					
				1	2	2b	3	4	5
615-1 615-2	Abraham Van Campen House / Zipser	c. 1900	Listed as part of Old Mine Road Historic District	X	X	X	X		
	Appalachian Trail (Appalachian National Scenic Trail)	1926, 1933	Determined Eligible in Pennsylvania and New Jersey	X	X	X	X	X	X
	Arnott Fen and Hogback Ridge		*Undetermined*	X	X	X			
617-1	Benjamin B. Van Campen House	c. 1840	Listed as Part of Old Mine Road Historic District	X	X	X	X		
8500 and 8552	Broadhead Farm "Wheat Plains" (Heller Farm)	c. 1890	Listed	X	X	X			
7456	Bushkill Dutch Reformed Church	1860	Determined Eligible for Listing	X	X	X	X		
7531	Bushkill School	1932	*Ineligible*	X	X	X	X		
7455	Peter's House	1840	Listed	X	X	X	X		
7502	Ralph G. Turn, Jr., Farmstead	1914	*Undetermined*	X	X	X	X		
3001	Camp Ken-Etiwa-Pec	1938	Determined Eligible for Listing	X	X	X			
607	Camp Mohican	1926	*Ineligible*	X	X	X	X		
Paha-quarry Copper Mines Tract	Camp Pahaquarra	1925	*Ineligible*	X	X	X	X	X	X
205	Camp Weygadt	1921	*Ineligible*				X	X	X
6909-2	Chado Farm Broadstone Farms	c. 1932 c. 1910s–1920s	Determined Eligible for Listing	X	X	X			
2123	Cold Spring Farm Spring House	Late 1800s	Listed	X	X	X	X		

Tract ID	Cultural Landscape Resource	Date	National Register Status	Alternatives					
				1	2	2b	3	4	5
603-1	Copper Mine Inn	c. 1840	Listed as part of Old Mine Road Historic District	X	X	X	X		
121 (on Slateford Farm tract)	Emory Pipher Quarry	1820s–1843	Determined Eligible for Listing					X	X
7624-1	Decker Ferry House as part of Old Mine Road Historic District	c. 1795/1895	Listed as part of Old Mine Road Historic District	X	X	X	X		
	Dimmick's Ferry	1826–1937	Determined Eligible for Listing	X	X	X	X		
2735	Fort Hynshaw	c. 1756–1757	Determined Eligible for Listing	X	X	X	X		
8300 or 8315	Nyce Farm-Van Gordon House (Eshback Farm)	1775–1795 1910–1920s dairy	Listed	X	X	X			
2707-C	Grube Cemetery		*Undetermined*	X	X	X	X		
8005-1	Shoemaker-Houck Farm (Silver Spray Farm)	c. 1822	Listed	X	X	X			
1900	Hidden Lake Lodge	1940 altered in c. 1965	*Ineligible*	X	X	X	X		
2148	Horace Van Auken House	1882 or 1868	Determined Eligible for Listing	X	X	X	X		
7111-1 7111-2 7150	Isaac Van Campen Inn	c. 1750	Listed as part of Old Mine Road Historic District	X	X	X			
7144	Jacob Roe House	c. 1812	Determined Eligible for Listing	X	X	X			
2919	Captain Jacob Shoemaker	c. 1790s	Listed	X	X	X	X		
1001-1	James Van Campen Farm (Blasi)	c. 1880	Determined Eligible for Listing	X	X	X	X		

Tract ID	Cultural Landscape Resource	Date	National Register Status	Alternatives					
				1	2	2b	3	4	5
6907-1 6907-2	John P. House Farmstead	c. 1900	Determined Eligible for Listing	X	X	X			
1359	John Stark Michael Farm	c. 1875	Listed	X	X	X	X	X	X
2122 2164	John Turn Farm: Limekiln, Smokehouse, Weavehouse	c. 1830s 1950s camp	Listed	X	X	X	X		
105	Laurel Falls Schoolhouse	1850, 1866 Altered c. 1945	*Ineligible*				X	X	X
919	McManus House	1915	Determined Eligible for Listing	X	X	X	X	X	X
1506-C	Michael Cemetery	c. 1792–1860	*Undetermined*	X	X	X	X		
	Abraham Van Campen III	c. 1800	*Ineligible*	X	X	X	X		
6500	E.L. Garris House	c. 1852	Listed as part of Old Mine Road Historic District	X	X	X	X		
	Garris Mill site	1832–1922 Reconstructed 1994	*Ineligible*	X	X	X	X		
6504-1	G. Trauger House	c. 1860	Listed as part of Old Mine Road Historic District	X	X	X	X		
821	Millbrook Schoolhouse	1840	Listed as part of Old Mine Road Historic District	X	X	X	X		
	Millbrook Village Historic District	1832–1875	Determined Eligible for Listing	X	X	X	X		
6502-1	Sylvester Hill House	c. 1850	Listed as part of Old Mine Road Historic District	X	X	X	X		

Tract ID	Cultural Landscape Resource	Date	National Register Status	Alternatives					
				1	2	2b	3	4	5
614-1	Miller House Amos van Campen House (outbuildings)	House destroyed 2012, outbuildings remain	Listed as part of Old Mine Road Historic District	X	X	X	X		
807	Minard-Hamilton Farmstead	c. 1870	*Ineligible*	X	X	X	X		
121 (on Slateford Farm tract)	Munch-Cyr Farm		Determined Eligible for Listing				X	X	X
6709-3	Myers Farmstead	Early 1900s Moved to site	*Ineligible*	X	X	X	X		
901 or 905	Newcomb House (Larch Hollow)	1850	Recommended Eligible for Listing	X	X	X	X	X	X
121	New York and Delaware River Slate Company Quarry	1870–1873	Determined Eligible for Listing				X	X	X
7106	Oakley Stoll Farmstead	c. 1835, 1850	*Ineligible*	X	X	X			
1017-1 1017-2	Otto Nehland House	1950s	*Ineligible*	X	X	X	X		
2130-C	Overfield Cemetery	c. 1798	*CLI*	X	X	X	X		
2130	Owens / Stone Spring Farm Springhouse	c. 1840	Determined Eligible for Listing	X	X	X	X		
2155	Pennsylvania Subdistrict Office	1932–1935	*Ineligible*	X	X	X	X		
7101	Richard Layton Farmstead	1812	Listed	X	X	X			
	River Road (PA) Shawnee to Decker's Ferry	1744 Altered 1838, 1912, 1934	*Undetermined*	X	X	X	X	X	X
	Route 209 (Community Drive to Spackman's Creek)	1750s Altered 1920s and 1930s	*CLI Undetermined*	X	X	X	X		

Tract ID	Cultural Landscape Resource	Date	National Register Status	Alternatives					
				1	2	2b	3	4	5
602-1	Sadie Van Campen Farm	1870 Altered 1930s	*Ineligible*	X	X	X	X		
6521-4	Salamovka	1850	Listed as part of Old Mine Road Historic District	X	X	X	X		
2700	Schoonover Farm (also called Schoonover Mountain House)	c. 1860	Listed	X	X	X	X		
121	Slateford Farm	1800, 1833	Listed				X	X	X
	Rosenkrans House	1800	Listed as part of Old Mine Road Historic District	X	X	X	X		
1353	Smithfield Beach	1955, 1957	Undetermined	X	X	X	X	X	X
324	Totts Gap Farm	1820, 1835 Altered c. 1935, c. 1945	Determined Eligible for Listing				X	X	X
	Totts Gap Road	1737 or earlier	Recommended Eligible for Listing				X	X	X
1357	Trieble-Rouch House site	1832 house demolished	Undetermined	X	X	X	X	X	X
2704-C	Van Auken Cemetery		*Undetermined*	X	X	X	X		
	Van Campen Sawmill site	c. 1793	Determined Eligible for Listing	X	X	X	X		
1016-1	Watergate Recreation Site	c.1960	*Recommended Ineligible, Awaiting SHPO concurrence*	X	X	X	X		
1502	Zion Lutheran Church	1851	Listed	X	X	X	X		
204 205	Delaware Water Gap Slate Company Quarry and Building Sites Historic District	1870–1904	Determined Eligible for Listing				X	X	X
	Old Mine Road Historic District		Listed	X	X	X	X		

Tract ID	Cultural Landscape Resource	Date	National Register Status	Alternatives					
				1	2	2b	3	4	5
8203 8209 8223 8227	Walpack Center Historic District	1850	Listed	X	X	X			
	Pennsylvania-New Jersey Interconnection (PNJ) utility line and corridor	1928–1956	Determined Eligible for Listing	X	X	X			

Notes:

CLI = Cultural Landscape Inventory

The transmission line clearing creates an abrupt opening where it crosses Old Mine Road. The corridor can be seen extending to the east and west, and towers are very visible.

Alternatives 1, 2 and 2b Crossing Community Drive and the Horace Van Auken Landscape

The existing transmission line (alternative 1) and proposed alternatives 2 and 2b transmission line also cross Route 209 (Community Drive) and passes through the Horace Van Auken component landscape. This alternative location constitutes both a physical and visual impact to the historic Community Drive corridor and the adjacent cultural landscape site.

Van Auken House on Community Drive.

Van Auken Barn on Community Drive.

Arnott Fen at Community Drive.

Alternatives 1, 2, and 2b Crossing APPA

The existing transmission line (alternative 1) and proposed alignment for alternatives 2 and 2b cross APPA, creating both physical and visual impacts on the trail, trail corridor, and other cultural landscapes within the APE.

Alternatives 2 and 2b Outside the Study Area to Susquehanna Substation

The alternative 2 alignment, which would also provide connection to alternatives 3 and 4, would traverse a substantially large section of Delaware State Forest lands in Pike County. The majority of the line's path through the county would go through state forest.

Alternative 2 Transmission Lines and Corridor Crossing APPA.

Continuing west, the line would cross state game lands in Pike, Lackawanna, and Luzerne counties. The line would also cross a small section of a small state forest in Lackawanna County and would cross a state forest in Luzerne County. There are no documented cultural landscapes or landscapes determined to be potentially eligible for National Register recognition in these areas.

Alternatives 2 and 2b Outside the Study Area to Roseland Substation

The alternative 2 alignment, which would also provide connection to alternatives 3 and 4, would traverse the north end of a state park in Sussex County and some small game lands in Morris County, bypassing another state park and a natural area to the south. There are no documented cultural landscapes or landscapes determined to be potentially eligible for National Register recognition in these areas.

ALTERNATIVE 3

The alternative 3 alignment would follow an existing transmission line corridor that travels southwest from the Bushkill Substation and crosses the River Road System (New Jersey), River Road (Pennsylvania), the Delaware River, and Route 602 as it trends northeast to reconnect with the proposed alternative 2 route outside NPS boundaries.

Cultural landscapes that fall within the APE for the alternative 3 alignment could potentially be affected by physical and/or visual impacts. Physical impacts would be due to the location of the proposed alignment directly through or across cultural landscape corridors (such as roads and trails) or landscape parcels (such as farms, churchyards, and cemeteries). Visual impacts to cultural landscapes could also occur across landscape corridors and parcels and from disruption of viewsheds from more distant landscapes within the APE. Please see “Table 24: Identified Cultural Landscapes within the APE for All Alternatives,” for a list of all resources identified, as well as the documentation status for resources along the alternatives.

Alternative 3 Crossing APPA

The proposed alignment for alternative 3 crosses the APPA. This creates physical and visual impacts affecting the trail, trail corridor, and other cultural landscapes with the APE for this alternative.

Alternative 3 Alignment Crosses APPA, Creating both Physical and Visual Effects for the Trail and Trail Corridor.

Alternative 3 Outside the Study Area to Susquehanna Substation

The alternative 3 alignment would traverse a substantially large section of Delaware State Forest lands in Pike County. Continuing west, the line would cross state game lands in Pike, Lackawanna, and Luzerne counties. The line would also cross a small section of a small state forest in Lackawanna County and would cross a state

forest in Luzerne County. There are no documented cultural landscapes or landscapes determined to be potentially eligible for National Register recognition in these areas.

Alternative 3 Outside the Study Area to Roseland Substation

The alternative 3 alignment would traverse the north end of a state park in Sussex County and some small game lands in Morris County, bypassing another state park and a natural area to the south. There are no documented cultural landscapes or landscapes determined to be potentially eligible for National Register recognition in these areas.

ALTERNATIVES 4 AND 5

The alignment for alternatives 4 and 5 would follow I-80 from the west to near the town of Delaware Water Gap. From here, it would head south and roughly follow the southern boundary of DEWA, returning to I-80 slightly east of the park's eastern boundary.

Cultural landscapes that fall within the APE for alternative 4 and 5 alignments could potentially be affected by physical impacts and/or visual impacts. Physical impacts would be due to the location of the proposed alignment directly through or across cultural landscape corridors (such as roads and trails) or landscape parcels (such as farms, schools and camps). Please see "Table 24: Identified Cultural Landscapes within the APE for All Alternatives," for a list of all resources identified, as well as the documentation status for resources along the alternatives.

Totts Gap Road.

Totts Gap Farm Adjacent to Totts Gap Road.

Alternatives 4 and 5 Crossing Totts Gap Road near Totts Gap Farm

The proposed transmission line for alternatives 4 and 5 would cross Totts Gap Road, creating both physical and visual effects on the historic road and adjacent landscapes. The proposed alignment for alternatives 4 and 5 also crosses the APPA.

Alternatives 4 and 5 Outside the Study Area to Susquehanna Substation

The alternative 4 alignment in this area would be the same as alternative 2. The alternative 5 alignment could follow the I-80 ROW, which bypasses a state game area in Monroe County and passes through some game lands in Carbon and Luzerne counties. There are no documented cultural landscapes or landscapes determined to be potentially eligible for National Register recognition in these areas.

Alternatives 4 and 5 Outside the Study Area to Roseland Substation

The alternative 4 alignment outside the study area would be the same as alternative 2. The alternative 5 alignment could follow the I-80 ROW. There are no documented cultural landscapes or landscapes determined to be potentially eligible for National Register recognition in these areas.

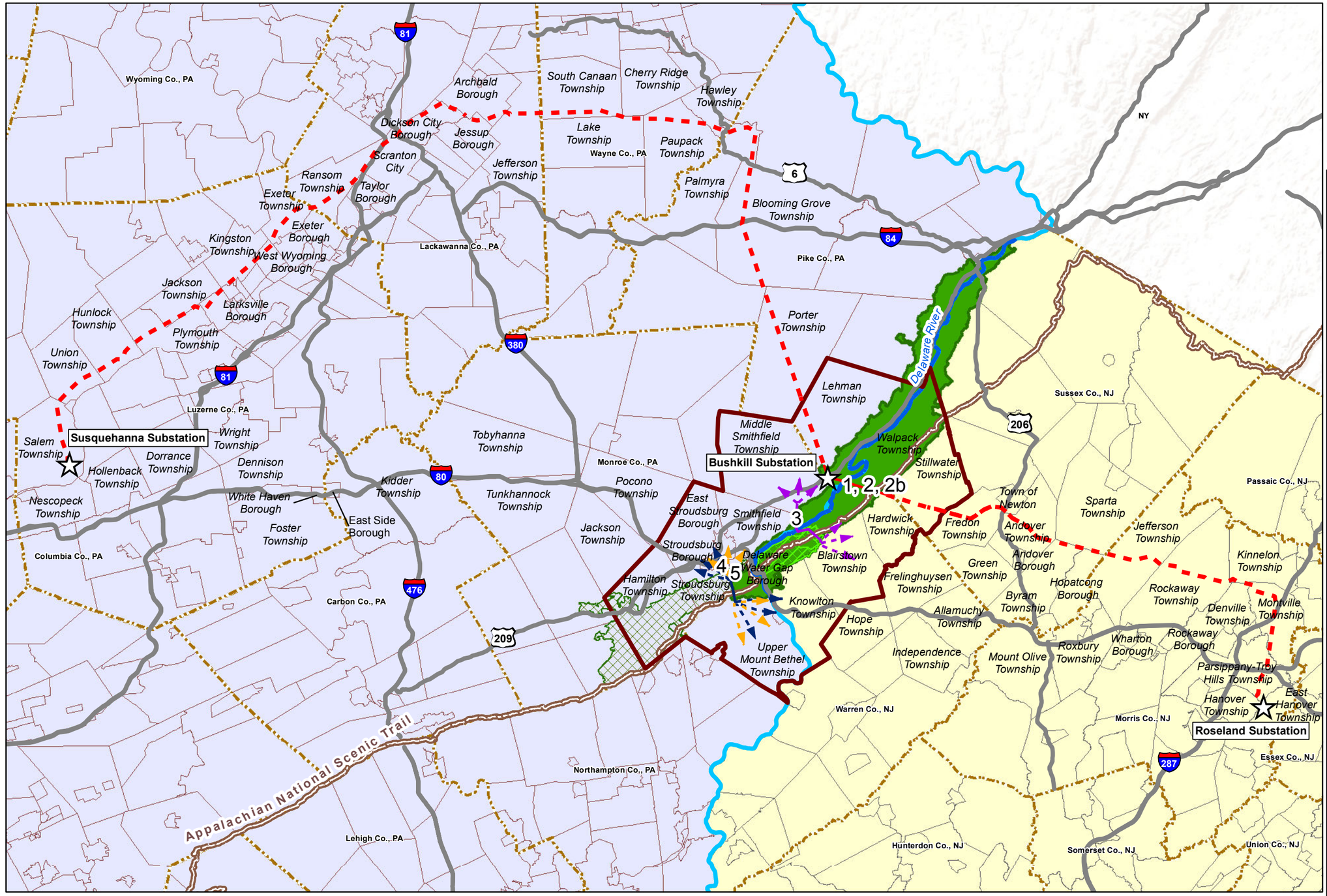
SOCIOECONOMICS

The proposed alternatives could affect local economies through changes in visitation and associated visitor spending. The alternatives could also affect where people live, which could have socioeconomic impacts. Because socioeconomics primarily pertains to effects outside NPS boundaries, the study area for socioeconomics includes landowners with inholdings within DEWA, and the counties and townships immediately adjacent to the proposed alternatives that intersect DEWA and the Cherry Valley NWR. Pennsylvania counties in the study area include Pike, Monroe, and Northampton. New Jersey counties include Sussex and Warren. Figure 47 shows counties and townships intersected by each alternative alignment inside and outside the study area. Because the NPS cannot dictate the route the transmission line would follow outside the study area, the socioeconomic conditions of those counties and townships are only briefly discussed in this chapter. The most recent and comprehensive statistical data were used to describe the affected environment, including data from the 2000 and 2010 decennial census, census population estimates between 2005 and 2009, and local agency planning documents.

For units of the national park system, most visitor spending and job creation is related to lodging, food, and beverage service (52 %), followed by other retail (29 %), entertainment and amusements (10 %), gas and local transportation (7 %) and groceries (2 %) (NPS 2010b). Figure 48 provides an overview of visitor trends and expenditures at DEWA from 2005-2010, which affects local socioeconomics. Although visitation did not substantially change from 2005 through 2009, visitor spending decreased, as did NPS jobs (including contractors) and local jobs supported by non-local spending. The latter decreased by more than half. These trends likely reflect national economic trends that occurred toward the end of the time period, so other economic factors may have contributed to the declines. However, visitor spending increased by 37% from 2009 to 2010, reaching the highest amount in the past six years, despite only a slight increase (1.4%) in visitation (Headwaters Economics 2012).

Based on a river users survey completed in summer 2010, 97% of DEWA visitors are from the United States, with the largest groups coming from New Jersey (40%), Pennsylvania (31%), and New York (19%). The average visitor group spent a total of $287. Inside DEWA, the average expenditure was $29 per person per trip. The total trip expenditures inside DEWA were primarily spent on water recreation equipment rental (48%) and camping fees (13%). Outside DEWA, the average expenditure was $94 per person per trip. The expenditures outside DEWA were primarily spent on water recreation equipment rental (28%), lodging (22%), and groceries and take-out food (15%) (Blotkamp et al. 2010, 5, 73, 75, 79).

Hunting is allowed in most parts of DEWA. Average daily expenditures (in 1989 dollars) were $31 by New Jersey hunters and $28 by Pennsylvania hunters. Total hunting expenditures for 1987/1988 were $1.4 million (Penn State 1989, 40). Nearly 75% of these expenditures were from the big game seasons, and 25% from various small game seasons. Approximately 20% of expenditures occurred in transit to the park or near the park (Penn State 1989, 44). Less than 20% of hunters were from the five-county region immediately adjacent to the park (Penn State 1989, 42). Urban and suburban counties surrounding Newark, Philadelphia, Allentown, and Bethlehem contributed nearly 70% of hunting use. Hunters averaged 10 years of hunting experience in the park and held a very positive attitude toward park resources (Penn State 1989, 58). Hunting is described in more detail in the “Visitor Use and Experience” section.



Legend

- Substation
- Alternative 2, 2b
- Alternative 3
- Alternative 4
- Alternative 5
- Appalachian National Scenic Trail
- Middle Delaware National Scenic & Recreational River
- Delaware River
- Road
- Socioeconomic Study Area
- Delaware Water Gap National Recreation Area
- Worthington State Forest
- CVNWR Boundary
- County Line
- New Jersey Municipality
- Pennsylvania Municipality

Note: Designated boundary of CVNWR is depicted, not all property is owned within the boundary

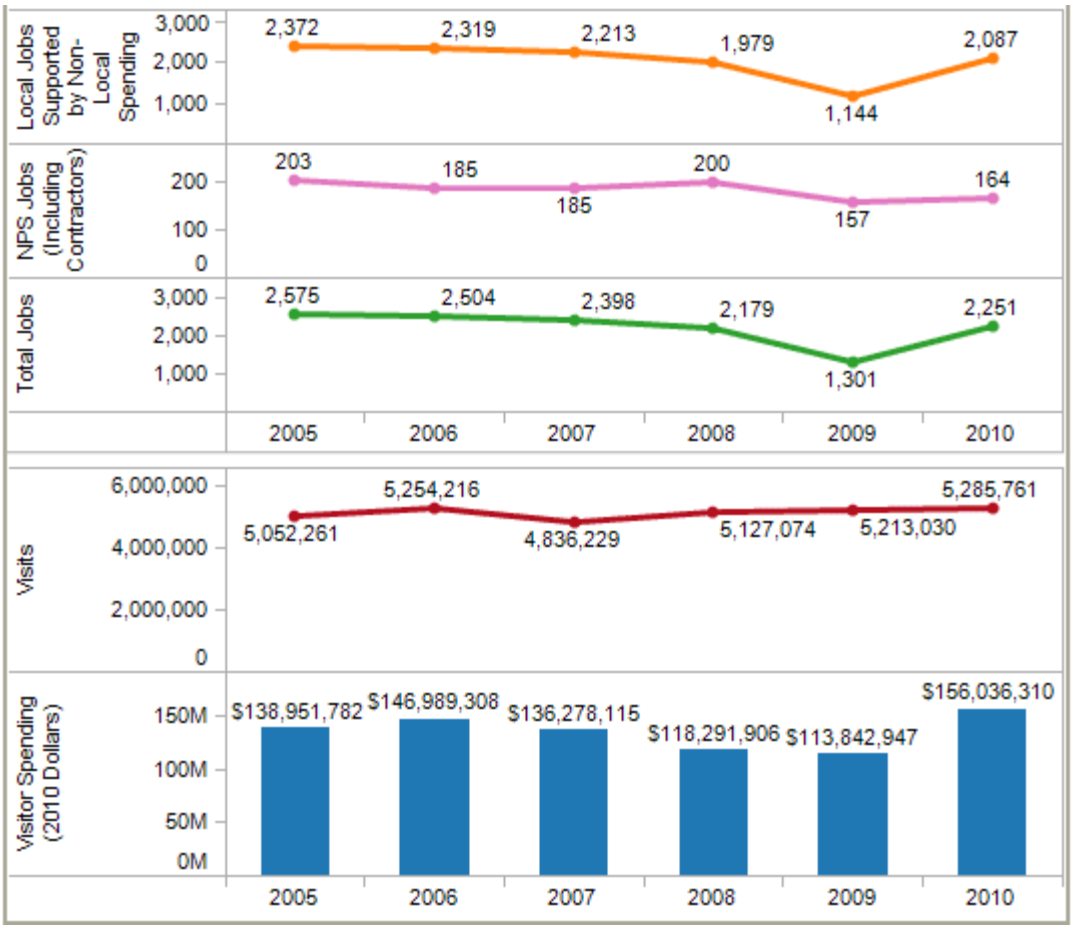
0 8 16
Miles

Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 47
Socioeconomics Area of Effect

Source: ESRI Streetmap 2006; NJOIT-OGIS 2008; PASDA 2010; ESRI ArcGISonline Map Service 2010;

Projection: NAD 83 UTM Zone 18N
Date: July, 2012



Source: Headwaters Economics 2012.

FIGURE 48: DEWA VISITATION TRENDS AND EXPENDITURES 2005–2010

Several commercial outfitters provide recreational services to the public, making use of DEWA and/or APPA. DEWA also hosts summer camps and several well-known special events that are supported by local businesses. There are currently 23 businesses with commercial use authorizations to provide recreational services within DEWA. Those businesses offer canoe, kayak, and raft trips on the Delaware River, rock-climbing and backpacking workshops, tours (such as the Water Gap Trolley), camping trips, retreats, bike rental, and fly-fishing. Over half of these businesses consider DEWA a primary destination for their services and are largely dependent on DEWA-related tourism to sustain their businesses (NPS 2011d). Thirteen canoe liveries (river outfitters) provide services within DEWA, as shown in table 25.

Not all lands within DEWA are owned exclusively by the NPS or used for recreational or park management purposes. The park currently permits 3,000 acres to local farmers for agriculture (NPS 2003a, 25). Some of these croplands are below the existing transmission lines described under the proposed alternatives. Land under private ownership, or "inholdings," also exist in DEWA. A restaurant (Walpack Inn), farms, campgrounds, and seasonal and year-round single-family residences are all represented within the developed, privately owned land remaining in DEWA.

TABLE **25: CANOE LIVERIES THAT PROVIDE SERVICES WITHIN DEWA**

Business Name	Offers Service Within DEWA Boundary	Offers Service Outside DEWA Boundary	Proximity to DEWA Boundary
Pennsylvania			
Adventure Sports Canoe and Raft Trips	X		South end
Chamberlain's Canoes	X	X	South end
Delaware River Country	X		South end
Dingman's Campground (Concession)	X		North end
Indian Head Canoes and Rafts	X	X	North end
Jerry's Three River Campground/Canoes	X	X	North end
Kayaks East	X	X	South end
Kittatinny Canoes and Campgrounds	X		North end
Pack Shack Adventures	X		South end
Pack 'n' Paddle Tours	X		South end
Shawnee River Trips	X		South end
Silver Canoe Rentals	X	X	North end
New Jersey			
Delaware River Rafting & Canoeing	X	X	South end

Source: Meis pers. comm. 2010.

INSIDE THE STUDY AREA

Counties crossed by each alternative are identified in table 26.

TABLE 26: ALTERNATIVES CROSSING COUNTIES WITHIN THE STUDY AREA

	Alternative			
	2, 2b	3	4	5
Pennsylvania				
Pike County	X	X	X	
Monroe County	X	X	X	X
Northampton County			X	X
New Jersey				
Sussex County	X	X		
Warren County	X	X	X	X

Many Pennsylvania counties have experienced negative growth or no growth in recent years. However, this is not the case for counties bordering the Delaware River. In the cases of Pike and Monroe counties, growth due to migration from New Jersey and New York has been extraordinary over the past 25 years (Lehigh Valley Planning Commission 2005, 6; NPS 2005c). This is demonstrated in decennial census data, which show a 15% decline in population in Newark and a 15% increase in the New York City

population since 1980, as compared to substantial population growth in Pike and Monroe counties (see table 27). In the 1970s, a wave of development began moving westward into the Poconos along I-80 (NPS 2003c), resulting in an urban-to-rural migration trend that has profoundly affected the study area (NPS 2003a). Many vacation and seasonal homes in the area were converted to year-round residences, and permanent residential and commercial developments expanded rapidly (NPS 1991a). Strip malls, fast food restaurants, and other similar development to meet the shopping and social needs of both residents and visitors also resulted, concentrated along the major roads and interchanges associated with I-80 and other major routes (NPS 2003a).

TABLE 27: POPULATION GROWTH FOR COUNTIES WITHIN THE STUDY AREA

	Total Population			% Change	
	1990	2000	2010	1990–2000	2000–2010
Pennsylvania	11,881,643	12,281,071	12,702,379	3%	3%
Pike County	27,966	46,303	57,369	66%	24%
Monroe County	95,709	138,690	169,842	45%	23%
Northampton County	247,105	267,077	297,735	8%	12%
New Jersey	7,730,188	8,414,378	8,791,894	9%	5%
Sussex County	130,943	144,165	149,265	10%	4%
Warren County	91,607	102,438	108,692	12%	6%

Source: U.S. Census Bureau 1990, 2011.

Development impacts were first felt in Monroe County and later in Pike County, and resulted in growth trends that rapidly changed the region's rural character. Monroe and Pike counties in Pennsylvania and Sussex County in New Jersey are the fastest growing commuter counties in their respective states. Approximately 60% of residents in these areas travel to work in the New York metropolitan area (NPS 2003a). The resident population in communities surrounding DEWA is expected to continue to increase by as much as 50% by 2030 (NPS 2003a; 2009h, 8). Socioeconomic indicators for each county within the study area are discussed in more detail below.

Pennsylvania: Pike County

Inside the study area, Pike County is the fastest growing area in Pennsylvania, growing 66% between 1990 and 2000 and 24% between 2000 and 2010 (see table 27) (U.S. Census Bureau 2011). This positive growth trend is expected to continue until 2030 (Pike County 2006, 2-8).

Pike County's leading industry is tourism, "the basis of which directly relates to the county's scenic rural character and natural resources," and the county has identified a goal to "retain tourism as a major component of economic development" (Pike County 2006). According to Pike County's most recent comprehensive plan, the tourism, real estate, and construction industries rely heavily on the continued attractiveness of the county. "Without the continuing healthy ecotourism industry growth, the social dynamics and attractiveness of the county would likely change dramatically" (Pike County 2006, 17-7–17-8). The unemployment rate in the county fluctuates seasonally due to the substantial number of workers dependent on the recreation/tourism industry (Pike County 2006, 17-1). Between 2007 and 2011, unemployment rates in Pike County peaked each year in February, increasing each year from 6.7% in 2007 to 12.1% in 2011 (BLS 2011). Over 20% of employment in Pike County is generated by the tourism industries (arts, entertainment, and recreation and accommodation and food services) (Pennsylvania Department of Labor & Industry 2011). Although the county's economy still relies on the tourism and

service industries, more retail and service establishments are becoming year-round businesses instead of seasonal businesses serving just the tourist trade (Pike County 2006, 13-9).

Farming in Pike County contributes to the local economy and plays a significant role in the scenic rural character of local communities. However, Pike County's agricultural community has been faced with impediments to its continued operation. The rising costs of farm operation, steadily increasing real estate taxes, and the continued pressure from development create hurdles for small farmers (Pike County n.d.). However, Pike County experienced a substantial increase in farmland between 2002 and 2007 (173%), whereas adjacent counties (Wayne and Monroe) experienced losses between 10% and 20% (USDA 2007).

Income levels in Pike County increased substantially from $44,608 in 1999 to $59,369 in 2009 (see table 28) (U.S. Census Bureau 2011). Median income levels in Lehman Township, the only township in the study area, are on a par with county levels at $59,295 (U.S. Census Bureau n.d.). The percentage of the population living in poverty in Pike County (8%) is lower than the statewide average (13%), while current unemployment rates are slightly higher, at 10% compared to the statewide rate of 9%.

TABLE 28: ECONOMIC DATA FOR COUNTIES WITHIN THE STUDY AREA

	Unemployment Rate (2010)	Median Household Income (2009)	People Below Poverty Level (2009)
Pennsylvania	9%	$49,501	13%
Pike County	10%	$59,369	8%
Monroe County	10%	$54,703	10%
Northampton County	9%	$57,999	9%
New Jersey	10%	$68,444	9%
Sussex County	9%	$80,155	5%
Warren County	9%	$70,092	7%

Source: U.S. Census Bureau 2011; BLS 2011.

Pennsylvania: Monroe County

Monroe County is one of the fastest growing areas in Pennsylvania, growing 45% from 1990 to 2000 and 23% from 2000 to 2010 (see table 27). This growth is expected to continue, reaching 31% to 54%—the same as Pike and Warren counties. The main growth driver in Monroe County is the expansion of the New York/Newark metropolitan regions east of the Delaware River (Monroe County 1999, 11). Development typically follows major highways, and development in Monroe County has concentrated at interchanges and along parallel arterial corridors (Monroe County 1999, 11). Population density is high along I-80 from East Stroudsburg to approximately 10 miles west. The communities along I-80, including Stroudsburg and East Stroudsburg, where population density is highest in this county, would be intersected by the alternative 5 alignment.

The median household income in Monroe County is $54,703, the lowest in the study area. Other economic data shown in table 28 indicate that county statistics are consistent with statewide statistics, with a slightly lower proportion of the population below the poverty level and a slightly higher unemployment rate (U.S. Census Bureau 2011).

A substantial portion of Monroe County's history and prosperity concerns recreation. In the twentieth century, the resort industry and recreation became Monroe County's main sources of income. Monroe

County has the third largest tourist economy in Pennsylvania and supports the third largest labor force in tourist-related expenditures. Total tourist expenditures in Monroe County are three to seven times higher than the other Pocono counties of Pike, Wayne, and Carbon, making these expenditures a major component of Monroe's economic base. A substantial percentage of revenue in Monroe County is generated by tourism. The New York and Philadelphia regions are the primary sources of visitors to the county, including DEWA (Monroe County 1999, 52). The role of the tourism industry is reflected in recent employment statistics, which indicate that the largest employment sectors in the county are retail trade and accommodation and food services, representing nearly 30% of total county employment (Pennsylvania Department of Labor & Industry 2011).

In 2009, only 85 people (of 56,527 total) in Monroe County were employed in the agriculture, forestry, and fishing industry (Pennsylvania Department of Labor & Industry 2011). Monroe County has a goal to "protect and promote continued productive agricultural use on viable agricultural lands" (Monroe County 1999, 63). Much of the county's growth and development has occurred on prime agricultural soils that were once farmland. Beginning with the vacation home rush of the 1960s and 1970s and continuing to the present influx of permanent residents, productive farmland has been reduced each year. This reduction of farmland corresponds directly to the increase in residential development in the county. Rising costs of farm operation, fluctuating market prices and demand, steadily increasing property taxes, and continued pressure from development are anticipated in the next decade (Monroe County 2004, 2–3). This is reflected in recent agricultural statistics, which indicate that the amount of land dedicated to agricultural production in the county decreased by 11% between 2002 and 2007 (USDA 2007).

Pennsylvania: Northampton County

Northampton County, located in the Lehigh Valley, is the most highly and densely populated county in the study area, with close to 800 people per square mile constituting the county's nearly 300,000 residents (see table 27) (U.S. Census Bureau 2011). Northampton County experienced the lowest population growth in the study area between 1990 and 2000 (8%), with growth rates increasing to 12% between 2000 and 2010. The county is expected to grow more than 30% between 2000 and 2030 (Lehigh Valley Planning Commission 2005, 47). The alignments for alternatives 4 and 5 only intersect one rural township, Upper Mount Bethel, in the northern portion of the county near DEWA and Cherry Valley NWR.

Tourism does not currently appear to play a measurable role in the county's economy, and the presence of DEWA is not identified by the county as a contributor. Tourism revenue is 5% to 7% for Northampton County. However, the county has a goal of promoting tourism activities "that relate to the unique physical, historic, and cultural features of the Lehigh Valley" (Lehigh Valley Planning Commission 2005, 56).

The Lehigh Valley is a metropolitan region consisting of Lehigh, Northampton, and Carbon counties in eastern Pennsylvania. The area has been changing from a predominantly agricultural area to a predominantly urban area. In 1975, 67% of the area was agriculture and vacant land. This percentage is expected to drop to about 45% by 2030. Agricultural and vacant land in Lehigh Valley's rural areas is being developed for housing, business, and industry at an average rate of 3.0 square miles per year. This rate has been increasing each decade since the 1970s (Lehigh Valley Planning Commission 2005, 9). Expanses of farmland still exist in northeastern Northampton County in Upper Mount Bethel, yet farmland is disappearing rapidly. The amount of land dedicated to agricultural production in the county decreased by 12% between 2002 and 2007 (USDA 2007). Like the other counties in the study area, Northampton County has a goal to protect farmland and to promote farming as an economic activity. There are sizable areas in Upper Mount Bethel where the county believes farming should remain the primary land use (Lehigh Valley Planning Commission 2005, 30).

Overall income levels have shown slow growth as high-paying manufacturing jobs were replaced by lower-paying jobs in services and trade. Despite the loss of 44% of the region's manufacturing jobs from 1970 to 2000, manufacturing remains the second highest employment industry in the county, representing 13% of total employment (Lehigh Valley Planning Commission 2005, 54; Pennsylvania Department of Labor & Industry 2011). The median household income for Northampton County was $57,999 in 2009 (see table 28). Income levels in Upper Mount Bethel have stayed on a par with county levels, at $58,972 in 2009 (U.S. Census Bureau n.d.).

New Jersey: Warren County

Warren County in New Jersey has experienced moderate population growth since 1990, increasing by 12% between 1990 and 2000 and 6% between 2000 and 2010 (see table 27). Like the Pennsylvania counties, Warren County's geographic location and proximity to key employment centers are contributing factors to growth. The most development continues to be in the southern part of the county near I-78, outside the study area. New developments in Warren County are often close to existing communities and accessible to highways, schools, and shopping. The northern part of the county, which is crossed by I-80, primarily consists of large sites with custom-built homes (Warren County Planning Board 2005, 19).

Although no tourism revenue data are available for Warren County, the county employs the smallest percentage of people in the sales and service industry in the study area. According to the Warren County Department of Economic Development and Tourism, there is little support for large-scale tourism, such as hotels and overnight tourism. The *Warren County Strategic Growth Plan* concluded that tourism has little potential of generating family wage jobs and increasing the county's tax base. A recent analysis of the New Jersey State tourism industry determined that tourism in Warren County accounts for approximately 5,000 jobs and has a total payroll of $84.8 million, which represents an average of $16,960 per job. The majority of tourist dollars are spent in restaurants and retail businesses (Warren County Planning Board 2005, 41).

Approximately 33% (74,975 acres) of Warren County's total land area is in farms; this area decreased by 4% between 2002 and 2007 (USDA 2007). However, less than 1% of total employment in Warren County is in the agricultural and natural resource industries (New Jersey Department of Labor and Workforce Development 2011). While agriculture was once the largest industry in the county, increased highway construction and population movement out of urban areas and into rural areas has diminished its role. Despite a recent loss in farmlands, Warren County ranks first among New Jersey counties for sales of dairy products and poultry and eggs, and ranks first for the number of many types of livestock (USDA 2007). The county has identified goals to support and preserve agricultural lands, and a substantial number of farms and acreage is preserved or identified for future acquisition (Warren County Planning Board 2005, 39–41).

Residents in Warren County are more affluent than the Pennsylvania counties discussed above, particularly along the alternative 1, 2, and 2b alignment. The county's median household income is $70,092, the second highest income in the study area (U.S. Census Bureau 2011). Poverty levels are also below the statewide average, with 7% of the county population living below poverty as compared to 9% statewide. The median household income in Hardwick Township, the township nearest to DEWA, is estimated at $89,000 (U.S. Census Bureau n.d.).

New Jersey: Sussex County

Sussex County's growth rate was highest from 1960 to 1970 at 57.4%, and the greatest increase in population occurred from 1970 to 1980, with 38,537 new residents. For each decade from 1980 to 2000, the population increased by about 14,000 (Sussex County n.d., 101). From 2000 to 2010, the county grew

by 4%, the slowest growth rate within the study area (see table 27). Sussex County provides easy access to highways and employment opportunities outside the county; over 60% of the county workforce travels outside the county for employment (Sussex County n.d., 113). According to a national study that compared growth rates among counties, Sussex County is a "Metropolitan Growth County," one of 124 U.S. counties that experienced growth rates of at least 10% each decade since 1950. These growth counties have developed at low densities of single-family homes where commutes are long; they are a typical "bedroom community." Lands identified as "developable" generally lie in the central Sussex County municipalities, which include Stillwater Township (Sussex County n.d., 101–102). Despite continued county growth, municipalities such as Stillwater Township have not experienced this same growth pattern. Stillwater Township experienced a slight decrease in population between 1990 and 2010 (U.S. Census Bureau 2011, 1990).

Recreation and tourism are considered the backbone of Sussex County's economy. However, the county's *Strategic Growth Plan* notes that "What is often thought to be the backbone of our county's economy employs only 4,298 people in our county, including Arts, Entertainment, Recreation, Accommodation, and Food Services." Approximately 7% to 11% of the county's revenue is from tourism. Although the number of people employed in the tourism industry has grown, wages associated with these jobs have prevented the tourism sector from becoming the foundation of the county's economy (Sussex County n.d., 145). Tourism wage rates in the area for museums, parks, and historical sites range from $268 per week in the private sector to $1,166 per week in the public sector; wage rates in the traveler accommodation industry and RV parks and recreational camps average $378 per week (New Jersey Department of Labor and Workforce Development 2011).

Sussex County was one of the last counties established in northern New Jersey and has large stretches of undeveloped land, giving the county its rural character. Between 1959 and 1997, 68,222 acres of Sussex County farmland ceased to be used for agriculture production, representing a loss of 1,795 acres per year. The rate between 1992 and 1997 decreased to an average of 506 acres lost per year, increasing to a loss of 1,709 acres per year between 2002 and 2007 (USDA 2007). Currently less than 1% of the county's population is employed in the agricultural and natural resources industry (New Jersey Department of Labor and Workforce Development 2011). Like Pike and Monroe counties in Pennsylvania, Sussex County has a goal to preserve its farmland. Similar to Warren County, Sussex County is developing and actively promoting agritourism to help sustain farming operations (Sussex County n.d., 231–232).

Sussex County is one of the wealthier counties in New Jersey. The county currently has the highest median household income in the study area, at $80,155. Sussex County also has the lowest proportion of people in the study area living below poverty, at 5% (see table 28) (U.S. Census Bureau 2011). The median household income for Walpack and Stillwater townships, the townships closest to DEWA, is estimated at $105,625 and $81,926, respectively; however, the population of Walpack Township is less than 25 because it lies within DEWA, which may account for the higher-than-average income levels (U.S. Census Bureau n.d.).

OUTSIDE THE STUDY AREA

Outside the study area in Pennsylvania, the S-R Line could travel through Wayne, Lackawanna, Luzerne, and Carbon counties en route to the Susquehanna Substation. Pertinent socioeconomic data for these counties is provided in table 29. Wayne and Carbon counties have experienced substantial growth, each increasing 11% from 2000 to 2010, compared to 3.4% for Pennsylvania overall. Lackawanna and Luzerne counties experienced almost no growth from 2000 to 2010, increasing by only 0.5%. Wayne and Carbon counties are more rural, with relatively small populations and low population density. Lackawanna and Luzerne counties are more densely populated, with more people per square mile than the statewide average. The median household income of all four Pennsylvania counties is lower than the statewide

average of $49,501 in 2009. The median household income for Luzerne County is the lowest of all counties along the S-R Line inside and outside the study area at $39,984 (U.S. Census Bureau 2011).

TABLE 29: SOCIOECONOMIC DATA FOR COUNTIES OUTSIDE THE STUDY AREA

	Population (2010)	Population Density (2010)	Median Household Income (2009)
Pennsylvania	12,702,379	283	$49,501
Wayne County	52,822	72	$46,036
Lackawanna County	214,437	467	$43,715
Luzerne County	320,918	360	$39,984
Carbon County	65,249	171	$44,945
New Jersey	8,791,894	1,185	$68,444
Morris County	492,276	1,049	$96,300

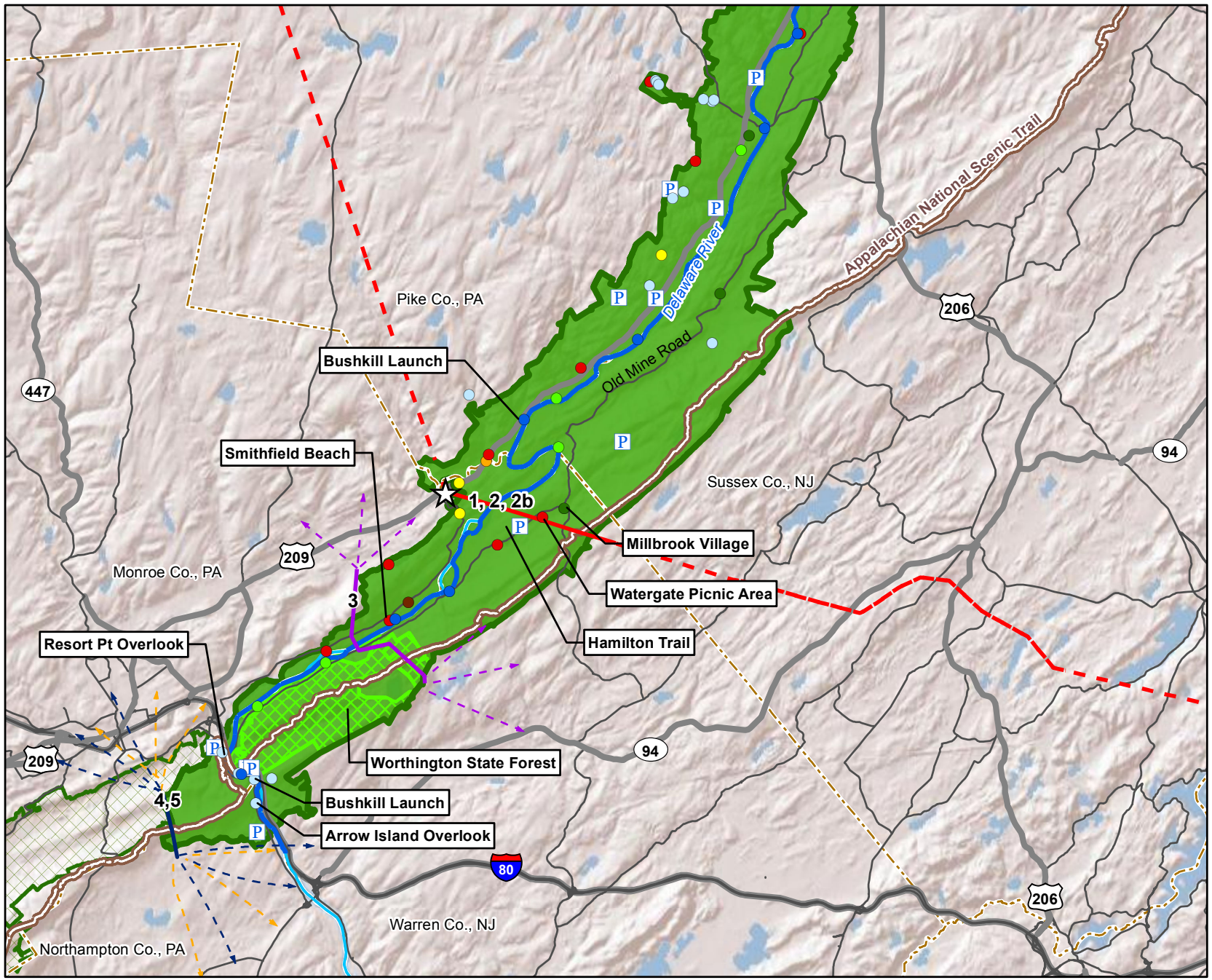
Outside the study area in New Jersey the proposed alternatives could cross Morris County. Morris County's population increased 4.7% from 2000 to 2010. The county is densely populated, with 1,049 people per square mile, but that number is below the statewide density of 1,185. Median household income in Morris County was the highest of all counties inside and outside the study area along the S-R Line, at $96,300 (U.S. Census Bureau 2011). Some municipalities outside the study area, such as the Sandyston Township, have been promoting ecotourism based upon their proximity to DEWA and APPA.

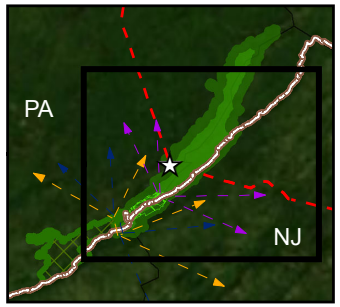
INFRASTRUCTURE, ACCESS, AND CIRCULATION

This section summarizes characteristics of the existing transportation infrastructure, access, and circulation in the study area. Construction activities associated with transmission lines would require transporting large pieces of equipment, such as towers and the cranes needed to erect them, as well as construction personnel. Roads in the study area are shown in figures 49 through 52. Ongoing transmission line maintenance would require similar activities, but to a much lesser or more infrequent extent. These activities could affect existing transportation infrastructure and services, particularly roads, and how visitors, NPS personnel, and local residents and business commerce/freight providers access and interface with their desired destinations and circulate through the area.

The study area for this topic includes the areas within the parks, with focus on routes that provide direct access to the vicinity of existing and potential transmission line right-of-way and utility access roads. Outside the study area, routes that serve supplementary connections to these primary routes were identified for analysis.

Roads provide important opportunities for travel between states, local residential neighborhoods, commuter trips, and for visitors to recreation destinations. Various federal highways, state routes, local county roads, and NPS-owned roads make up the transportation network surrounding DEWA. There are approximately 86 miles of paved roads and 83 miles of unpaved roads in the 67,210 acres of DEWA, and DEWA has over 50 entry points, with a high proportion of travel through the park made by commuters and local residents (NPS 2009h, 6, 13). The majority of roads within DEWA are owned and managed by the NPS; however, there are some state, county, or local roads in the park and that provide entry to the park, as well as private/public inholdings in the states of Pennsylvania and New Jersey with their own roads for access to their properties (NPS 2009h, 11). US and state highways in both New Jersey and Pennsylvania traverse the DEWA boundary as shown in figures 49 through 52.





Legend

- Airpark
- Campground
- Information
- Meeting Hall
- Point of Interest
- Picnic Area
- Ranger Station
- River Access
- Parking
- Substation
- Alternative 1, 2, 2b
- Alternative 3
- Alternative 4
- Alternative 5
- Appalachian National Scenic Trail
- Delaware River
- Middle Delaware National Scenic & Recreational River
- Road
- Delaware Water Gap National Recreation Area
- Worthington State Forest
- CVNWR Boundary
- County Line

Note: Designated boundary of CVNWR is depicted, not all property is owned within the boundary

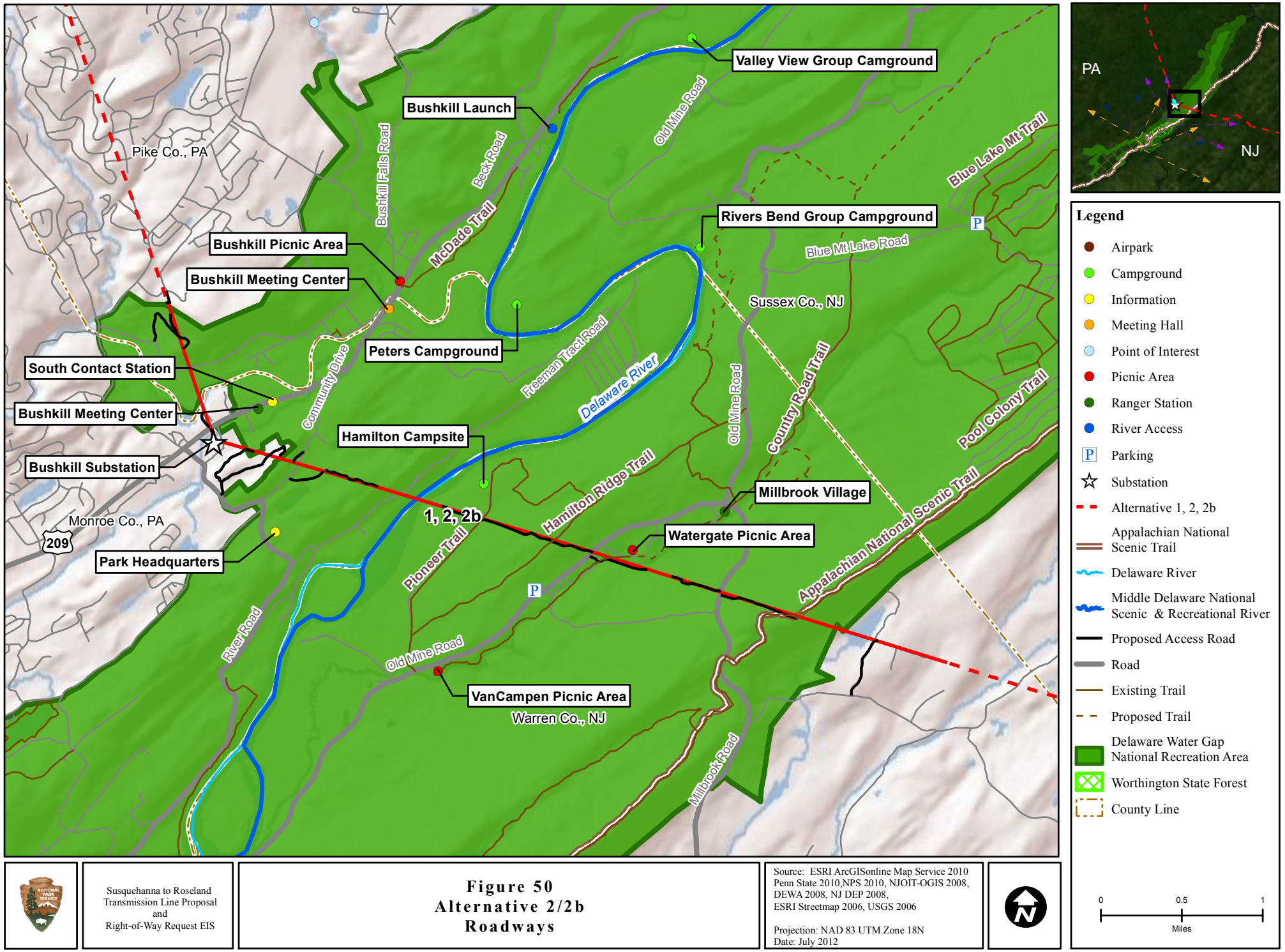
0 2 4
Miles

Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 49
Roadways and Project Vicinity

Source: ESRI ArcGISonline Map Service 2010
Penn State 2010,NPS 2010, NJOIT-OGIS 2008,
DEWA 2008, NJ DEP 2008,
ESRI Streetmap 2006, USGS 2006

Projection: NAD 83 UTM Zone 18N
Date: July 2012

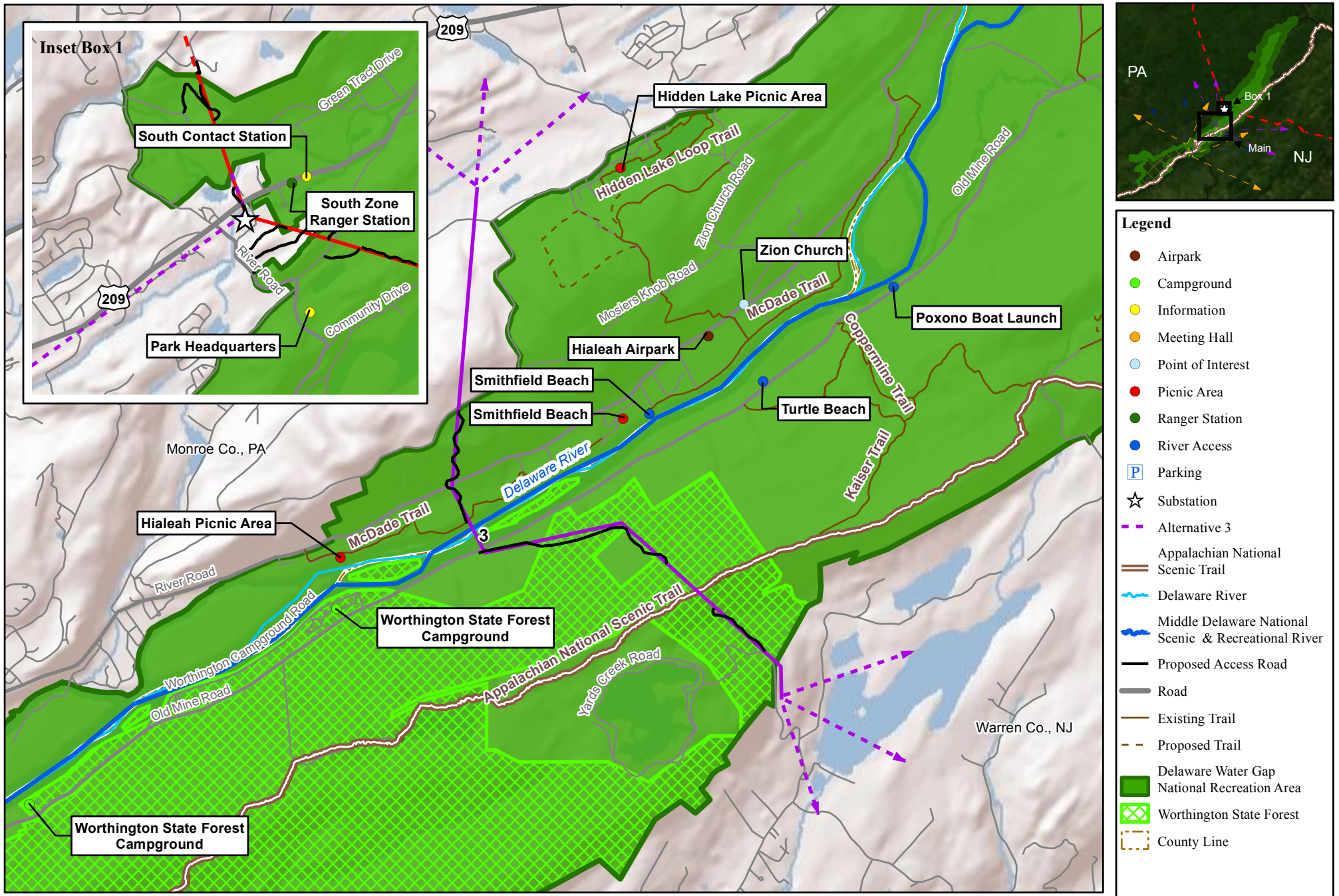


Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 50
Alternative 2/2b
Roadways

Source: ESRI ArcGISonline Map Service 2010
Penn State 2010,NPS 2010, NJOIT-OGIS 2008,
DEWA 2008, NJ DEP 2008,
ESRI Streetmap 2006, USGS 2006

Projection: NAD 83 UTM Zone 18N
Date: July 2012

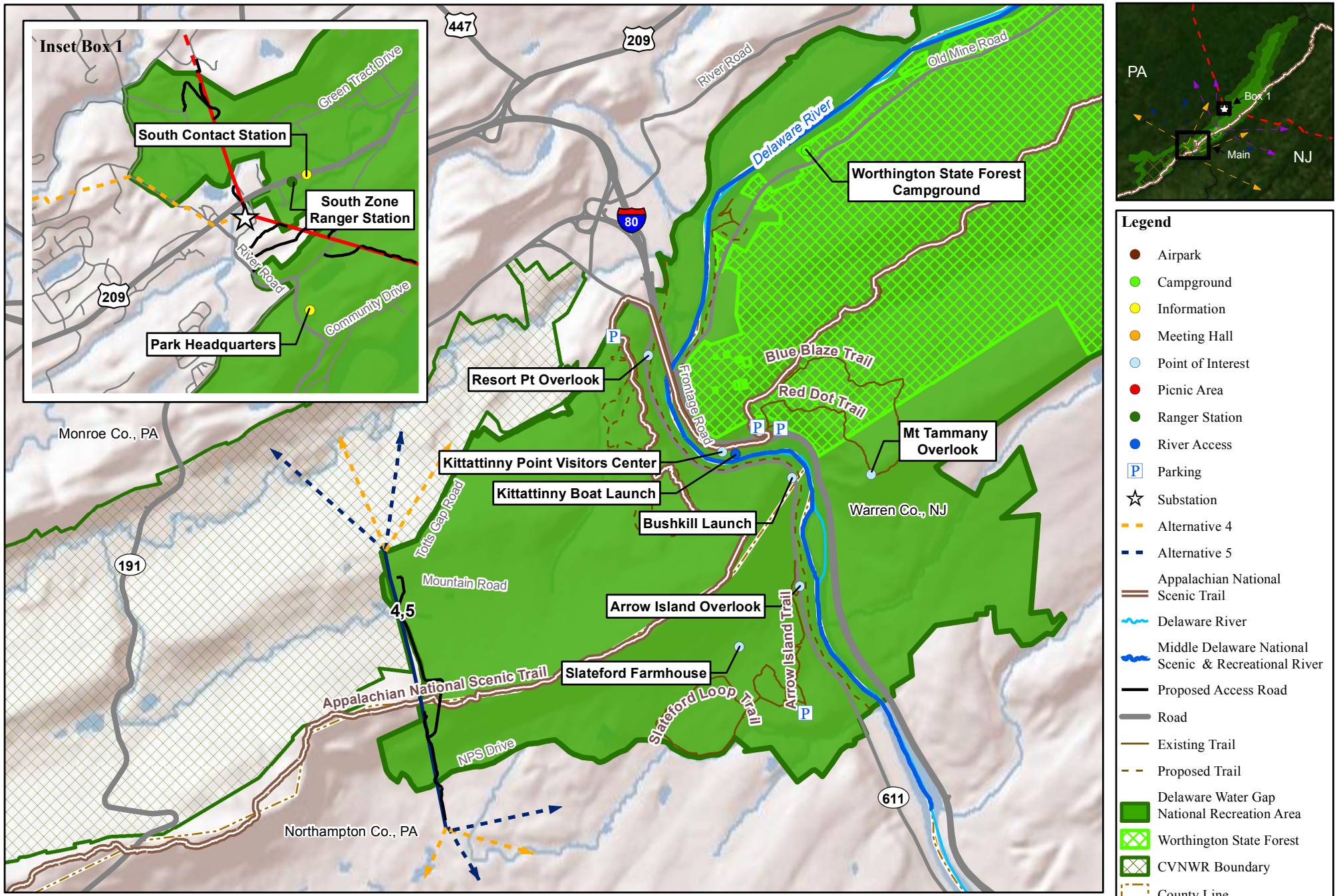


Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 51
Alternative 3
Roadways

Source: ESRI ArcGISonline Map Service 2010
Penn State 2010,NPS 2010, NJOIT-OGIS 2008,
DEWA 2008, NJ DEP 2008,
ESRI Streetmap 2006, USGS 2006

Projection: NAD 83 UTM Zone 18N
Date: July 2012



Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 52
Alternative 4,5
Roadways

Source: ESRI ArcGISonline Map Service 2010
Penn State 2010,NPS 2010, NJOIT-OGIS 2008,
DEWA 2008, NJ DEP 2008,
ESRI Streetmap 2006, USGS 2006

Projection: NAD 83 UTM Zone 18N
Date: July 2012

ALTERNATIVE 1 (NO ACTION), ALTERNATIVE 2, AND ALTERNATIVE 2b

Inside the study area on the Pennsylvania side, US 209 functions as the major backbone of the road transportation network. To the south, I-80 serves as a major entry point to DEWA. I-80 is also one of three east–west access points that cross the Delaware River within a 30-mile span, providing high-speed, high-capacity east–west access (NPS 2009h, 6). PA 191 and PA 611 provide access to the southern end of DEWA near the alignments for alternatives 4 and 5. These routes may also be used to access the construction and maintenance areas for alternatives 1 (maintenance only), 2, 2b, and 3 from the south.

Several roads traverse the study area in both states, including River Road and US 209 in Pennsylvania and Old Mine Road in New Jersey. These roads are designated NPS roads, with the exception of the southern part of Old Mine Road, which runs through Worthington State Forest and is owned by the State of New Jersey (NPS 2009h, 14).

On the New Jersey side of the study area, traffic volumes are relatively low because the Kittatinny Mountain Range acts as a natural barrier, restricting road access. However, local roads, including Millbrook/Blairstown Road (CR/NPS 602) and Flatbrookville/Stillwater Road (NPS 615) provide access to the study area (NPS 2009h, 14).

Tables 30 and 31 provide additional information on arterial, collector, and local roads within the study area, including the state in which it is located and its character/use. The tables list each road's functional class, as defined by the appropriate state transportation department. Figures 49 through 52 show the locations of the roads and were used for background information for tables 30 through 35. Character/use of each road is defined by the following:

- road to park—road provides entry point to the park
- main north–south or east–west road—road serves as a main north–south or east–west travel route in or near the parks
- scenic route—road provides scenic viewing opportunities
- historic – road is listed or eligible for listing on the National Register, or part of a historic district
- regional or secondary road—road provides connection(s) to other roads that provide entry to the park
- serves existing utility ROW corridor – road directly accesses existing utility ROW.

Table 30 provides information on regional roads within the study area. The functional classifications of these roads are principal and minor arterials. Rural principal arterials exhibit corridor movements with trip length and density suitable for substantial statewide or interstate travel and movements between all (or virtually all) urban populations over 50,000 and a larger majority of those over 25,000. Rural minor arterials provide linkage of cities, larger towns, and other traffic generators that are capable of attracting travel over similarly long distances, integrated interstate and intercounty service.

TABLE 30: REGIONAL ARTERIAL ROADS WITHIN THE STUDY AREA

Road	States	Character/Uses
I-80	Pennsylvania, New Jersey, New York	Road to park Interstate highway (principal arterial)
US 209	Pennsylvania	Road to park Two-lane highway Rural minor arterial
PA 191	Pennsylvania	Two-lane road Rural minor arterial
PA 611	Pennsylvania	Main north–south road through southern end of park Two-lane road Rural minor arterial Scenic route

Source: NJDOT 2004, PADOT 2009a.

The study area is served by various local roads that provide access to DEWA, surrounding communities, and/or workplaces for commuters. Table 31 provides information for each local road in the study area, including the state or states in which it is located, its character/uses, and the direction and location of travel through DEWA. Rural collector roads generally serve travel of intracounty importance. Rural local roads primarily provide access to land adjacent to the collector network and serve travel over relatively short distances.

River Road, located on the Pennsylvania side of DEWA, dates to 1744 and is considered an important part of the area's historical and cultural landscape. The original road was laid out by early European settlers and extended from Philadelphia to Milford, Pennsylvania. The portion within the park is considered one of the last remaining sections that most closely resemble its original character. Within the park, the road extends from Shawnee-on-Delaware north to its intersection with US 209 near Bushkill. The majority of the road's alignment is a historic road trace, although the portion of River Road in front of DEWA Headquarters was constructed in 1965. River Road is considered a park resource itself with potential eligibility for the National Register as a historic district (NPS 2005d, 1, 9) (see the "Cultural Landscapes" section for more information). Based on American Association of State Highway and Transportation Officials guidelines and the NPS Park Road Standards, River Road can be classified as either a principal park road or a connector park road. The Federal Highway Administration (FHWA) considers River Road to be a connector park road (FHWA 2003, 1). The NPS defines a connector park road (a Class II road) as a road that provides access within a park to areas of scenic, scientific, recreational, or cultural interest, such as overlooks and campgrounds (NPS 1984, 3). As a park road, River Road is not an essential element of the local traffic patterns. No commercial traffic is allowed on River Road other than that permitted by the superintendent (NPS 2005d, 56). River Road is characterized by narrow pavement widths; minimal, if any, shoulders, with trees at pavement edges; several sharp curves; and an uneven profile. The existing asphalt pavement is currently in fair to very poor condition, with various forms of pavement deterioration (such as cracks, differential settling, rutting, and pothole patching) occurring throughout. Several NPS maintenance patches have been performed to smooth the pavement surface, but no work to correct any subsurface problems has occurred (NPS 2005d, 61; FHWA 2003, 1–2). Substantial pavement damage occurs due to lack of ditches along many of the shoulders, which allows water to infiltrate under the pavement (FHWA 2003, 2). A 1998 FHWA engineering study recommended total reconstruction to rehabilitate River Road. In addition, about 30% of 66 existing culverts may need to be replaced, and safety improvements are needed. The study notes that any rehabilitation must maintain the road's rural setting and character (FHWA 2003, 2). However, no rehabilitation has occurred to date.

TABLE 31: RURAL COLLECTOR AND LOCAL ROADS WITHIN THE STUDY AREA

Road	States	Character/Uses	Direction and Location of Travel through DEWA
Bushkill Falls *Road*	Pennsylvania	Two-lane road Rural collector road	North–south from US 209 at Bushkill (concurrent with SR 2001 from Milford Rd to US 209)
Community Drive	Pennsylvania	Narrow road Rural local road Serves ROW corridor Locally-owned	North–south from River Road to near intersection with Hidden Lake Rd to US 209 near Bushkill Meeting Center?
Creek Road	Pennsylvania	Two-lane road Rural local road Locally-owned	East–west parallel to US 209 between park boundary and US 209 near Bushkill Meeting Hall
Freeman Tract Road	Pennsylvania	Scenic route Unpaved road Rural local road Locally-owned	Northeast–southwest from River Road near DEWA Headquarters, terminating at river
Millbrook/Blairstown Road (CR 602 from Millbrook Village to the park boundary, NPS 602 in park)	New Jersey	Main east–west road Two-lane road Rural local road	East–west from Blairstown to Millbrook Village (ending at old Mine Road)
Old Mine Road	New Jersey	Main north–south road for park visitors Low speed road; portion includes a one-lane section Rural local road Scenic route Listed historic resource Southern portion closed in winter	North–south on east (New Jersey) side of river
River Road	Pennsylvania	Primary entry road to park (at I-80 and near Shawnee-on-Delaware) Main north–south road for park visitors Two-lane road Rural local road Low speed scenic route Eligible historic resource Serves existing utility ROW corridor	North-south orientation on west (Pennsylvania) side of river

Source: DEWA Citizen Advisory Commission 2007; NPS 1987, 63–64; 2009i, 13–15; 2010o; 2010p; 2010q; 2010r; NJDOT 2004, PADOT 2009a.

Old Mine Road is extremely narrow due to overhanging rock ledges and vegetation. It is listed on the National Register as a historic district. The southern section of Old Mine Road is minimally maintained, especially through Worthington State Forest. This section of Old Mine Road becomes a one-way route near I-80, where traffic is controlled by a timed, 3-minute traffic light. Old Mine Road makes a sharp turn under the interstate at the exit ramp at the Kittatinny Visitor Center. Old Mine Road is believed to be one of the oldest roads in the country (NPS 1983b). As noted in the "Cultural Landscapes" section, the

DEWA 1987 GMP identified goals for the preservation of cultural landscapes, including the Old Mine Road. The GMP states, "The Old Mine Road … will be used for interpretation of historic development and growth of the area, as well as for recreational purposes such as hiking and scenic driving. Any actions that will affect the road [and its] respective corridor will have to meet requirements for preserving [its] historical and cultural integrity" (NPS 1987, 33).

Some roads within the study area not only provide important access for motorized vehicles, but also provide road bicycle touring and trail bicycling access. Approximately 3,500 bicyclists use DEWA trails annually (NPS 2009h, 22). Bicycling can be used as an alternative transportation mode, in addition to a recreational use (bicycling as a recreational activity is discussed in the "Visitor Use and Experience" section). The McDade Trail is the only designated bicycle trail in DEWA, though bicycles are permitted on all roads open to vehicular traffic.

Various seasonal multiuse paths exist in DEWA, which can be used for recreation or transportation purposes. On the Pennsylvania side, the McDade Trail offers hiking, bicycling, and cross-country skiing opportunities for visitors. On the New Jersey side, Blue Mountain Lakes Road connects to approximately 10 miles of cross-country skiing trails (NPS 2009h, 22).

DEWA has an extensive network of trails, the majority of which are used for day-use activities. APPA also receives day users, as well as long-distance hikers walking the entire trail or multiday sections of the trail. These pursuits are primarily recreational and not necessarily for transportation. However, visitors can walk from the Delaware Water Gap borough to the scenic viewing opportunities within DEWA (NPS 2009h, 18). More details about trails are provided in the "Visitor Use and Experience" section.

Although most visitors to DEWA use private vehicles, there are several public and private transportation service options for accessing the park and surrounding communities. Transit service in the study area is primarily provided by fixed-route, fixed-schedule buses operating in mixed traffic. Additionally, commuter rail provides access to the northern end of the park at Port Jervis, New York. In addition, various private companies provide public transportation to locations near the study area (NPS 2009h, 30–32). No connecting transit services offer transfers to commuter rail. The Monroe County Transportation Authority Pocono Pony, under the auspices of the NPS and with NPS funding, provides fixed-route, shared-ride, and special-transport bus services. The Pocono Pony offers various routes, all of which can be connected to provide broader service (Monroe County Transit Authority 2010). Within the study area, a fixed route provides access to the DEWA entrance on US 209, and to the intersection of Broad Street and Main Street in the Delaware Water Gap borough (an access point for the APPA). As of spring 2011, the NPS and the Pocono Pony are working together to provide transportation to and around DEWA on a pilot program to test the use of public transportation in the park. Two routes serve the park with service beginning in East Stroudsburg and Milford. This service is seasonal, with planned service dates of April 30 through October 30 (Monroe County Transportation Authority 2011).

Because most visitors use private vehicles to access recreation sites, designated parking areas near highly visited recreation sites represent a significant facility for visitors. Within the study area, the Bushkill Launch parking area is highly used by visitors to access key recreation sites. In addition, the largest concentrations of visitor parking spaces in the study area are located at Kittatinny Point Visitors Center and Smithfield Beach (NPS 2009h, 14). Various other sites throughout the park offer additional visitor parking.

In addition to designated visitor parking areas, various undesignated parking areas exist throughout the park. Dispersed parking throughout DEWA is available on most roads and accounts for a large amount of visitor parking. Some of these areas are considered unsafe and harmful to natural resources. While efforts to eliminate these specific undesignated parking areas have been undertaken, designated parking areas do not provide adequate parking for visitors during peak times, including hunting season and some summer weekends. Thus, it is likely that these undesignated parking areas will continue to be used by visitors during busy months.

Some roads within the study area have been identified as scenic routes, including the following:

- River Road from Bushkill, Pennsylvania, to Shawnee-on-Delaware, Pennsylvania—provides scenic views of agricultural lands, Kittatinny Ridge, and the Delaware River Valley
- Old Mine Road—provides scenic views of hills, villages, Kittatinny Ridge, the Delaware River Valley, and other historic sites within the park on the east side of the river (NPS 2010o)

Table 32 shows the primary roads used to access the most often visited sites in the park (5% or more of visitors surveyed reporting visits to the site). Of the noted visitor destinations within the study area, Milford Beach, Smithfield Beach, and Dingmans Boat Launch are the most visited (30% or more visitors surveyed reported visits to those sites). Visitor destinations are described in further detail in the "Visitor Use and Experience" section under "Visitor Use of Recreational Facilities."

TABLE 32: ROADS TO MOST VISITED LOCATIONS WITHIN DEWA

Visitor Destination	State	Roads Used to Access Destination
Smithfield Beach	Pennsylvania	River Road
Bushkill Access	Pennsylvania	US 209
Kittatinny Point Visitor Center	New Jersey	I-80
Turtle Beach	New Jersey	Old Mine Road
Bushkill Meeting Center	Pennsylvania	US 209
Park Headquarters	Pennsylvania	River Road
Poxono Access	New Jersey	Old Mine Road
Millbrook Village	New Jersey	Old Mine Road Walpack Flatbrook Road (NPS 615) Millbrook/Blairstown Road (CR/NPS 602)

Source: Blotkamp et al. 2010, 43.

Roads within DEWA not only provide access to recreation sites and scenic destinations, they also provide access to surrounding towns. Stroudsburg is the closest large town to DEWA accessible from I-80. Stroudsburg is accessed from the north primarily by PA 191, from the northeast and east by US 209 and I-80, and from the south by SR 611 (table 33).

TABLE 33: PRIMARY ROADS USED TO ACCESS LOCAL COMMUNITIES

Community	State	Roads Used to Access Community
Stroudsburg	Pennsylvania	• I-80 • US 209 • PA 191 • PA 611
Delaware Water Gap	Pennsylvania	• I-80 • PA 191 • PA 611
Shawnee-on-Delaware	Pennsylvania	• River Road • Hollow Road
Bushkill	Pennsylvania	• US 209 • Bushkill Falls Road
Marshalls Creek	Pennsylvania	• US 209 • PA 402 • Marshalls Creek Road

Source: NPS 2010p, 2010q.

A presentation from the NPS DEWA Traffic Safety Study Open House held on July 15, 2008, summarized data related to safety issues that exist in the park. The July 2008 open house presentation identified US 209 and Brodhead Road (near Bushkill Access) and US 209 and Bushkill Falls Road as two areas experiencing the highest incidences of motor vehicle accidents within the study area based on parkwide data (NPS 2008d, 5). Both locations are near Bushkill. Data from the Pennsylvania Department of Transportation (PADOT) indicate that the annual average daily traffic along US 209 between East Stroudsburg and US 206 near Milford is 12,317. The annual average daily traffic is the typical daily traffic on a road segment for all days in a week over a 1-year period, including traffic in both directions. Traffic volumes on these routes generally decrease from south to north, with the highest US 209 volumes near the multiple road intersections at Marshalls Creek. Volumes decrease en route to Bushkill, where they then increase slightly at the intersection of Bushkill Falls Road. Volumes resume a substantially decreasing trend farther north en route to Dingmans Ferry (PA 739) and US 206 near Milford (PADOT 2010).

Within DEWA, major sources of congestion include east–west access points and roads that provide access to surrounding, densely populated communities. According to the June 2009 *DEWA Alternative Transportation Feasibility Study*, several roads that provide access to DEWA from the west that originate in dense, planned communities are a major source of congestion. Within the study area, Bushkill Falls Road has relatively consistent congestion issues. Additionally, congestion is generally an issue at all east–west toll bridges in DEWA, including on I-80 (NPS 2009h, 13–14).

I-80 currently carries some of the highest truck volumes in Pennsylvania—approximately 10,000 trucks per day. These trucks carry an estimated 216 megatons of freight per year. Approximately 60% of the freight carried along I-80 originates and terminates outside Pennsylvania. Much of this traffic connects New York City metropolitan markets with Midwestern markets. According to FHWA freight forecasts, it is expected that I-80 commercial traffic will more than double by 2035. I-80 from the Ohio state line to I-81 will continue to be one of the largest-volume truck routes in the state (PADOT 2009b, 8).

Beyond the high truck volume and freight traffic, I-80 also serves a growing commuter pattern to and from the New York metropolitan area and the Pocono region. Overall current traffic volumes range from an average of 15,000 to 20,000 average daily traffic west of I-380 to over 40,000 average daily traffic east

of I-380. This eastern section has the highest average daily traffic on I-80 and is generally the oldest section, with a high percentage of original construction (PADOT 2009b, 9).

ALTERNATIVE 3

The affected environment for alternative 3 would be the same as that for alternatives 1, 2, and 2b.

ALTERNATIVE 4

In addition to I-80, mentioned in the discussion of alternatives 1, 2, and 2b, roads in the study area near the alternative 4 alignment are PA 191 and PA 611. PA 191 and PA 611 are considered minor arterials. Totts Gap Road in Pennsylvania is a rural road in the study area that travels northwest–southeast and forms the southern boundary of DEWA.

As mentioned above, seasonal multiuse paths within DEWA can be used for recreation or transportation purposes. Although most hiking pursuits are primarily recreational and not necessarily for transportation, visitors can walk from the Delaware Water Gap borough to scenic viewing opportunities within DEWA (NPS 2009h, 18). In addition, the APPA traverses the study area.

PA 611 through the Delaware Water Gap has been identified as a scenic route through the southern part of DEWA. It provides scenic views of the Delaware Water Gap formation, as well as access to three overlooks that provide scenic viewing opportunities:

- Arrow Island Overlook
- Point of Gap Overlook
- Resort Point Overlook

In addition, the Kittatinny Point Visitor Center, located at the Delaware Water Gap, provides scenic viewing opportunities of the southern area of DEWA (NPS 2010p, 2010q, 2010r). There are many other nondesignated vistas within the park that help to accentuate all viewsheds. PA 611 provides access to several minor destinations that are near the alignments for alternative 4, including the Arrow Island, Point of Gap, and Resort Point Overlooks.

Roads within DEWA provide access to surrounding towns. The Borough of Delaware Water Gap is located near the southwestern area of DEWA. This community is accessed from the north primarily by SR 611, from the south by SR 191, and from the east by I-80 (NPS 2009h, 15).

ALTERNATIVE 5

The affected environment for alternative 5 would be the same as alternative 4, with the exception of the portion of the study area near Bushkill. Alternative 5 would not traverse this area.

OUTSIDE THE STUDY AREA

Outside the study area in Pennsylvania, I-84 and SR 6 provide access to DEWA from the north. Access from the west is provided by various roads such as Bushkill Falls Road, Silver Lake Road, PA 739 (Dingmans Turnpike), and SR 2001. Traffic volumes on these roads are relatively high because they are used by residents of the surrounding densely developed communities. US 206 is an access point that provides an east–west crossing for commuters near Milford and for the Dingmans Choice Toll Bridge,

which provides weight- and capacity-restricted east–west access, connecting Dingmans Ferry, Pennsylvania and Layton, New Jersey (NPS 2009h, 6).

The regional roads outside the study area include PA 402, NJ 94, CR 560, PA 739, US 209, and US 6. Major north–south transportation access is provided by US 402, and major east–west transportation access is provided by I-84 (NPS 2009h, 13–15). Tables 34 and 35 provide additional information on each regional and local road outside the study area, including the state or states in which it is located and its character/uses.

TABLE 34: ARTERIAL ROADS OUTSIDE THE STUDY AREA

Road	States	Character/Uses
I-80	New York, New Jersey, Pennsylvania	Interstate highway (principal arterial) Crosses southern end park
I-84	New York, Pennsylvania, New Jersey	Interstate highway (principal arterial) Adjacent to northern park boundary
PA 191	Pennsylvania	Regional road (minor arterial)
PA 402/Resica Falls Road	Pennsylvania	Secondary road (minor arterial)
PA 611	Pennsylvania	Main north–south road (minor arterial) Scenic route
PA 739/Dingmans Turnpike	Pennsylvania	Main east–west road (major collector) Connects to CR 560
US 209	Pennsylvania	Road used to access park (minor arterial) (south of Bushkill and south of Milford) Main north–south road Scenic route
US 6	Pennsylvania	Primary road to Milford and northern end of park (principal arterial) Connects to US 209 in Pennsylvania and US 206 in New Jersey
US 206	New Jersey	Rural principal arterial Runs north-south from Milford and crosses I-80 east of DEWA
NJ 94	New Jersey	Rural minor arterial Roughly parallels the park east of the Kittatinny Mountain Range, Crosses I-80 near DEWA at Columbia and US 206 in Newton

Source: DEWA Citizen Advisory Commission 2007; NPS 1987, 63–64; 2009i, 13–15; 2010o; 2010p; 2010q; 2010r; PPL and PSE&G 2008; NJDOT 2004, PADOT 2009a.

TABLE 35: RURAL COLLECTOR AND LOCAL ROADS OUTSIDE THE STUDY AREA

Road	State	Character/Uses	Direction and Location of Travel through DEWA
Milford Road	Pennsylvania	Main north–south road Rural major collector road Concurrent with US 209 between Bushkill and Marshalls Creek Serves existing utility ROW corridor	North–south from Bushkill to Milford
CR 560	New Jersey	Rural major collector road	East–west connection between PA 739 and US 206
Deckertown Turnpike	New Jersey	Rural major collector road	East–west from US 206
Layton Hainesville Road (CR 645/NJ 645)	New Jersey	Rural minor collector road	North–south to CR 560
Walpack Flatbrook Road (NPS 615)	New Jersey	Rural local road	North–south from Old Mine Road at Flatbrookville to Peters Valley

Source: NJDOT 2004, PADOT 2009a.

I-84, north of DEWA, serves travelers between Scranton, Pennsylvania, and Hartford, Connecticut. It is a well-traveled route, providing an alternate route for Boston–New York City traffic via the Massachusetts Turnpike, I-84, and I-684. I-84 traverses a generally hilly route, including the Poconos, the historic Hudson Valley, and the foothills of Connecticut. It also makes part of an outer loop of New York City and is a major thoroughfare for Connecticut-based commuters (Interstate Guide 2007).

Toll bridges are located outside the study area but within DEWA near Milford on US 206 and at Dingmans Ferry, which connects PA 739 to CR 560. One additional toll bridge is located outside but near DEWA: the Portland toll bridge, which connects Portland, Pennsylvania (on PA 611), to Columbia, New Jersey (on NJ 94), southeast of DEWA.

According to the NPS DEWA Traffic Safety study, the intersection of US 209 and PA 739 / Dingmans Turnpike near Dingmans Ferry has experienced one of the highest incidences of motor vehicle accidents within DEWA, along with the two intersections at US 209 mentioned above (NPS 2008d, 15).

Also, as mentioned above, the *DEWA Alternative Transportation Feasibility Study* (NPS 2009h, A-23) identified several roads that provide access to DEWA from the west that originate in dense, planned communities and are a major source of congestion. Outside the study area, these roads include PA 402 (Resica Falls Road), Silver Lake Road, PA 739 (Dingmans Turnpike), and SR 2001 (Bushkill Road/Milford Road) (NPS 2009h, A-23). Additionally, congestion is generally an issue at the toll bridges outside the study area. Congestion issues outside the DEWA boundary also include major north–south and east–west thoroughfares in Monroe and Warren counties. The Middle Smithfield Township 2007 comprehensive plan update identifies congestion along US 209 as being the township's largest transportation issue and indicates that the Marshalls Creek Bypass Project/US 209 Relief Route is underway to relieve congestion near US 209 and US 402 (Middle Smithfield Township 2007, 8-3–8-4). The Marshalls Creek Bypass Project/US 209 Relief Route is scheduled for completion by the end of 2012.

Outside the study area in New Jersey, US 206 functions as a major transportation artery to the south. In New Jersey, major east–west transportation access is provided by I-80, and I-84. NJ 94 roughly parallels

the park east of the Kittatinny Mountain Range, and crosses I-80 near DEWA at Columbia and US 206 in Newton.

On the New Jersey side of DEWA, traffic volumes are relatively low because of the Kittatinny Mountain Range serving as a barrier with few road crossings. However, roads such as CR 560 and Layton Hainesville Road (CR 645) provide access to the study area (NPS 2009h, 14).

Bicycling facilities outside the study area include NPS 615, which provides road touring on a paved road from Flatbrook Ridge to Walpack Center. The route follows 6.5 miles of rolling hills and sharp curves.

Public and private transportation services in and near the parks include:

- Pike County (Pennsylvania) provides shared-ride/demand-response services for handicapped, disabled, and senior citizens in Pike County (NPS 2009h, 16; Pike County Area Agency on Aging 2010).
- Northampton County (Pennsylvania) provides bus service to areas near the southern end of DEWA, via the Easton system route (LANTA 2010).
- New Jersey Transit provides passenger train service from the New York City area to Port Jervis (New York), north of the park, via the Port Jervis–Suffern Line (NJ Transit 2010). New Jersey Transit connects to the Metropolitan Transportation Authority rail system, Amtrak, Greyhound, and other regional public and private transit systems (NJ Transit 2010).
- New Jersey Transit operates "Wheels" Suburban Transportation Services bus routes, with routes 890 and 891 providing access across the Delaware River into Easton, Pennsylvania (located southeast of the study area), where passengers can connect to Lehigh and Northampton Transit Authority service (Warren County 2004, 17). The Shortline bus, a private transportation service, provides private charter tours with regular daily service to Port Jervis, north of the park (State Parks 2010). Sussex County provides bus service within the county and out of county through a loop route. Additionally, a paratransit service is available for seniors, disabled people, and veterans. The major Sussex County bus routes, routes 1 and 2, do not provide access to areas near the study area (Sussex County 2008). Warren County has five intracounty bus routes, two commuter rail lines, and two private bus carriers (Warren County 2004, 15).
- Martz Trailways, the Shortline Bus, and Greyhound provide access to DEWA from surrounding states and counties. Martz Trailways routes buses to a location near the southern end of DEWA from Scranton, Wilkes-Barre, Effort, and Mount Pocono, Pennsylvania, and New York City (NPS 2009h, 16).

No public transit connections are provided from either the Delaware Water Gap borough or Port Jervis (NPS 2010s).

VISUAL RESOURCES

The affected environment for visual and scenic resources is the viewsheds of DEWA, MDSR, and APPA. The viewshed is defined as areas with a line of sight looking toward and away from the proposed transmission line corridors for the alternatives. The viewshed is based on geography in addition to built and natural features, which determine what can and cannot be seen from a given location. For a more detailed discussion of how the viewshed analysis area was established, refer to the "Visual Resources" section of chapter 4 under "Methodologies."

McDade Trail in DEWA.

A Cliff Trail overlook, at the northern end of DEWA.

The Delaware Water Gap, from I-80.

Watergate Recreation Site, a day-use facility in DEWA.

This section provides an analysis and evaluation of views at specific key observation points (KOPs). However, it does not address the actual and overall impacts on scenic resources. Within the study area viewsheds, important representative places from which to view scenic resources that could be impacted by the proposed actions were identified in consultation with NPS staff, and are described in more detail in this section. While these views are meant to represent the character and variety of the scenic resources of DEWA, MDSR, and APPA where they would or may be impacted by the proposed alternatives, there would be points within the resource viewsheds that would be impacted which are not included by the KOPs. The enabling legislation for the park resources directs managers to protect and preserve the scenic resources as an important element of the rationale for establishing the national significance of the individual units. DEWA is itself a cultural landscape of exceptional scenic resource value as is APPA and MDSR. The visual analysis of the affected environment described here and the impacts to the resources described in chapter 4 will help the reader understand the ramifications of the proposed alternatives in specific areas described. The reader can assess the overall scenic impacts themselves using chapter 4 as a tool.

The site vicinity is shown in figure 53. Spanning the border of New Jersey and Pennsylvania, the majority of the (DEWA) viewshed falls within the Delaware River watershed, and includes a variety of geologic features and land cover types. To the north, the geologic features of the Pocono glaciated plateau gives way to ridge and valley formations of the northern Allegheny Mountains. To the south and east, the Great Appalachian Valley, that eventually gives way to the megalopolis of eastern New Jersey and New York

City. Local population centers include Stroudsburg and East Stroudsburg in Pennsylvania. Outside of these boroughs, the communities are mostly rural with diffuse population centers and densities.

Two distinct landforms compose the study area landscape for all alternatives: the Valley and Ridge physiographic province, including the river lowlands or alluvium-filled basins and the low parallel ridges of the valley, and the Appalachian Plateau province, with its enlarged stream valleys and rounded highlands. The elevation of the valley varies from 300 to 400 feet AMSL. The adjacent highlands rise an additional 600 to 1,000 feet (NPS 1999, 43).

SCENIC AND AESTHETIC RESOURCES

A landscape's visual resources provide the stimulus that results in visual experience. Alternatives can affect visual experience by changing the visual resource base. Therefore, an inventory of existing resources is required to analyze impacts. Important scenic and aesthetic resources within the affected environment viewshed include the following:

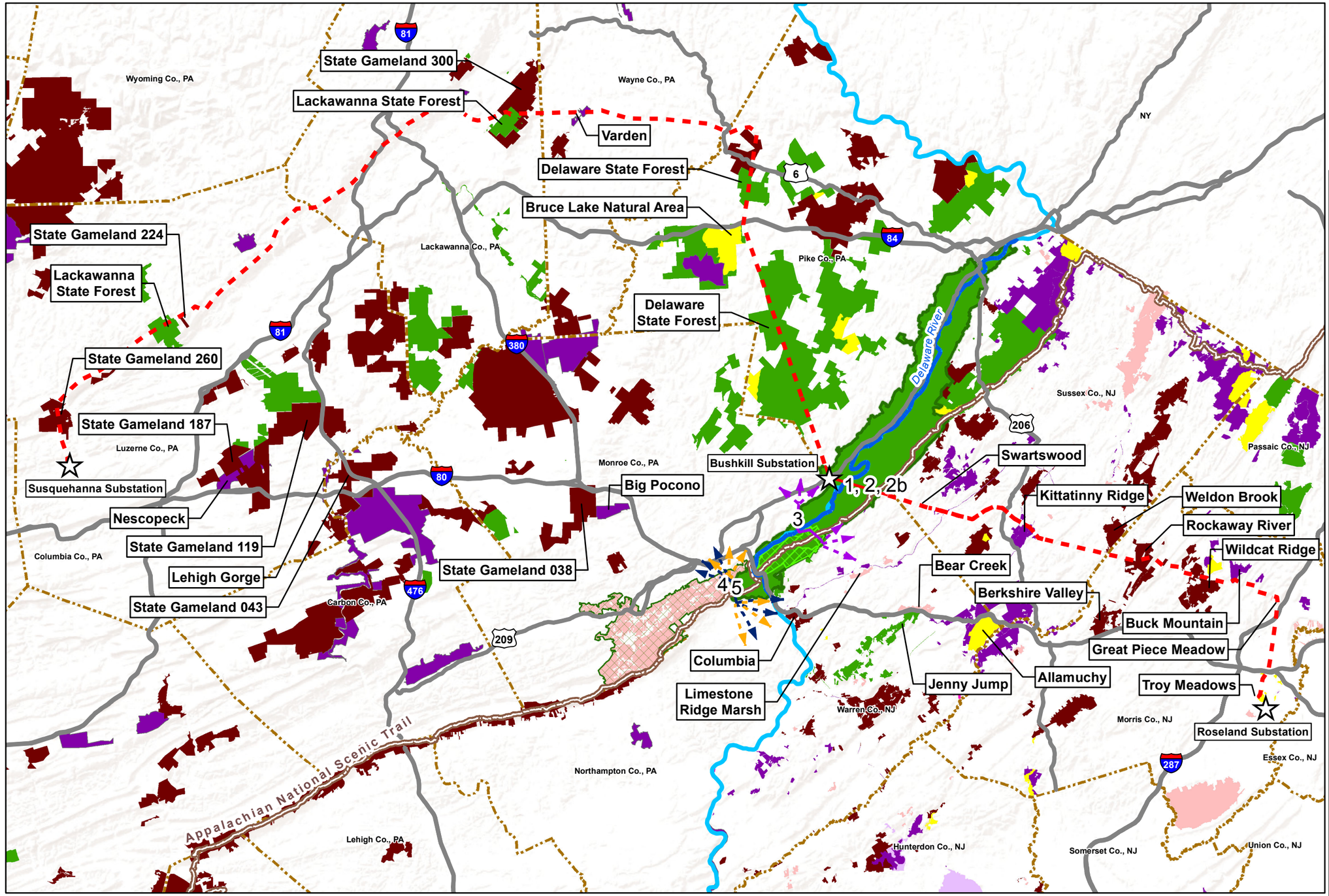
- DEWA
- APPA
- MDSR
- Scenic Road US 209
- Old Mine Road, New Jersey
- River Road, Pennsylvania

Given the geographic variety of the proposed alternatives, the location of scenic and aesthetic resources varies for each, as described in the "Landscape Character" section below.

VISUAL CHARACTER

In order to assess impacts on visual resources, the visual character of the affected environment must be established. People do not experience the visual environment as discrete, individual objects, but rather as an integrated whole. Visual understanding or cognition of an environment is based on the visual character of objects and the relationships between them. Visual character is influenced largely by land use patterns within the unique alternatives' study areas (FHWA 1988), which are described individually below. This report uses the FHWA protocol to evaluate the quality of views, considering the concepts of unity, intactness, and vividness in a given viewshed. Scenic resources are an important value defined in the NPs Organic Act of 1916 (Organic Act), the DEWA Enabling Act, and the Wild and Scenic Rivers Designation. Definitions of these terms are as follows:

> **Unity**: the degree to which the visual resources of the landscape join to form a coherent, harmonious visual pattern.
>
> **Intactness**: the visual integrity of the natural and built landscape and its freedom from encroaching elements.
>
> **Vividness**: the combination of landform, water, vegetation, and human-made development that form a memorable composition and distinct visual pattern (FHWA 1988).



Legend

- Substation
- Alternative 2, 2b
- Alternative 3
- Alternative 4
- Alternative 5
- Appalachian National Scenic Trail
- Middle Delaware National Scenic & Recreational River
- Delaware River
- Road
- State Park
- State Forest
- Wildlife Area/Preserve
- Natural Area
- Wildlife Management Area/Gameland
- Fish Hatchery/Fishing Access
- Recreation Area
- Delaware Water Gap National Recreation Area
- Worthington State Forest
- CVNWR Boundary
- County Line

Note: Designated boundary of CVNWR is depicted, not all property is owned within the boundary

0 8 16
Miles

Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 53
Protected and Recreational Areas Outside of the Study Area

Source: USGS 2006, NJDEP 208, NPS 2010
EA Engineering 2010, NJGIN 2010,
PASDA 2010, Penn State 2010,
ESRI ArcGISonline Map Service 2010;

Projection: NAD 83 UTM Zone 18N
Date: July 2012

As noted above, KOPs were selected to approximate impacts for the entire viewshed. While these views are meant to represent the character and variety of the scenic resources of DEWA, MDSR, and APPA where they would or may be impacted by the proposed alternatives, there would be points within the viewsheds that would be impacted which are not included by the KOPs. For more information regarding this methodology, see "Chapter 4: Environmental Consequences."

Landscape Character Delaware Water Gap National Recreation Area

DEWA includes over 40 miles of nationally designated scenic river (MDSR) and 27 miles of APPA, plus 100 miles of other trails affording views of streams, ridgetop overlooks, wetlands, and waterfalls (NPS 2010t). As described in the DEWA GMP, "Scenic resources [include a] mosaic of color, form, and texture that has resulted from a unique blending of natural and cultural resources within the Delaware River Valley" (NPS 1987, 11).

The DEWA landscape consists of heavily wooded Pennsylvania and New Jersey uplands, rolling hills of successional forests, open lowlands of the Delaware and Flatbrook valleys, the Delaware River and its tributaries, and lakes (NPS 1987, 13). As mentioned in the "Socioeconomics" section, development in the area has resulted in growth that has rapidly changed the region's character. The resident population in communities surrounding DEWA is expected to continue to increase by as much as 50% by 2030 (NPS 2003d; 2009h, 8), making the land protected within its boundaries increasingly rare in an area so close to major metropolitan areas.

The DEWA, APPA, and MDSR landscape includes:

- Farms
- Early pre-historic and historic human settlement
- French and Indian war remnants
- Evidence of Dutch occupation
- Hotels/Resorts

Landforms and vegetation features seen from the Delaware River.

The Delaware River is one focal feature of DEWA, and 40 miles of the river passes through the recreation area boundaries. In 1978, the river section within the NPS boundaries was designated as the MDSR in recognition of its remarkable resources. In keeping with the provisions of the Wild and Scenic Rivers Act, water quality within the river's upper reaches is extremely high, supporting outstanding natural, fisheries, and recreational resources. In 1992, revised water quality standards designated the river as "Special

Protection Waters" to protect the existing water quality from measurable change in the designated scenic river stretches through a monitoring-based regulatory program (NPS 1999, 2–3). The water in this river segment is renowned for being "cleaner than clean," exceeding standards for drinking water (NPS 2010u). Water recreation such as floating the river, kayaking, and canoeing offers high-quality views of the forested Kittatinny Ridge and the largely undeveloped river shorelines and valley.

Old Mine Road.

The landscape comprises second- and third-growth forest, old fields and thickets, and croplands, reflecting several centuries of continuous human occupation. Miles of old farm roads, mostly abandoned, once provided access for farming and logging. About 3,000 acres, mainly prime farmland in the valley of the Delaware River, is leased to farmers to preserve the rural agricultural scene. An additional 1,500 acres, primarily old farm fields and home sites in various stages of ecological succession, are now managed to maintain cultural landscapes and enhance scenic wildlife habitat diversity. In recent years, farmers have declined to cultivate some areas that were previously farmed because it is no longer profitable and because there are fewer farmers it may cease to be as valuable a tool. Only the most productive land in the valley is now under cultivation, and much of the remaining land is covered with maturing forest, mainly mixed oak communities that have grown in areas that were logged at least once. Some old farm fields have been restored and planted with warm season grasses to maintain open space and prevent the spread of invasive plants, while maintaining an agricultural landscape. Old fields and shrub thickets provide an "edge" to forested areas (NPS 1999, 43, 46–47).

Historic Millbrook Village.

The DEWA cultural landscape is influenced by its history of human habitation, reflected in the way sites were spatially organized in response to certain natural features and topography, land use patterns, views and vistas, circulation patterns, and vegetation. The flat, fertile floodplains of the Delaware River and the Flatbrook Valley were used for farm fields, which were delineated by primary roads and the river, as well as rock, tree, and fencerows. Dwellings were usually built near a water source, and can still be seen today. Views of and access to farm fields and the river were important to the organization of buildings and circulation. Because of the widespread removal of trees in this rural landscape and the sloping nature of the overall valley, expansive views of the fields, river, other farmsteads, and villages were a prominent feature of this area. Some of the bridges and roads have been widened with shoulders or changed to conform to modern safety standards. However, the historic pattern of agricultural development remains as one of the pervasive themes of the DEWA cultural landscape (NPS 1999, 50). The park is a tapestry of natural and cultural resources woven into a single large scale cultural landscape that is composed of three separate parks: DEWA, MDSR, and APPA, and also Route 209.

Villages were also part of the historic landscape. Today, Walpack Center and Peters Valley are easily recognized as historic villages. In other valley villages, such as Bushkill, Egypt Mills, Flatbrookville, and Dingmans Ferry, the historic village only partially remains. Villages were situated at the confluence of brooks and streams, along roads, or near mills or quarries. The boundaries of villages are difficult to

determine, because they served surrounding farmsteads and fields. Because villages were sited at the base of a ridge, views of these fields were probably a strong feature from within these villages, as were the views of the village from surrounding fields (NPS 1999, 51).

The cultural landscape changed as the decline of agriculture gave way to the rise in recreation, resulting in the expansion of hotels and boarding houses. Farmers opened their homes to summer boarders, and wealthy individuals purchased secluded farms for summer residences. Through this transition, farms retained some agricultural elements, such as field patterns, outbuildings, and circulation patterns. These traditional settings were embellished with ornamental stonework and plantings, tree-lined walkways, mowed lawns, reflective ponds, and additional cabins or structures. These embellishments still prevail at some properties, including Schoonover Farm, Zimmermann Farm, and Heron's Nest. Views of the rural landscape and the river were "a commanding aesthetic attraction to these recreational visitors" (NPS 1999, 51). In addition to the transformation of farmsteads, new recreation-related facilities, such as Boy Scout camps, were established upland from the river valley in the Pocono Highlands and Kittatinny Ridge. Attractions such as Childs Park and Dingmans Falls were developed, as well as summer residences such as the Crane-Goldhart house (NPS 1999, 51).

The rural character of the communities adjacent to the park has also been changing. The creation of new residential units and resort complexes has led to increases in some commercial development along the major road corridors that border the park. Historically, these new homes were intended for seasonal weekend and vacation use. Now, many have been converted to primary residences because people desire to live in areas with a natural setting. Seventy-five thousand more people reside in the counties surrounding the park than was originally forecast for the year 2000. Strip malls, fast-food restaurants, and other similar developments targeting residents and visitors are concentrated along the area's major roads and interchanges associated with I-80, I-84, US 6, US 206, US 209, PA 739, NJ 15, and NJ 94. However, no large-scale manufacturing or industrial complexes border the park or are planned for the future (NPS 1999, 54).

Despite disturbance associated with human settlement, DEWA supports over 1,300 species of vascular plants and diverse plant communities. Of special importance are those communities that have retained much of their ecological integrity and contribute to the biological diversity of the park and thus its scenic quality. These communities are often home to rare plant and animal species, as discussed in the "Rare and Unique Communities" section.

Overlooks, scenic vistas, and clear air are some of DEWA's most appealing qualities. The quality of the air in and around DEWA is generally considered "good." This normally translates into excellent viewshed conditions for DEWA's natural and cultural resources. Occasionally during summer heat spells atmospheric inversions can occur, causing higher levels of ozone and haze. On average, the recreation area may experience 14 such days during a summer. On these days, the views and vistas of the Delaware Water Gap, the river valley, and the Kittatinny Mountains can be somewhat obscured (NPS 2008e).

Appalachian National Scenic Trail

APPA traces the high points of Kittatinny Ridge along the Pennsylvania and New Jersey state lines, and 27 miles of the trail passes within the DEWA boundary. Much of the trail within the study area is surrounded by forest, so views are frequently limited to the foreground. However, at clearings, the trail's relatively high position affords hikers opportunities for expansive views to the north across the Delaware River Valley or southeast across the continuous forest of rural western New Jersey.

Within gaps and low points, the trail passes beneath mixed oak forest with occasional pine and hemlock, while the highest knolls are typically rocky and grass-covered. Each season highlights a different color

palette for the trail and its vistas. The trail is particularly scenic in autumn, when the canopy changes to a mosaic of red, orange, and yellow. Summers are verdant; winter brings bare branches and occasional snow flurries.

APPA in Pennsylvania.

Vista from APPA in New Jersey.

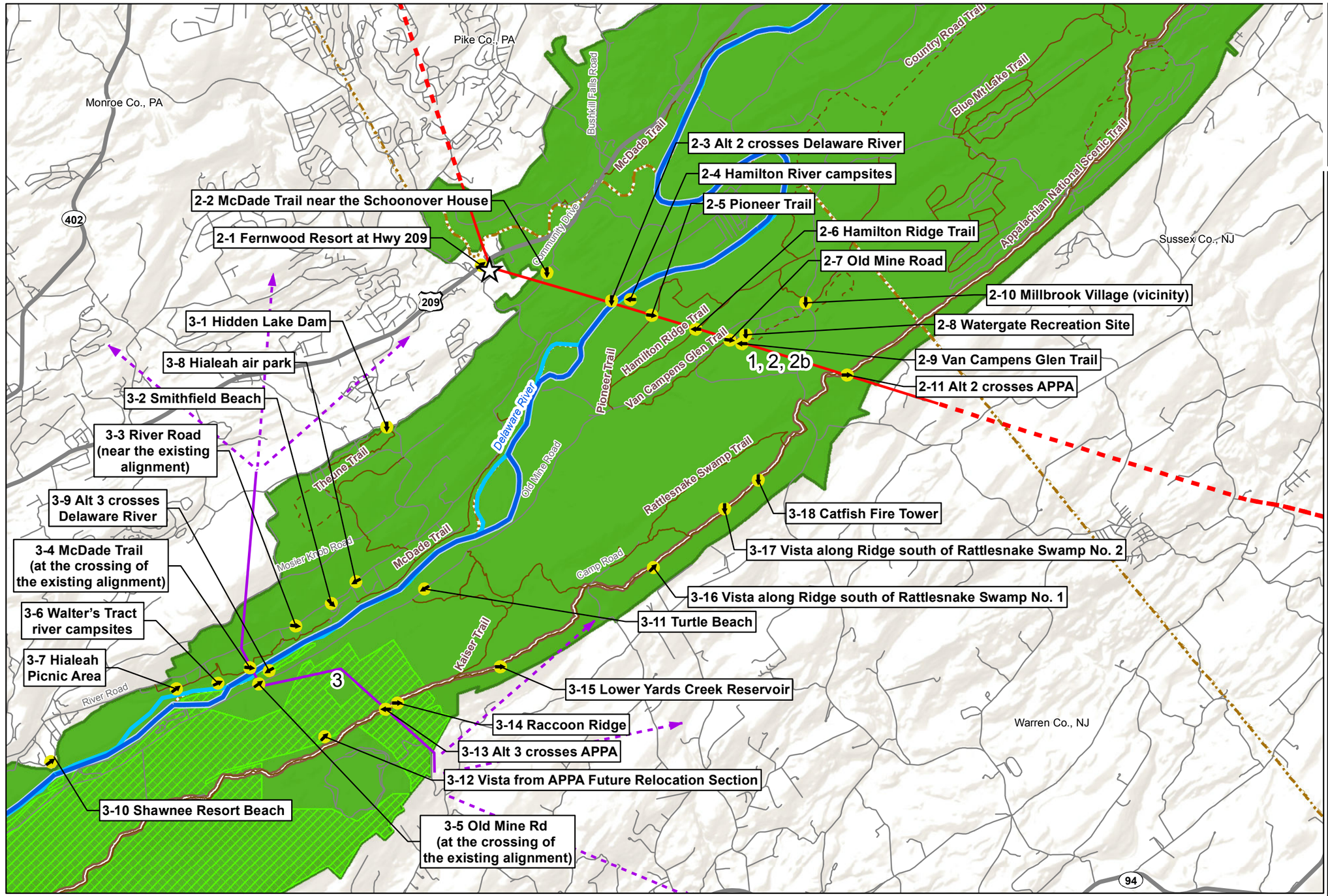
APPA receives an estimated two to three million visitors per year over its entire 2,178 miles. The trail's natural and remote landscape attracts the attention of large numbers of visitors, offering 280 shelter sites and 44 designated overnight-use areas, as well as approximately 4,000 undesignated (visitor-created) campsites. This allows visitors to enjoy APPA for a variety of purposes, from quick day trips to multiday or multiweek journeys along longer stretches of the trail (NPS 2009i, 78–79). As described in the "Visitor Use and Experience" section, the portion of the trail in DEWA is heavily used (NPS 1981, 29). The total number of APPA users in DEWA as reported by the NPS Public Use Statistics Office was 66,700 in 2009 (NPS 2010v). Of the APPA visitors to this region, 36% are day-use visitors. Another 37% stay overnight along the trail, and the remaining 27% hike longer sections of the trail (Manning et al. 2000, 10, 91, 102).

The portion of APPA that would be paralleled or crossed by the transmission line under each alternative follows:

- Alternatives 1, 2, and 2b: At the east edge DEWA and directly west of Sand Pond, which is north of Hardwick Township, New Jersey, the trail emerges from the woods and follows the transmission line ROW for about 600 feet before turning away from the ROW again and reentering the forested cover, resuming its northeast-southwest trajectory.
- Alternative 3: At the east edge of DEWA, south of the alternative 2 crossing, and just north of Upper Yards Creek Reservoir, the small utility line crosses the trail approximately perpendicularly at the crest of Kittatinny Ridge.
- Alternatives 4 and 5: At the southernmost boundary of DEWA, the utility line crosses the trail just north of Northampton County Park near Totts Gap Road.

Key Observation Points

"Key observation point" (KOP) is a term used to describe an identified location and position of a viewer. KOPs can be either sensitive points within the viewshed, typical points representing landscape character or view type, or random points (FHWA 1988, 33). KOPs typically document the landscape scene from a stationary viewpoint and in a level position. For this study, NPS staff provided the locations for representative KOPs, shown in figures 54 and 55.



Legend

- Selected KOP by view direction
- Substation
- Alternative 2, 2b
- Alternative 3
- Appalachian National Scenic Trail
- Middle Delaware National Scenic & Recreational River
- Delaware River
- Road
- Existing Trail
- Proposed Trail
- Delaware Water Gap National Recreation Area
- Worthington State Forest
- County Line

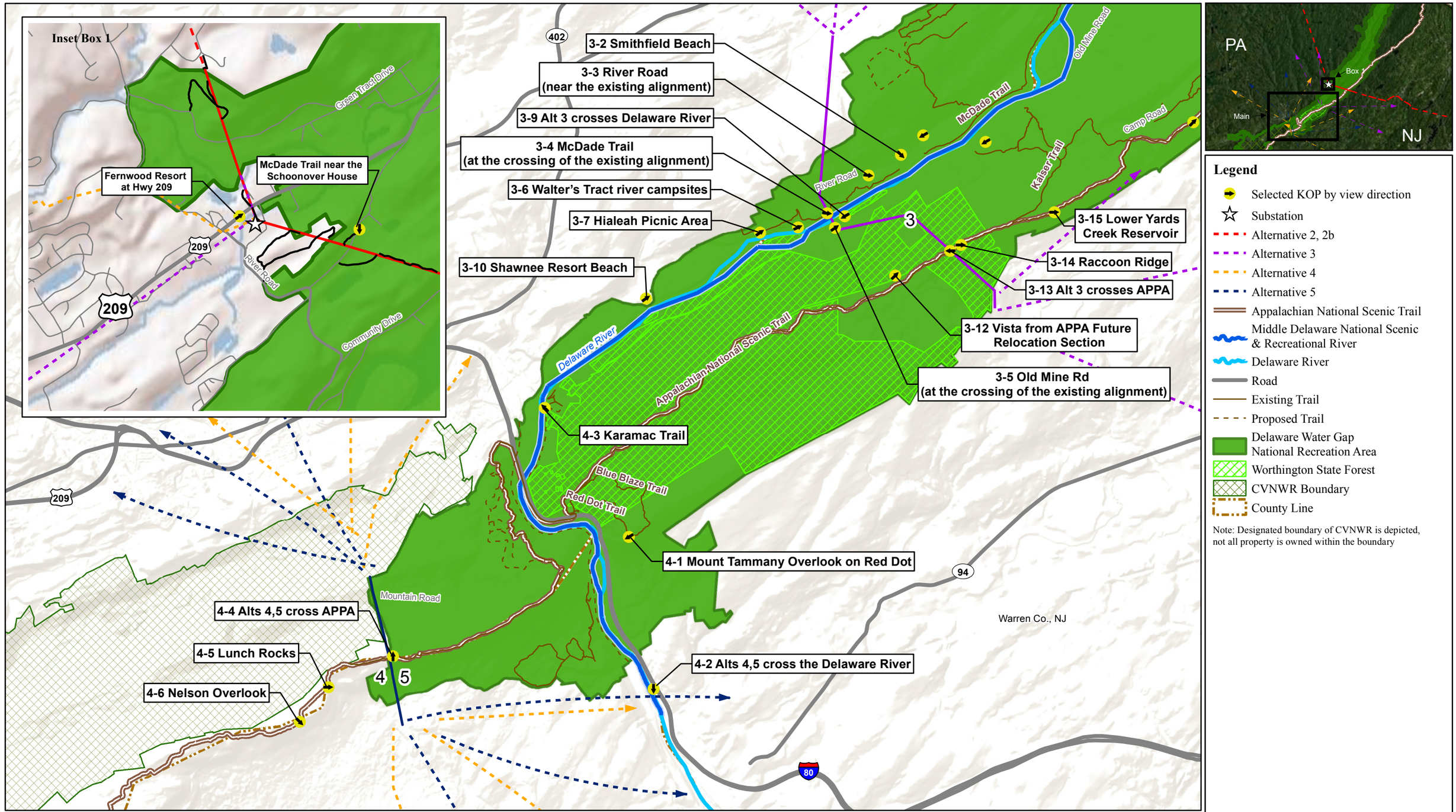
0 1 2 Miles

Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 54
Selected Key Observation Points

Source: ESRI ArcGISonline Map Service 2012; National Atlas of the United States 2005

Projection: NAD 83 UTM Zone 18N
Date: July 2012



Legend

- Selected KOP by view direction
- Substation
- Alternative 2, 2b
- Alternative 3
- Alternative 4
- Alternative 5
- Appalachian National Scenic Trail
- Middle Delaware National Scenic & Recreational River
- Delaware River
- Road
- Existing Trail
- Proposed Trail
- Delaware Water Gap National Recreation Area
- Worthington State Forest
- CVNWR Boundary
- County Line

Note: Designated boundary of CVNWR is depicted, not all property is owned within the boundary

0 1 2
Miles

Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 55
Selected Key Observation Points

Source: ESRI ArcGISonline Map Service 2012; National Atlas of the United States 2005

Projection: NAD 83 UTM Zone 18N
Date: July 2012

Photographs were taken at each KOP to document existing conditions. Each KOP was assessed using the FHWA visual quality rating scale. Vividness, intactness, and unity were rated on a numeric scale from 0 to 7. On this scale, 0 = very low visual quality, 3 to 4 = average/moderate quality, and 7 = very high quality. For more information regarding KOP scoring, refer to the *Visual Resources Technical Report* (DEA 2011). KOPs considered for this study are identified and described by alternative below.

The following sections describe the landscape and visual character by alternative.

ALTERNATIVE 1 (NO ACTION), ALTERNATIVE 2, AND ALTERNATIVE 2b

The alignments for alternatives 1, 2, and 2b coincide and are discussed here collectively. The alternatives' alignment corresponds to the applicant's existing 147-mile 230-kilovolt (kV) B-K Line alignment between Susquehanna and Roseland substations. Following the alignment from Susquehanna Substation eastward, the B-K Line roughly parallels the western fringe of the Wilkes-Barre/Scranton metropolitan area, crossing from Luzerne County into Lackawanna County. According to aerial photography, the alignment follows an escarpment feature above the urbanized area. Named landforms include the highpoints Bald, West, and Bell mountains. North of Scranton, outside the town of Blakely, the alignment turns east. Here the photographs indicate that the alignment passes over rural, dispersed developments in Wayne County, Pennsylvania. East of Lake Wallenpaupack, the alignment turns sharply south and enters State Game Land No. 183. After crossing I-84 in Pike County, the alignment passes over the undeveloped, forested terrain of Delaware State Forest before intersecting Bushkill Substation near Fernwood Hotel and Resort and the western boundary of DEWA, off US 209. Here the corridor turns east-southeast.

Within DEWA, the alignment crosses APPA and several natural features, including Arnott Fen, Hogback Ridge, MDSR, and Kittatinny Ridge.

Leaving DEWA, the alignment passes through the Skylands region of northwestern New Jersey. The area is characterized by low topography and dispersed rural and agricultural developments. In the vicinity of Lake Valhalla, just west of I-287, the alignment turns directly south. East of the Jersey City Reservoir, among the residential developments of suburban Parsippany, New Jersey, the alignment reaches the Roseland Substation.

The alignment for alternatives 1, 2, and 2b, which would cross DEWA directly east from the Bushkill Substation and would use the existing B-K Line ROW, would affect the following park resources (as identified by park staff), which are described in more detail in the following sections.

Trails crossed by existing ROW:

- APPA
- Delaware River Water Trail
- McDade Trail (Pennsylvania)
- Hamilton Trail (New Jersey)
- Pioneer Trail (New Jersey)
- Van Campen Glen Trail (New Jersey)

Scenic features crossed by existing ROW:

- Hamilton River Campsites (New Jersey)—12 campsites
- Watergate Picnic Area (New Jersey)—currently, most of the transmission line towers and lines are hidden by trees
- Old Mine Road (New Jersey)—scenic auto tour

Scenic resources with potential views of alternative alignment:

- Watergate Recreation Site
- Millbrook Village
- US 209
- Cliff Trail
- Salamovka House
- Multiple scenic viewpoints along APPA

Alternative 1, 2, and 2b Alignment Crossing APPA

Primary viewer groups: day- and long-distance hikers

At the high point of the Kittatinny Ridge escarpment, APPA passes beneath the existing B-K Line. The trail enters the cleared ROW and follows the corridor for 400 to 500 feet before reentering the woods. Hikers pass close by two large, galvanized-steel lattice tower structures. The clearing creates views both east and west. Looking west, the view overlooks the Delaware River Valley, and the cleared corridor is clearly discernible for several miles.

Looking west from APPA at the B-K Line crossing in New Jersey.

This view demonstrates low to moderately low unity because the large, linear corridor detracts from the overall harmony of the landscape. Similarly, intactness is low, because the lattice towers encroach on the natural surroundings and the wide swath of cleared vegetation visually detracts from the otherwise forested landscape. The view demonstrates average vividness because the transmission line structures and corridor create a human-made anomaly along the primitive foot trail.

Alternative 1, 2, and 2b Alignment Crossing the Delaware River

Looking south from Delaware River toward existing transmission line. Wires are visible midway up the frame.

Primary viewer groups: boaters, canoers/kayakers, anglers, campers

The alignment for alternatives 1, 2, and 2b would cross the Delaware River between river miles 222 and 223, north of Depew Island. As is typical in DEWA, the river is broad, shallow, and swift, and the water is relatively clear. It is most common for river users to let the current carry them downstream and then take out; therefore, the most common view would face downstream to the southwest. From the river, views are limited by the ridges to the east and west and the deciduous vegetation extending to the water's edge. Moving upstream or downstream, views are often free of human-made developments for several minutes before reaching a recreation facility or a group of riverfront cottages. Large, steel lattice towers and conductors (i.e., wires) can be seen from the river as boaters pass under the existing B-K Line. One tower can be seen at the top of the Hogback Ridge on the Pennsylvania side of the river, and two more are clearly visible within the cleared corridor climbing an eastern ridge through Hamilton River Campsites.

This view has moderately high unity because the river bending away from the viewer adds harmony. Intactness is average to moderately high because the conductors can be seen, but are not overt, and because the tower on Hogback Ridge is so heavily screened by trees. Vividness is similar to other views from the river; the combination of water and vegetation, particularly during fall color, is highly memorable.

Hamilton River Campsites

Primary viewer group: campers

The Hamilton River Campsites, on the New Jersey side, are accessible to the public by watercraft only. About 10 designated primitive campsites follow the bank beneath a canopy of young deciduous trees. Very little vegetated understory exists, giving the area an open appearance. The lack of vehicular roads or constructed appurtenances, except for a wooden restroom, provides a rustic backcountry aesthetic. The existing B-K Line transmission corridor creates a noticeable gap in the scattered tree cover a few hundred feet away.

Current view within Hamilton River Campsites, looking north. The existing corridor that alternative 2 would follow can be seen in the middleground to the right, although it is screened by tree trunks.

This view has high unity because the visual elements all complement one another to

create a pleasing forested bank, shown in the photograph during autumn color. Intactness is high, enhanced by the trees that, for the most part, screen the utility corridor and views of the lattice tower structure. The remote aesthetic, proximity to the river, and vegetation pattern enhances vividness, which is high.

McDade Trail, Community Drive, and Schoonover House

Facing south along McDade Trail; existing no action transmission line structure is visible at left; alternative 2 would replace structures, following the existing route.

Primary viewer groups: hikers, bicyclists, scenic drivers; also nature photographers, bird-watchers, visitors interested in regional history

McDade Trail extends approximately 32 miles—more than three-quarters the length of DEWA—along the Pennsylvania side of the river. The trail parallels Community Drive near the DEWA Headquarters building. Community Drive is a narrow, quiet lane with little visible development other than a few residences. The historic Schoonover House and the Van Auken Barn can be seen along the drive. The existing B-K Line, which the alignment for alternatives 1, 2, and 2b would follow, crosses the trail adjacent to a small meadow.

Van Campen Glen Trail

Primary viewer group: day hikers; also, nature photographers and bird-watchers

Van Campen Glen Trail connects Watergate Recreation Site at the north with Van Campen Glen Picnic Area to the south, a distance of about 2 miles. The trail follows Van Campen Brook through a scenic glen shaded by shagbark hickories and hemlock trees, and passes a waterfall. Before reaching Watergate Recreation Site to the north, the trail passes directly beneath the existing B-K Line. The existing cleared corridor creates an abrupt visual change compared with the previously shaded hike. The grassy-scrub vegetation within the corridor varies from 3 to 7 feet high.

Current view facing northwest along the B-K Line corridor from Van Campen Glen Trail; alternatives 2 and 2b would replace existing structures along this route.

Unity and intactness for this view are low, as the lattice towers and abrupt clearing

create visual conflict and intrusion. Vividness is average, because the towers and corridor themselves are vivid against the landscape. The variety of vegetation surrounding the trail adds to the scene's memorability.

Hamilton Trail

Current northwest-facing view of Hamilton Trail at B-K Line corridor crossing, which alternatives 2 and 2b would follow.

Primary viewer group: day hikers

Hamilton Trail is accessed by two obscured trailheads accessible from Old Mine Road (each marks the start and/or end of the trail), or via Orchard Trail near Millbrook Village. The trail is pleasant and mostly flat, following an old asphalt roadbed. The surrounding forest is mixed deciduous, pine, and hemlock. Approximately midway along the trail, the existing B-K Line passes overhead. The corridor is cleared of trees, and abruptly intersects the shaded hike, while tall brush fills the alignment. Looking south, the cleared swath affords views toward Kittatinny Ridge, where the corridor can be seen to its crest.

Unity and intactness are low to average because the intrusion of the cleared corridor and large infrastructure elements detract from the surrounding landscape. Vividness is also low to average, because the towers and corridor create a vivid view, although incongruous with the surrounding landscape.

Pioneer Trail

Primary viewer group: day hikers

Pioneer Trail begins at an intersection with Hamilton Trail (discussed above) and winds down a steep, conifer-covered slope before tracing the edge of a terrace overlooking the Delaware River. Hiked as a loop, the two trails total about 6.5 miles. The vegetation surrounding Pioneer Trail is similar to that of Hamilton Trail. Interesting sights along this trail include a pair of abandoned houses with a car and associated detritus, as well as several collapsed stone boundary walls. The existing B-K Line passes over the Pioneer Trail near the east end of the terrace. One of the lattice towers can be seen in the corridor from the trail through the trees, as shown in the image. The cleared area is a bit more overgrown than at the Hamilton Trail; thick undergrowth and shrubs are 3 to 4 feet high, and canopy trees overhang the corridor.

Looking north from Pioneer Trail toward existing transmission line structures; the alternatives 2 and 2b would follow the same corridor.

Similar to Hamilton Trail (as discussed above), unity, intactness, and vividness all rate low to average at Pioneer Trail where the transmission line crosses the trail.

Watergate Recreation Site

View within Watergate Recreation Site, looking south. Existing transmission structures related to the no action alignment which alternatives 2 and 2b would follow are visible through trees.

Primary viewer groups: picnickers, day hikers, photographers, anglers

Watergate Recreation Site is an expansive, grassy day-use area accessed from Old Mine Road. Amenities include a parking lot, restrooms, and dozens of picnic tables set on a large lawn area. Several ponds associated with Van Campen Brook are visible. The site is in a small valley and is visually enclosed and inward-looking because it is surrounded by large trees and higher topography.

The existing B-K Line that the alignment for alternatives 1, 2, and 2b would follow is visible, abutting the southern end of the lawn area. Although intermittently screened by a row of large trees, the existing transmission line corridor can be clearly seen from many vantage points, with picnic areas farther south more affected than others. The transmission line ascends hills to the east and west; the corridor to the east can also be clearly seen from the site as it climbs a slope.

This viewshed has high unity because the landform, water, and managed landscaping combine to form a coherent scene. Intactness is average, because the existing transmission towers and line encroach somewhat on the scene. Vividness is also average, because the visual elements are attractive but not remarkable in the context of the environment.

Millbrook Village

Primary viewer groups: visitors interested in local history, picnickers, photographers

This collection of historic structures is between Old Mine Road and Van Campen Brook, in the location of a historic grain mill and the hamlet that grew up around it during the mid-1800s. The village is part of the Old Mine Road Historic District. Some of the farmhouses and other structures are original to the location, while others were relocated here in the 1970s from nearby areas. Most of the buildings follow basic Georgian style: one- or two-story white clapboard, with vertical windows and dark-colored shutters. Green lawns and landscaping fill

Typical view within Millbrook Historic Village. The proposed alignment for alternatives 2 and 2b would pass near and would be visible from Millbrook Village.

the spaces created by the buildings, and there are many trees within the village. A central gravel lane, around which many of the buildings are oriented, runs northeast to southwest through the village and then continues south where it connects to the Watergate Recreation Site.

Today, the village is staffed on Saturdays and other days in summer and for special events the rest of the year, such as Millbrook Days, when volunteers demonstrate crafts and skills of the period.

The village is just northwest of Watergate Recreation Site and lies in the same small valley, which is visually completely bounded by tree-covered ridges. Unity is moderately high because the visual elements—both human-made and natural—combine to create visual coherence. Intactness is reduced by the visible utility lines and pole. Vividness is moderately high, because this collection of historic buildings forms a memorable scene.

US 209, Little Egypt Road

Current view south along US 209 at intersection with Little Egypt Road. The existing (no action) B-K Line corridor alternatives 2 and 2b would follow is located in the distance beyond the middleground ridge, and is not visible. Foreground utility lines adjacent to the highway are unrelated to the alternatives.

Primary viewer group: scenic drivers, commuters

US 209 serves as one of the primary gateways to DEWA, providing visitors access from Pennsylvania. Entering Delaware Water Gap just south of Bushkill and exiting near Milford, the highway lies within the boundary of DEWA for 21 miles and is listed as one of its scenic and alternate routes (NPS 2010o). The highway is “a straight and level ride past farm fields on the east side and Pocono Plateau on the west. Several side roads turn west to go to the sites of waterfalls” (NPS 2010o). The area near the intersection with Little Egypt Road offers a typical view along the highway: little development can be seen, and the openness of cornfields along the highway provides wide view opportunities up- or downvalley toward the forested slope of Kittatinny Ridge. US 209 is a good choice for sightseeing, providing views of the area’s fall foliage color display.

This scene demonstrates moderately high unity. Intactness is also average, because the guardrail and visible utility lines detract from the landscape elements. Vividness is average for this view, reduced by the lack of dramatic or contrasting features.

Cliff Trail, Riverview Overlook

Current view looking southeast across Delaware River Valley. Existing B-K Line corridor that alternatives 2 and 2b would follow cannot be seen. The proposed transmission line may be seen from this scenic vista.

Primary viewer groups: hikers, photographers

Accessed from US 209 via Raymondskill Road at the northern end of DEWA, the Cliff Park Trail system offers a series of broad vistas along Cliff Trail, which climbs to a height of 500 feet above the valley floor. A wide, straight trail passes through a mixed hemlock/pine forest for about 2 miles before reaching the Riverview Overlook, which offers wide views to the east, north, and south across the Delaware River Valley. Farmed fields are the only obvious human-made elements in the immediate view; no transmission alignments are apparently visible. The river draws the eye into the distance to the south, as seen in the image. To the north, the monument at High Point State Park, New Jersey, may be seen.

Unity in this view is exceptionally high. The combination of landform, water, and vegetation, including the farmed fields, creates an extremely harmonious scene. Few to no encroachments can be seen; therefore, intactness is also high. Likewise, vividness, or memorability, is highly enhanced by the high vantage point and appealing combination of natural features.

Salamovka House/Delaware River Valley View

Looking west across Old Mine Road from Salamovka House. The B-K Line corridor cannot be seen due to trees to the left.

Primary viewer group: scenic drivers

The Salamovka House is a large historic home situated on a high bluff along Old Mine Road north of Millbrook Village. Recently, the house was used as a general store. Views from the large porch of the farmhouse span the Delaware River Valley to the west toward the ridge behind Bushkill, Pennsylvania. A large patch of cleared vegetation is currently maintained across Old Mine Road by the NPS to maintain this view.

The existing B-K Line is not visible because of the angle of the view and screening vegetation. This view demonstrates average to moderately high unity, because the visible elements do not combine to enhance harmony. The noticeable utility line and road encroach somewhat on the scene from this viewpoint (although less so in

the case of views from the house itself). Therefore, intactness is average. Vividness for this scene is average, enhanced somewhat by the elevated vantage point and unique context of the historic house.

Raccoon Ridge, APPA

Primary viewer groups: hikers, bird-watchers

Atop a narrow ridge highpoint, this APPA vista offers panoramic views of the Delaware River and valley to the north and the Great Valley to the south. Undulating ridges, continuous deciduous forest cover, and a lack of noticeable human development enhance the view's integrity. The trail's exposed rocky outcrops create visual interest in the foreground as well.

Current view from summit of Raccoon Ridge, facing north. The no action alignment that alternatives 2 and 2b would follow is at such a distance that is barely discernible.

Raccoon Ridge is an extremely high-quality viewpoint. Unity is very high, given the harmonious combination of natural features viewed from a superior position. Intactness is high because few visual encumbrances can easily be spotted that would detract from the scale of the scene. Vividness is very high, particularly when viewed in the fall, when color and texture are very striking.

Vista from Future APPA Relocation Section

Primary viewer group: future APPA hikers

North of Sunfish Pond, APPA follows the Kittatinny Mountain ridgetop, which is a mixture of copses and rocky, scrub-covered bluffs. The view faces northeast, following the Delaware River Valley upstream. The next hillside rises to the right, and a cluster of small trees and brush to the left provides a visual frame, focusing the eye into the distance. Other than farmed fields paralleling the river in Pennsylvania, the view lacks much obvious human-made development. The existing B-K Line crosses DEWA in the distance, and the alignment proposed for alternative 3 climbs the nearby ridge on the opposite side, away from the viewer; therefore, it would not be seen.

Existing view north from a knoll planned for inclusion in a future alignment of APPA.

The combination of interesting landform, water, and vegetation cover create high vividness. These visible elements combine to create a highly harmonious view; therefore, unity is high. No apparent visual encroachments detract from the overall scene; therefore, intactness is high as well.

Rattlesnake Mountain

Primary viewer group: hikers

Along APPA on a narrow stretch of ridgeline, Rattlesnake Mountain provides an expansive and distant view. The panoramic view looks west across the Delaware River and DEWA landscape. A visual sense of remoteness, outstanding (although ephemeral) display of fall color, and exposed rock outcrops contribute to very high vividness. Several scattered communication towers can be seen on a number of distant ridgetops but are at such a distance as to be considered negligible. The existing B-K Line, approximately 10 miles away, cannot be seen. Intactness is high, given the great distance to any noticeably encroaching elements, such as the towers. Unity is enhanced by the distinct layers of the scene: the rocky foreground from which to view, the undulating landscape and dramatic vegetation colors, and the distant background ridge.

Looking west from Rattlesnake Mountain viewpoint. The B-K Line corridor that the alternatives 2 and 2b alignment would follow is too far away to be seen.

Blue Mountain

Current view to the west from APPA at Blue Mountain. The B-K Line corridor that alternatives 2 and 2b would follow occurs too far away to be seen.

Primary viewer group: hikers

Blue Mountain viewpoint is roughly 1 mile north of Rattlesnake Mountain, with similar views to the west. There are more ridgetop trees here, but the view is still panoramic. Given the distance to the existing B-K Line corridor, 10 miles or more, the transmission line is not discernible from this viewpoint.

Similar to Rattlesnake Mountain, unity and intactness are high. Vividness is very high.

Sunrise Mountain Pavilion

Primary viewer group: sightseers, hikers

At the top of a 1,600-foot-high knoll, Sunrise Mountain scenic overlook is a developed viewpoint operated by Stokes State Forest, New Jersey. Foreground deciduous trees frame the view to each side and from below, screening the view to some extent. APPA is below the developed overlook. Some scattered rural residential development is visible.

Unity from this view is moderately high, because the visual elements appear coherent, but the scene is limited by the lack of a strong focus. Intactness is average to moderately high, reduced somewhat by the screening effect of the tall foreground trees. Vividness is moderately high, given the expansiveness of the vegetation cover and the high point from which to view.

Overlook view at Sunrise Mountain. The existing transmission corridor and alignment that alternatives 2 and 2b would follow cannot be seen due to distance and view angle.

ALTERNATIVE 3

Alternative 3 would follow the same route as alternatives 1, 2, and 2b to the Bushkill Substation, where the alignment would diverge to the southwest, following a horseshoe-shaped existing transmission line corridor. The route would parallel US 209 northwest of DEWA among large-lot residential developments and a golf course. Just east of the Shawnee Mountain Ski Area, the transmission line would turn south, passing through an undeveloped tract of forest. The alternative 3 alignment would enter DEWA from the north at Mosiers Knob Road. On the east side of the Delaware River, the route would cross River Road and McDade Trail about 1 mile south of the Smithfield Beach Picnic Area and 0.75 mile north of the Hialeah Picnic Area. On the east side of the Delaware River in New Jersey, the route would pass through Worthington State Forest. The route would perpendicularly cross APPA before exiting DEWA and state forest boundaries.

The route would then trend northeast, on the east side of the upper and lower Yards Creek reservoirs, roughly paralleling the DEWA boundary and APPA for approximately 6 miles. The distance between the trail and the transmission line route would vary between about 0.25 mile and 1 mile along this 6-mile stretch. For nearly 2 miles of this stretch, the route would follow (but remain outside) the DEWA boundary, where it would also be closest to APPA—approximately 0.25 mile away and topographically lower. About 2 miles farther north, the alternative 3 route would then reconnect with the B-K Line alignment, continuing east beyond the study area boundary to the Roseland Substation.

Trails crossed by existing ROW:

- APPA
- Delaware River Water Trail
- McDade Trail

Scenic features crossed by existing ROW:

- River Road scenic auto tour
- Old Mine Road scenic auto tour

Scenic resources with potential views of alternative alignment:

- Multiple scenic viewpoints along APPA
- Walter's Tract River Campsite
- Hialeah Picnic Area
- Hialeah Air Park
- Smithfield Beach
- Turtle Beach
- Shawnee Resort
- Hidden Lake Dam

Alternative 3 Alignment Crossing APPA

Primary viewer group: hikers

Current view along APPA beneath the transmission line crossing proposed for alternative 3, looking south.

Just south of the Raccoon Ridge vista, the existing transmission corridor that alternative 3 would follow passes perpendicularly over APPA at the crest of Kittatinny Ridge. Three wood monopoles are clearly seen from the trail, and the corridor is approximately 90 feet wide. The cleared corridor affords views in two directions. A view across the Delaware River Valley can be seen to the northwest and some distance beyond. The river itself cannot be seen from the trail. To the southeast, the view is wider and overlooks the Yards Creek Reservoir area and beyond. The combination of visible water and the adjacent landform make this the more appealing view.

The scene has average unity, as demonstrated at other utility crossings; the poles and conductors, combined with the linear vegetation cut, conflict with the natural environment. The utility line is very

apparent in the clearing; therefore, it creates a significant encroachment on the scene. Intactness is moderately low to average. Vividness maintains a moderately high rating because the transmission line is an anomaly. However, the cleared corridor provides some views into the distance. Vividness is also enhanced by the variety and patterning of vegetation seen.

View from APPA overlooking Yards Creek Reservoir facilities to the south. The existing transmission corridor that alternative 3 would follow is somewhat discernible across the reservoir.

View Overlooking Lower Yards Creek Reservoir

Primary viewer group: hikers

Above the two Yards Creek Reservoir water bodies, this view south from APPA exhibits high quality. The combination of distinct foreground, middleground, and background elements contribute to very high unity and vividness in this view. Specifically, the contrasting foreground texture of the stone and water enhance these elements. The existing transmission corridor that alternative 3 would follow is visible below, which reduces intactness to moderately high.

Rattlesnake Swamp Ridge, View 1

Primary viewer group: hikers

Current view from APPA to the northeast from ridge near Rattlesnake Swamp. An existing transmission structure along the alignment that alternative 3 would follow is visible to the lower right.

At the eastern edge of DEWA, Kittatinny Ridge drops steeply into the Great Valley to the south, and for several hundred feet APPA traces the edge of a ledge following a series of narrow rocky outcrops. The experience is unusual for APPA in this area, because most other segments pass beneath forest canopy, limiting continuous outward views. Many opportunities are present to view up and down the valley, which is for the most part covered by continuous forest. The existing transmission line that alternative 3 would follow is clearly visible below. In contrast to the wooden poles used elsewhere along this alignment within DEWA, the tower structures in this segment consist of larger lattice towers, which create a greater encroachment on the scene compared with wood.

The view quality from several points along this escarpment ledge is very high. Unity, intactness, and vividness are all high to very high.

Current view from APPA along ridge near Rattlesnake Swamp, looking south. Alternative 3 would follow an existing transmission corridor that parallels the trail for 3 miles and the superior view position from APPA emphasizes visibility of the corridor against the vegetation.

Rattlesnake Swamp Ridge, View 2

Primary viewer group: hikers

Farther north along APPA, another high-quality viewing opportunity exists along the same ridge, this one looking to the south toward the Yards Creek reservoirs.

As with the first view, this expansive view overlooks mostly uninterrupted forest cover for many miles. The addition of visible water enhances the vividness of the view, which is very high. Unity and intactness are high.

Catfish Fire Tower

Primary viewer group: hikers

The Catfish Fire Tower north of the Mohican Outdoor Center facility is situated at the top of a small bald knoll. APPA passes just beneath the 60-foot New Jersey Forest Fire Service tower structure. A sign at the base of the stairs prohibits entering the tower; however, no gate or barrier impedes passage. A narrow view looking southeast can be seen before the gravel road trail reenters the woods descending the knoll.

Looking southeast from APPA near Catfish Fire Tower. The existing corridor that alternative 3 would follow is near the base of the ridge that APPA follows, and existing structures cannot be seen from the trail.

Because the tower is not an NPS facility and cannot be lawfully entered, views from the tower platform cannot be considered for this study. However, the view from the trail was evaluated. Unity from this view is moderately high. Intactness is very high. Vividness is moderately high, because it is similar to many points along APPA in the area.

Alternative 3 Alignment Crossing the Delaware River

Current southeast-facing view of corridor crossing location proposed for alternative 3, seen from the New Jersey bank of the Delaware River.

Primary viewer groups: canoers, kayakers, anglers

The existing alignment that alternative 3 would follow crosses the Delaware River between Tocks and Labar islands. An H-pole can be seen on the Pennsylvania bank, while three poles are visible upslope from the New Jersey bank. The poles and narrow corridor are only briefly visible at the crossing point because the poles cannot be seen above the canopy created by surrounding vegetation, which somewhat screens the alignment.

The slow-moving river and landform create very high unity. While the utility crossing is visible, its narrow width and the small scale of the wood poles help it to be somewhat visually absorbed into the hillside; therefore, intactness is not greatly reduced by its encroachment. Vividness for the scene is high.

Walter's Tract/Hialeah Island Campsites

Primary viewer group: watercraft campers

View within Walter's Tract campsite, adjacent to Delaware River. The existing transmission corridor that alternative 3 would follow is behind trees in the center of the image.

Three campsites accessible from the river compose Hialeah Island Campsites and Walter's Tract. Walter's Tract campsite, #106, is on the Pennsylvania bank north of the Hialeah Picnic Area and adjacent to McDade Trail. Campsite #106 includes a metal fire ring centered in a large cleared area surrounded by hardwoods. The river is partly visible through the deciduous understory. The existing transmission corridor that alternative 3 would follow crosses the river just north of this campsite. However, the existing lines and a short segment of cleared corridor can only be seen from the river's edge, not from within the campsite. It is likely that more of the existing structures and conductors would be visible during winter leaf-off conditions.

This view has high unity because the water, sloping landform, and trees combine to create a coherent river scene. Intactness is also high because no encroaching elements can be seen. Vividness is average.

Alternative 3 Alignment from River Road

River Road, looking north. The existing alignment that alternative 3 would follow is visible in the background to the right.

Primary viewer groups: scenic drivers, bicyclists

River Road begins at I-80 and winds north along the floodplain edge of Pennsylvania, ending at Bushkill Village. The nearby US 209 carries most through traffic, so River Road is used primarily for sightseeing. The road passes farm fields and mixed woods and provides infrequent glimpses of the river. The existing transmission line that alternative 3 would follow crosses River Road just south of Tocks Island, then turns north upslope. Farther north along the road, the cleared corridor is plainly visible across the river as it crests the far ridge.

This view is typical of much of River Road: the lanes are narrow and vegetation clings to each side, with regular vistas opening up across farmed fields. Unity is high for this view. The small utility line in the foreground and the visible corridor reduce intactness to moderate. Vividness is high, enhanced by the contrasting scenic road, field, and sloping landform backdrop.

Alternative 3 Alignment Crossing McDade Trail

Primary viewer groups: hikers, bicyclists

As discussed previously, the McDade Trail extends for approximately 32 miles on the Pennsylvania side of the Delaware River. To reach this view, access to the trail is provided at a trailhead just north of Hialeah Picnic Area.

Current view looking east across Delaware River toward the existing corridor proposed for alternative 3 (visible in center).

A hill and vegetation to the west block views from the trail until the transmission line crossing, where a wooden H-pole is clearly visible immediately adjacent to the trail. Three wooden poles can be seen on the opposite (east) side of the river, but the transmission line turns sharply north (upstream) and the corridor is blocked by vegetation. Not much of the transmission line can be seen to the west due to a sharp topographic incline. However, the corridor opening is an obvious change in a mostly wooded area. Just north of the crossing, the trail turns sharply west and vegetation blocks views of the transmission line for hikers traveling south.

Viewed from the transmission line crossing, unity is moderately high because the river and dense vegetation in the foreground dominate the view. The corridor across the river is narrow and the wooden poles visually blend in with the surrounding trees; therefore, intactness is moderately high. Vividness is average, because the view angle on the river is perpendicular and not unusual.

Hialeah Picnic Area

Current view within Hialeah Picnic Area. The existing corridor that alternative 3 would follow is not visible.

Primary viewer groups: picnickers, hikers

Hialeah Picnic Area is accessed from River Road on the Pennsylvania side of DEWA. Situated on a long, narrow terrace just above the river level, the area provides opportunities to view the river, but most areas are densely screened by trees along the riparian edge. Many tall trees are also clustered between picnic sites and along the narrow, gravel access road, limiting distant views within the site. The existing utility line that alternative 3 would follow crosses the area about 1 mile to the northeast but cannot be seen from within the picnic area due to the surrounding trees. However, it is very likely that the expanded transmission line and taller towers would be visible from the picnic area's one-way exit road.

Views within the picnic area exhibit high unity and intactness, enhanced by the lack of distracting or intrusive elements in this primarily natural scene. Vividness is moderately high, enhanced by the proximity to the river's edge.

Smithfield Beach

Primary viewer groups: river recreationists (canoers, kayakers, inner tubers, boaters), picnickers, swimmers

Smithfield Beach is a large, developed day use and boat launch area accessed from River Road on the Pennsylvania side of the river. This beach is about 1 mile north of the point where the alternative 3 route would cross River Road. From the wide, grassy waterfront area, a segment of the alternative 3 corridor can be seen across the river as it climbs the far slope; however, no poles or tower structures are visible. Otherwise, the area near the river is park-like and visually pleasing. The swim beach and the boat ramp are the

Current view toward Delaware River from Smithfield Beach, facing east. Existing corridor proposed for alternative 3 to follow is visible on the far slope.

only waterfront areas with unobstructed river views; elsewhere at Smithfield, the river is screened by tall trees.

This photograph of Smithfield Beach exhibits high unity and intactness because the cleared corridor is visible but does not dominate the viewshed. Vividness is moderately high.

Turtle Beach Recreation Site

View facing south from Turtle Beach picnic and swim area.

Primary viewer groups: picnickers, swimmers, river recreationists

Turtle Beach is accessed from Old Mine Road, between two of the proposed alignments considered for this report. It is north of the existing transmission line that alternative 3 would follow and south of the B-K Line. Turtle Beach was opened for public use in 2010 and is one of the few grassy, park-like riverside recreation areas on the New Jersey side of DEWA. Large deciduous trees to the south and west of the picnic area block views; the existing transmission line cannot be seen from the picnic area. The beach itself is farther south and is entirely grass (no sand). It is a large, open expanse. Another picnic area is farther inland; many large trees to the south might block views in that direction. The existing transmission line is not apparently visible downstream.

Unity and intactness are very high. Vividness is high because the water, adjacent landforms, surrounding tree cover, and incorporation of the developed area compose a memorable view.

Shawnee Inn Beach

Primary viewer groups: resort patrons, river recreationists, golfers

The Shawnee Inn is a private golf resort and hotel northeast of the Delaware Water Gap, but outside DEWA boundaries. The existing transmission line that alternative 3 would follow crosses the Delaware River approximately 2.3 miles east of the resort. Looking upstream from a sloping gravel canoe launch on the bank of the resort's large, landscaped grounds, the existing transmission line cannot be seen. However, it is possible, although unlikely, that widening the cleared zone under alternative 3 may cause the corridor to be visible.

The view at the river's edge exhibits high unity. Intactness is also very high. Vividness is moderately high to average, given that the view is somewhat typical of other, less scenic areas along the river.

Shawnee Inn resort facilities.

Shawnee Inn Beach. The existing alignment that alternative 3 would follow is too far away to be seen.

Hialeah Air Park

Primary viewer group: model airplane club members

Current view of Hialeah Air Park, looking south. The existing corridor proposed for alternative 3 can be seen in the background, climbing the slope to the right.

The Roxbury Area Model Airplane Club flies radio-controlled model airplanes at the Hialeah Air Park, which is accessed from River Road north of Smithfield Beach. The park is a large, open lawn area visible from River Road. Farmed fields abutting the site and its level to inferior position emphasize the site's broad floodplain aesthetic. The existing transmission line that alternative 3 would follow can be seen ascending the far hillside about 1 mile away across the river to the south. The corridor is not visible on the near side of the river. As at Smithfield Beach, the existing wooden towers do not extend above the canopy, and vegetation has grown into the corridor, making the towers blend in with the landscape somewhat—more so here than at Smithfield Beach because the distance is slightly greater.

This view demonstrates high unity because the scene is highly cohesive. Intactness is moderately high, impeded just slightly by the visible transmission corridor clearing and minor elements in the foreground.

Vividness is low to average, reduced by the lack of dramatic or remarkable features.

Hidden Lake Dam

Current view of Hidden Lake Dam. The existing alignment proposed for alternative 3 to follow cannot be seen.

Primary viewer groups: picnickers, anglers, hikers

Hidden Lake is a small, dammed lake on the western boundary of DEWA between US 209 and River Road. Access is from Hidden Lake Road / Highway 517, which is not very busy. A short trail begins at the northernmost parking lot and parallels the lake, which anglers access for fishing, for about 500 feet. The alternative 3 transmission line would be behind (northwest of) the lake. There currently is too much vegetation to see the existing transmission line. Aerial photographs show a park road encircling part of the lake and the larger parking lot to the southwest. The photographs show trails leading to the lake from the northwest, but none from the southeast. Therefore, it is likely that most visitors face away from the existing transmission line that alternative 3 would follow.

This view exhibits very high unity and intactness. The fall color seen here and the combination of natural elements, including the still water's reflectivity, make it highly vivid.

ALTERNATIVE 4

The alternative 4 alignment would be 162 miles long and would follow the existing B-K Line through northeastern Pennsylvania until reaching Bushkill Substation. As with alternative 3, the alternative 4 alignment could then veer southwest of the Bushkill Substation to create a loop to the south that would reconnect with the B-K Line east of the parks. However, the alternative 4 loop could extend farther south compared to alternative 3, crossing a total of approximately 1 mile of DEWA as the route rounds the southern DEWA boundary. This alignment would not cross Worthington State Forest, and would cross but not follow any part of APPA.

Leaving Bushkill Substation, the route would travel southwest, paralleling the western DEWA boundary and passing through several rural residential communities. East of East Stroudsburg, Pennsylvania, the alignment would turn to the south. This area is forested and includes scattered golf courses and vacation communities. A new ROW would be required for the alternative 4 transmission line in this area.

The route could continue south across I-80 and veer east just north of the Cherry Valley Golf Course, where the alternative 4 alignment could turn across a 0.4-mile stretch with no ROW to meet and follow another existing transmission line with a 100-foot ROW.

In this section, the proposed alignment for alternative 4 would cross about 1 mile of DEWA land near its southern extent, roughly following the DEWA boundary, and would perpendicularly cross APPA near Totts Gap Road. Just south of DEWA, the alternative 4 alignment would turn east and travel 2.7 miles over land with no existing ROW, where the alignment would cross the Delaware River adjacent to a historic rail bridge. On the east side of the Delaware River in New Jersey, the route could travel east, passing through Knowlton Township in Warren County, which is characterized by farmed fields, rural communities, and forested patches. This route would follow a railroad ROW for 21 miles, the

construction of which left a discernible linear path through the landscape where cut and fill segments are visible in the terrain. However, the alignment is vegetated to either side. Near Andover, New Jersey, the alternative 4 proposed route could rejoin the B-K Line and coincide with that route southeast to Roseland Substation.

Trails crossed by existing ROW:

- APPA (crossing coincides with alternative 5, discussed below)
- Slateford Loop Trail (not examined for this report)

Scenic resources with potential views of alternative alignment:

- Mount Tammany summit
- Karamac Trail

Mount Tammany Summit

Primary viewer groups: hikers, photographers

Current view from Mount Tammany summit, looking southwest across Delaware Water Gap to Mount Minsi.

The viewpoint at the summit of Mount Tammany, New Jersey, provides an excellent vantage point from which to view the Delaware Water Gap and surrounding landscape from above. The summit view is reached via the Red Dot (Tammany) Trail, which starts at the Dunnfield parking lot, accessed from westbound I-80. The trail climbs 1,250 feet in 1.5 miles and is extremely steep and very rocky, similar to a talus slope in many places, making hiking challenging. The trail is forested with deciduous trees and no views can be seen until a small southeast-facing clearing about halfway to the top, from which Mount Minsi can be clearly seen approximately 1 mile to the south. A small clearing appears again near the summit, providing views to the south that are partially blocked by foreground vegetation. From a boulder-covered slope at the 1,527-foot summit, Mount Minsi (which is at a slightly lower elevation, at 1,463 feet) can be seen again. Views of the Delaware in both directions are also quite scenic from this position.

This is an example of an extremely high-quality view because it demonstrates very high unity and vividness. Intactness is also high, although impeded somewhat by the encroachments of I-80 and PA 611 and the railroad that parallels PA 611 within the Delaware Water Gap.

Karamac Trail

Karamac Trail along the Pennsylvania side of Delaware River. Piers from a deconstructed rail bridge are visible. The existing alignment that alternative 4 would follow is not visible.

Primary viewer group: hikers, river recreationists

Karamac Trail is accessed from Old Mine Road just east of the point where I-80 bridges the Delaware River. The short trail provides access to the Delaware River at the former New York, Susquehanna and Western Railroad Bridge abutment and the site of the former Karamac Hotel. The trail closely hugs the river, which is many feet below, and observant hikers may notice several examples of historic stone masonry and slope engineering related to the rail bed. Stone support piers in the river visible from the northern end of the trail are all that remains of the railroad's truss bridge. No existing transmission structures are visible. However, it is remotely possible that the alternative 4 transmission line may be visible from this point.

Unity at this view is high, reduced somewhat by the concrete treatment of the bank. Intactness is high; the bridge piers do not encroach on the scene but add visual interest. Therefore, vividness is very high in the scene.

Arrow Island Overlook

Primary viewer group: any

Arrow Island Overlook is on the south side of the river from PA 611. Visual connection to the river below is mostly screened by foreground and riparian trees and shrubs. Mount Tammany is plainly visible above across the river. The overlook faces northeast, away from the proposed alternative 4 transmission line. The overlook is also close to the river elevation, with Mount Minsi directly to the south, forming a natural barrier between the overlook and the transmission line location. Therefore, the proposed alternative 4 transmission line cannot be seen from this overlook.

Arrow Island Overlook view toward Mount Tammany.

The integration of the simple overlook into the landscape enhances the unity of the scene, which is very high. Few visual encroachments are visible; therefore, intactness is high, yet could be enhanced by opening greater views to the river below. The unique landform of Mount Tammany and its angled,

exposed rock layers, coupled with the surrounding vegetation and glimpses of the river, combine to create very high vividness.

Alternative 4 Alignment Crossing the Delaware River

Decommissioned railroad bridge as viewed from the Delaware River. The alignments for alternatives 4 and 5 both propose to cross the river within the rail ROW.

Primary viewer groups: kayakers, canoeists, anglers

The alternative 4 alignment would cross the Delaware River adjacent to an existing decommissioned railroad bridge between the riverside towns of Slateford and Portland, Pennsylvania. This stretch of river can be very shallow and difficult to navigate; therefore, access to this view would be restricted to those with appropriate watercraft or on foot from the Pennsylvania bank. I-80 hugs the riverbank on the New Jersey side; therefore, views from that side are restricted. The bridge, the Delaware River Viaduct, is approximately 0.8 mile beyond the DEWA boundary and therefore outside the river segment designated as scenic and recreational, though it is possible the crossing may be visible from the designated river section. The historic concrete arch span bridge itself is very scenic and contributes considerable vividness to the scene. The combination of the scenic built feature within the surrounding landscape also creates very high unity. Intactness is very high as well, because no encroachments disrupt the view.

Alternative 4 Alignment Crossing APPA

Primary viewer group: hikers

The existing transmission line proposed for the alternative 4 alignment crosses APPA just inside the westernmost DEWA boundary. The corridor at the trail intersection is overgrown with woody vegetation. The corridor crosses the trail nearly perpendicularly, and provides views to the north and south. Views in both directions overlook forested valleys, and the cleared corridors are visually obvious and distracting into about the middle of the view. Two parallel cleared corridors, separated by a vegetated strip about 200 feet wide, are visible looking north. Two wooden double poles stand to either side of the trail.

APPA, viewed at the crossing of the existing transmission line alignment proposed for alternatives 4 and 5.

This crossing viewpoint is rather typical. Unity is average. Intactness is low. Vividness is moderately low.

ALTERNATIVE 5

Decommissioned railroad bridge as viewed from Delaware River. The alignments for alternatives 4 and 5 both propose to cross the river within the rail ROW.

In contrast to alternative 4, the alternative 5 alignment would not follow any portion of the B-K Line, but would follow an existing transportation corridor rather than a utility route. The alternative 5 alignment would follow the same proposed route through DEWA as alternative 4. The alternative 5 alignment would consist of 110 miles from the Susquehanna Substation to the Roseland Substation. The majority of the route would follow I-80.

Starting at the Susquehanna Substation, the alternative 5 alignment would follow an existing 230-kV transmission line with an approximately 150- to 200-foot ROW. It would pass through farmland for a few miles before intersecting I-80, where it would diverge from the existing 230-kV alignment. The interstate is a two-lane road each direction, and includes a narrow, planted median. Just west of the DEWA boundary, the proposed transmission line would veer off the I-80 ROW and follow the same route proposed under alternative 4 around the southern end of DEWA, where it would cross APPA as described for alternative 4.

Alternative 5 would then reconnect with I-80 in New Jersey east of the park unit. From that point eastward, the transmission line would continue following the I-80 ROW for approximately 17 miles after leaving DEWA, where the visual character would resemble that described for alternative 4 until Stanhope, New Jersey. Here, the landscape surrounding the interstate shifts to become more developed and suburban. Large patches of forest can still be seen between developed tracts. The route would leave the interstate ROW for a few miles through Allamuchy, which is densely forested, before reconnecting with I-80, paralleling the interstate to the intersection with I-280, where it would turn in a southerly direction. The route would reach Roseland Substation via an existing transmission line ROW, which it would follow for approximately 3 miles through a large-scale mosaic of subdivisions and fragments of forested flatlands.

Trails crossed by existing ROW:

- APPA

Alternative 5 Crossing the Delaware River:

- Same as alternative 4

Alternative 5 Crossing APPA:

- Same as alternative 4

SOUNDSCAPES

According to the NPS, the acoustical environment is composed of a combination of acoustic resources, including natural, cultural, and historical sounds. A soundscape is defined as the way in which humans perceive this acoustic environment (NPS 2010w). Specifically, the natural soundscape encompasses all the natural sounds that occur in parks, including the physical capacity for transmitting those natural sounds and the interrelationships among park natural sounds of different frequencies and volumes (NPS 2006c, 56). Natural sounds may range from wildlife calls and insect chirps to sounds produced by physical processes, such as wind rustling leaves on trees, thunder, and water moving through rivers, creeks, and streams within a park. A 1998 study by Colorado State University found that 72% of Americans surveyed regarded opportunities to experience natural peace and the sounds of nature as a "very important" reason for preserving national parks, 23% found it "somewhat important," 4% "slightly important," and 1% "not at all important" (Haas and Wakefield 1998).

The soundscape in the parks could be affected by non-natural human-caused sounds expected under the proposed alternatives, including the no-action alternative, and from sound produced by the transmission lines during operation. Under the action alternatives, the use of equipment for decommissioning, construction, and maintenance activities would also generate sound in the short term. These sources of non-natural human-caused sounds have the potential to affect the soundscape.

The affected environment for soundscapes could be more than 1 mile from the areas where construction would occur along the proposed alternative alignments and along the access roads needed to construct and maintain the transmission lines. It is estimated that 6,400 feet (1.2 miles) from construction activities is the distance at which construction noise is expected to decrease to about the background level. This estimate was calculated assuming a noise level decrease of approximately 7.5 decibels (dB) for every doubling of distance from the noise source across a soft surface such as vegetation (Caltrans 1998, 27). Background sound level monitoring was conducted to assess the existing acoustical environment. Six monitoring locations were identified in consultation with NPS staff to provide a representative sample of ambient sound levels in the study area and facilitate the comparison of proposed alternatives with respect to their potential effect on the soundscape.

NOISE FUNDAMENTALS

Sound can be perceived as noise because of loudness, frequency, duration, occurrence at unwanted times or from an unwanted source, or interruption of or interference with a desired activity. In a national park setting, noise is a subset of human-made sounds that may adversely affect park resources, including visitor experiences or biological resources, by modifying or intruding on the natural soundscape or by impeding or covering the natural sounds that are an intrinsic part of the park environments (NPS 2000a). Noise can vary in character from day to night and from season to season.

Sound is measured in a logarithmic scale using units called decibels (dB). Sound is composed of various frequencies, but the human ear does not respond to all frequencies. The A-weighted decibel scale (dBA) is commonly used to describe noise levels because it emphasizes the frequencies between 1 kilohertz (kHz) and 6.3 kHz to simulate the relative response of human hearing. Sound levels measured using the A-weighted decibel scale are generally expressed as dBA. Table 36 shows a range of decibel levels for recognizable sounds. Table 37 shows the effects of different levels of sound on people.

TABLE 36: COMMON SOUNDS AND THEIR ASSOCIATED NOISE LEVELS

Source	Level (dBA)
Normal breathing	10
Rustling leaves	20
Whisper	20–30
Quiet rural area at night	32–35
Ambient noise in an average home	50
Normal conversation at 3 feet	60–65
Vacuum cleaner	60–82
Freeway traffic at 165 feet	70
Noisy urban area during daytime	70–80
Garbage disposal at 3 feet	80
Pick-up truck (55 mph at 50 feet)	80–82
Chainsaw	85
Rock concert	90–115
Jet flyover at 1,000 feet	110
Space shuttle liftoff	188

Source: CPUC 2009; Michael Minor and Associates 2001, 1–2.

TABLE 37: SOUNDS AND THEIR EFFECTS ON HUMANS

Sound Level (dBA)	Relevance
35	Blood pressure and heart rate increase in sleeping humans
45	World Health Organization's recommendation for maximum noise levels inside bedrooms
52	Speech interference for interpretive programs
60	Speech interruption for normal conversation

Source: Berglund et al. 1999; Haralabidis et al. 2008; USEPA 1974.

HUMAN AND WILDLIFE RESPONSES TO CHANGES IN NOISE LEVELS

It is widely accepted that the average human ear cannot perceive noise level changes of less than 3 dBA. A change of 5 dBA is readily perceptible and an increase or decrease of 10 dBA is perceived as being twice or half as loud, respectively (MPCA 1999, 5, 9). Noise may interfere with human activities, such as sleep, verbal communication, and tasks requiring concentration. Noise may also cause annoyance, hearing damage, and other health-related problems. The degree of disturbance from unwanted sound depends on the amount and nature of the intruding noise and the type of activity occurring where the noise is heard. Because individuals have different sensitivity to noise, the degree of disturbance also depends on the person experiencing the noise. For example, in the context of a park unit, if regions of a park were dedicated to enjoying the tranquility and serenity of the natural environment, sounds from motorboating and hunting would be distracting. However, if these activities were consistent with the purpose of a particular region of the park, these sounds would be considered appropriate. For these reasons, noise is a subjective term requiring consideration of which sounds are appropriate or necessary for park purposes

within the various park management zones, and which sounds are inappropriate or adversely affect park purposes within various park management zones (NPS 2000a).

Studies have shown that, in addition to their effects on humans, intrusive and other human-induced noises can result in adverse physiological and behavioral changes in wildlife communities. For example, some sound sources have been associated with increased stress levels, as well as suppression of the immune system, in wildlife. Additionally, increases in ambient noise levels may interrupt communication networks of insects, birds, and mammals, which are necessary for survival and reproduction. Specifically, wildlife communications may signal readiness for mating, danger from predators, and territorial claims (NPS 2010x).

NOISE ATTENUATION

Factors influencing how noise affects the surrounding noise-sensitive receptors include the distance from the noise source, the frequency (pitch) of the sound, the absorbency of the intervening terrain, the presence or absence of obstructions, and the duration of the noise event. The degree of impact also depends on the listener, the existing sound levels, and the time the noise event occurs. Topographic features and structural barriers that absorb, reflect, or scatter sound waves can increase or decrease noise levels (USFS 2007, K-4–K-5).

Distance: Noise levels depend on the distance from the noise source and the attenuation of the surrounding environment. At distances greater than 50 feet from a sound source, every doubling of distance across a soft surface such as vegetation produces a 7.5 dBA reduction in sound (Caltrans 1998, 27).

Air Absorption: Sound energy is absorbed into the air as a function of temperature, humidity, and the frequency of the sound. This attenuation can be up to 2 dBA over 1,000 feet. Such attenuation is short term and occurs over a great distance. Sound waves bend toward cooler temperatures, and temperature inversions may allow sound to travel greater distances (NYSDEC 2000, 9–10).

Land Forms and Structures: Sound levels can be accentuated or focused by certain features, causing noise at specified locations. For example, canyons or cliffs can cause echoes or reflect sound (NYSDEC 2000, 10). The landscape of the Delaware River Valley within DEWA is characterized by gently rolling to steep river terraces and floodplains (NPS 2005c, 43). Thus there would be localized areas of accentuated sound levels.

Trees: Vegetation can provide a noticeable noise reduction, but to do so it must be at least 15 feet high, 100 feet wide, and dense enough to completely obstruct the line of sight between the source and the receiver. This type of vegetation may provide up to 5 dBA of noise reduction. Taller, wider, and denser areas of vegetation may provide greater noise reduction. The maximum reduction that can be obtained is approximately 10 dBA (FHWA 2010). Evergreens provide better vegetation screening than deciduous trees (NYSDEC 2000, 21). The vegetation in DEWA consists of croplands, old fields and thickets, and mature forests of evergreen and deciduous trees (NPS 2005c).

TRANSMISSION LINE NOISE

Once the transmission line is operational, noise sources would include noise from the transmission lines and noise from maintenance and inspection activities. Transmission line noise includes corona, insulator, and aeolian noise, as described below (CPUC 2009).

Corona Noise: Corona is the breakdown of air into charged particles caused by the electrical field at the surface of conductors. The crackling or hissing sound caused by the corona effect is the most common noise associated with transmission lines. The voltage of the line and current weather conditions affect both the type and level of noise generated by the transmission line. An electric field surrounds power lines and causes implosion of ionized water droplets in the air, which produces the sound. Therefore, heavy rain and high humidity typically produce corona noise levels near the transmission line that are higher than those under dry conditions. The noise levels also vary depending on the voltage of the transmission line.

Insulator Noise: This noise is similar to corona noise and is produced by dirty, worn, or damaged insulators. Current technology typically uses polymer insulators instead of ceramic or glass insulators to minimize this type of noise.

Aeolian Noise: This noise is caused by wind blowing through the conductors and/or structures and is dependent on wind velocity and direction. If the wind blows steadily and perpendicular to the lines it can create an aeolian vibration, which can produce resonance if the frequency of the vibration matches the natural frequency of the line. Dampeners can be attached to the lines to minimize aeolian noise.

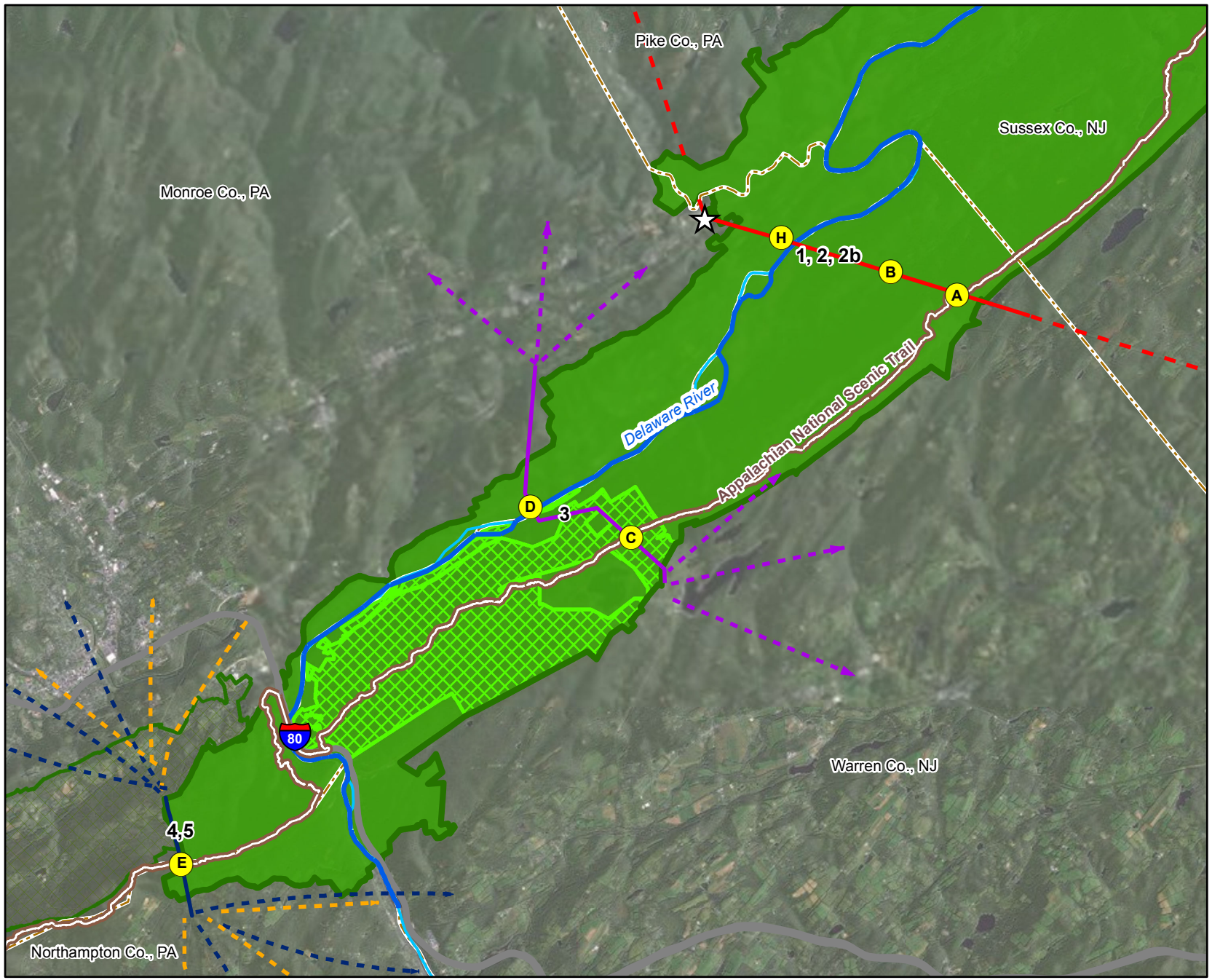
CONSTRUCTION NOISE

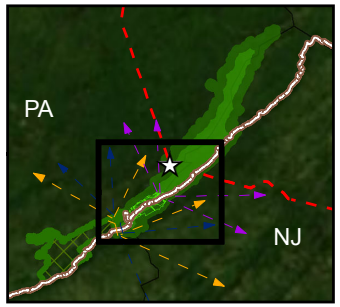
Noise from construction equipment can vary from intermittent to nearly continuous. Assuming that a truck (90 dBA), scraper-grader (87 dBA), movable crane (82 dBA), tractor (85 dBA), and two power saws (78 dBA) are operating in the same area, peak construction period noise would generally be about 93 dBA at 50 feet from the construction site (USEPA 1971, cited in USFS 2007). As distance from the noise source doubles, the decibel level would decrease by 7.5 dBA. Therefore, using this scenario, peak construction noise would be approximately 40 dBA at a distance of 6,400 feet (1.2 miles) from the source. This is very close to the background noise levels in the project area (see discussion of sound level monitoring below).

SOUND LEVEL MONITORING

Sound level monitoring was conducted at eight locations to establish a baseline for the acoustical environment in the project area. Sound level monitoring was conducted between October 7, 2010, and November 14, 2010. Figure 56 shows the location of each monitoring station with respect to the alternative alignments. Sites were monitored with Cesva SC310, Larson Davis 831, or Norsonic Nor140 ANSI Type 1 sound level meters set to log 1/3-octave band sound levels every second. Each sound level meter was calibrated before and after the measurements and fitted with 3- or 7-inch-diameter windscreens. The windscreens reduce the self-noise created by wind passing over the meter's microphone. Each microphone was placed approximately 4.5 feet above the ground. In each case, the ground was considered "soft"; that is, it was suitable for vegetation growth. In addition to the sound level meters, each monitor was equipped with an audio recorder and an anemometer, a device used to measure wind speed.

Weather data for the general area was obtained for the Mount Pocono meteorological station. Temperatures during the monitoring period ranged from a low of 24°F to a high of 71°F, with an average temperature of 46°F. Wind speeds ranged from 0 feet per second to 53 feet per second, with an average of 13 feet per second. The area received 3.91 inches of precipitation over the course of 15 days. Data collected during sustained winds greater than 16 feet per second were not taken into account in the monitoring results.





Legend

- Sound Monitoring Location
- Substation
- Alternative 1, 2, 2b
- Alternative 3
- Alternative 4
- Alternative 5
- Appalachian National Scenic Trail
- Delaware River
- Middle Delaware National Scenic & Recreational River
- Delaware Water Gap National Recreation Area
- Worthington State Forest
- CVNWR Boundary
- County Line

Note: Designated boundary of CVNWR is depicted,not all property is owned within the boundary

0 1 2
Miles

Susquehanna to Roseland
Transmission Line Proposal
and
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Figure 56
Sound Monitoring Locations

Source: ESRI ArcGISonline Map Service 2012
Penn State 2010,NPS 2010, PASDA 2010
NJOIT-OGIS 2008, DEWA 2008, NJ DEP 2008
ESRI Streetmap 2006, USGS 2006

Projection: NAD 83 UTM Zone 18N
Date: July 2012

The existing acoustical environment, based on the sound monitoring results, are presented below by alternative. The data in this summary includes the natural ambient sound level, the existing ambient sound level, and the types of noises that were audible at each site during the monitoring period. The natural ambient sound level—that is, the environment of sound that exists in the absence of human-caused noise — is the baseline condition, and the standard against which current conditions in a soundscape (acoustic resource) will be measured and evaluated" (NPS 2006a, 104). However, the desired acoustic condition may also depend on the resources and the values of the park, the land use, and the kinds of activities and developments that are appropriate for the purpose of the park (NPS 2006a, 100).

The measurements of the natural ambient sound level exclude human-produced sources of sound. The existing ambient sound level includes both natural and human-produced sources of sound. These measurements are presented statistically using the level of sound exceeded 50% of the time during the monitoring period, which represents the median level of the sound recorded. Monitoring results generally show that the existing ambient sound level is within 5 dBA of the natural ambient sound level. At the six monitoring sites, the existing daytime ambient sound level ranged from 36 to 48 dBA, and the natural daytime ambient sound level ranged from 33 to 48 dBA. Common natural sounds included animals, wind, and water rushing. The most prevalent human-produced sound was associated with aircraft. Vehicular traffic, people, and gunshots were also audible at many sites. Hunting is permitted in most parts of DEWA. Hunting seasons vary based on animal and firearm type, but are generally from mid-fall to early winter. Therefore, gunshot sounds would not be heard during peak summer visitation months. The existing transmission lines were not audible at any of the sites during the monitoring period. More detailed information is available in the *Soundscapes Technical Report* (Resource Systems Group, Inc. 2010). In addition to developing statewide noise standards, New Jersey created a model noise ordinance as a performance code to be adopted and enforced by local municipalities (NJDEP 2010b). However, it is up to each local municipality to determine whether they want to create their own noise ordinance or adopt the state's rules without specifying a local noise ordinance.

Of the four counties and 8 townships in both Pennsylvania and New Jersey adjacent to the alternatives on federal lands, 3 of the townships have noise ordinances that could apply to this proposed action. No boroughs are adjacent to the alternatives on federal lands. Stroud Township, Pennsylvania, has adopted noise level regulations within their ordinance in section 6.420, "Noise Control" (Nauman pers. comm. 2010). Table 38 presents the permissible continuous sound levels by land use type.

TABLE 38: STROUD TOWNSHIP CONTINUOUS SOUND LEVEL LIMITS BY RECEIVING LAND USE

Receiving Land Use Category	Time	Sound Level Limit (dBA)
Residential, public space, open space, or institutional	7:00 a.m.–9:00 p.m.	60
	9:00 p.m.–7:00 a.m. plus Sundays and legal holidays	50
Commercial or business	7:00 a.m.–9:00 p.m.	65
	9:00 p.m.–7:00 a.m. plus Sundays and legal holidays	60
Industrial	All times	65

Per the Stroud Township ordinance, applicable exceptions to the above noise level rules include "construction operations, between the hours of 8:00 a.m. and 6:00 p.m." Therefore, this ordinance would only apply to the proposed alternatives if construction activities occur outside this time frame.

In addition to noise-level thresholds, the Stroud Township ordinance includes vibration control guidelines. Vibration controls prohibit the use of "any device that creates vibration which is above the vibration perception threshold of an individual at or beyond the property boundary of the source if on private property or at 50 feet from the source if on a public space or public right-of-way" (Stroud n.d.).

Lehman Township, Pennsylvania, has adopted noise level regulations within its ordinance in section 505 (Lehman n.d.). Table 39 shows the permissible continuous noise levels by land use type.

TABLE 39: LEHMAN TOWNSHIP CONTINUOUS SOUND LEVEL LIMITS BY RECEIVING LAND USE/DISTRICT

Land Use or Zoning District Receiving the Noise	Hours/Days	Sound Level Limit (dBA)
At a lot line of a residential use in a residential district	7:00 a.m.–9:00 p.m. other than Sundays, Christmas Day, Thanksgiving Day, New Year's Day, Labor Day, and Memorial Day	62
	9:00 p.m.–7:00 a.m. plus Sundays, Christmas Day, Thanksgiving Day, New Year's Day, Labor Day, and Memorial Day	55
At any other lot line	At all times and days	70

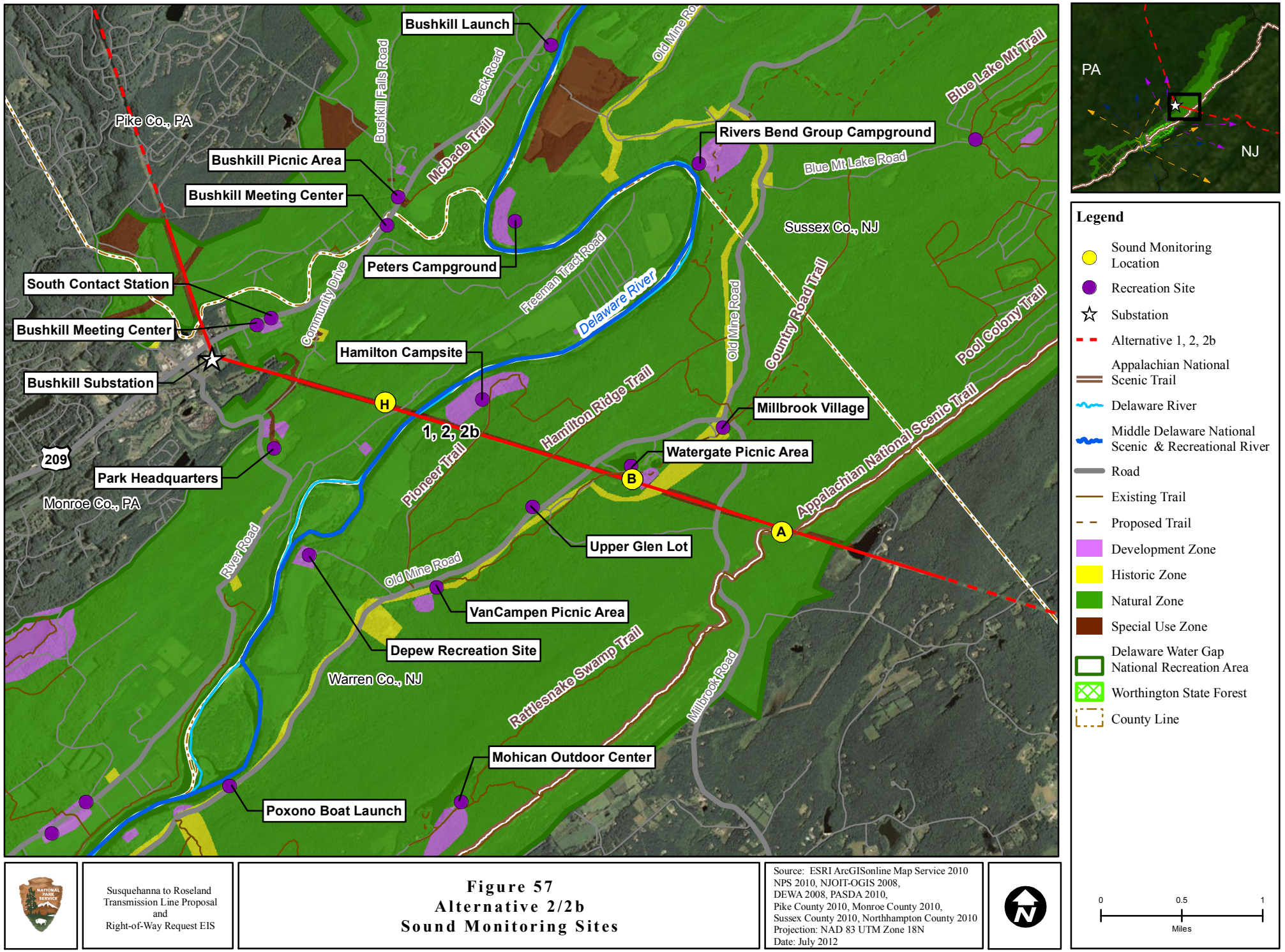
Per the Lehman Township ordinance, applicable exceptions to the above noise level rules include "repair or installation of utilities or construction of structures…between the hours of 7:00 a.m. and 8:00 p.m." (Lehman n.d.). Therefore, this ordinance would only apply to the proposed alternatives if construction activities occurred outside this time frame.

Upper Mount Bethel Township, Pennsylvania, has a specific noise ordinance that would apply to the proposed alternatives (Cartwright, pers. comm. 2010). However, the contact at the township declined to provide a copy of the noise ordinance or any specific information on permissible noise levels and exemptions for public utilities.

ALTERNATIVE 1 (NO ACTION), ALTERNATIVE 2, AND ALTERNATIVE 2b

Inside the study area, the alternative 1, 2, and 2b alignments would follow the B-K Line ROW, which is designated as quasi-public land in a special use zone as defined in the DEWA GMP. The surrounding areas are primarily zoned natural, but the alignment would also cross a cultural zone and would be near two small areas designated as development zones. As shown on figure 57, sound monitoring was conducted at three locations along this alignment.

Site H: This site is west of the Delaware River between a small wetland and power line at the top of the ridge between Freeman Tract Road and Community Drive on the northern edge of the B-K Line ROW, about 65 feet from the existing power lines. This site is near the crest of the eastern side of the ridge and is representative of wildlife habitat on the west side of the Delaware River. The natural ambient sound level at this site was measured at 34 dBA during the day and 29 dBA during the night. Animal noises were quite varied, ranging from crickets and birds to larger animals such as raccoons and groundhogs. Canopy wind noise was also recorded. The existing ambient sound level at this site was measured at 37 dBA during the day and 33 dBA during the night. Human-produced sound was audible at Site H typically 30% to 48% of the time during the day. The soundscape at Site H was dominated by aircraft noise during the early morning through evening periods. There was also intermittent road traffic and siren noise.



Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 57
Alternative 2/2b
Sound Monitoring Sites

Source: ESRI ArcGISonline Map Service 2010
NPS 2010, NJOIT-OGIS 2008,
DEWA 2008, PASDA 2010,
Pike County 2010, Monroe County 2010,
Sussex County 2010, Northhampton County 2010
Projection: NAD 83 UTM Zone 18N
Date: July 2012

Site B: This site is in a small island of dense foliage next to the Watergate Recreation Site and approximately 130 feet north of the B-K Line ROW. This site is representative of a lakeside, road-accessible visitor use area. The monitor was placed approximately 65 feet south of some picnic tables and 65 feet north of a stream. The natural ambient sound level at this site was measured at 48 dBA during the day and night. Site B was dominated by the constant sound of the stream, with birds also audible during the day. The existing ambient sound level at this site was measured at 48 dBA during the day and night. Human-produced sound is audible at Site B typically 20% to 30% of the time during the day. Sources included aircraft, automobile traffic, and people. Gunshots and the sound of vehicle doors closing were also heard, but were more distant. At night, the only sounds other than the stream were typically aircraft or traffic noise.

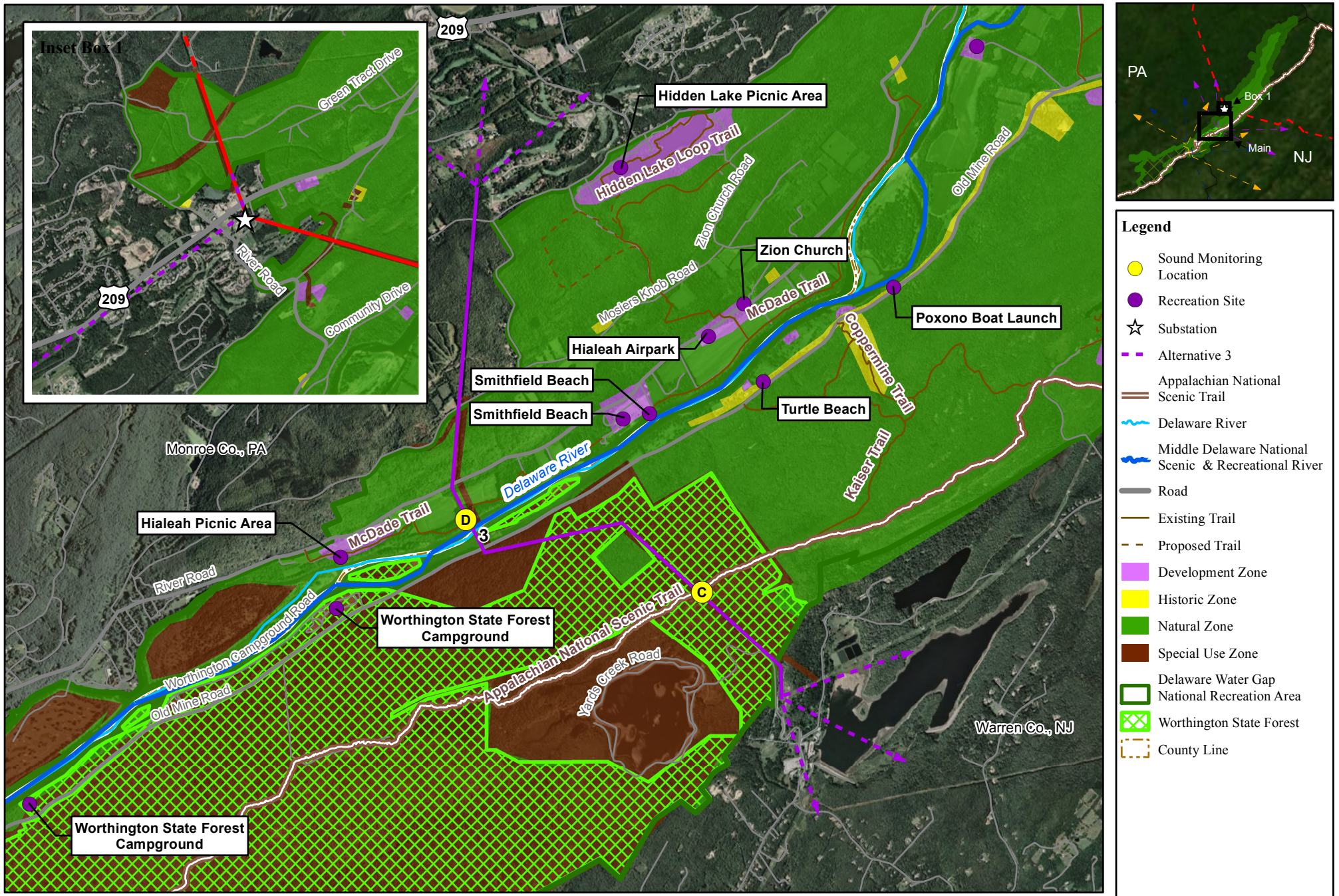
Site A: This site is near the B-K Line's crossing of APPA. The site is approximately 163 feet east of APPA and 30 feet south of the existing transmission line ROW, with power lines approximately 65 feet away. The site is exposed and somewhat remote, approximately 1 kilometer north of NJ 602 and 1,200 feet west of Sand Pond. It is representative of ridgetop land on the east side of the park. The natural ambient sound level at this site was measured at 33 dBA during the day and 32 dBA during the night. Natural sounds included wind, as well as animal sounds from birds, squirrels, deer, and coyotes. The existing ambient sound level was measured at 36 dBA during the day and 34 dBA during the night. The primary human-produced sound at Site A was aircraft noise, which was audible 40% to 60% of the time during the day. Sirens, distant traffic, and gunfire were also audible during quiet periods. During the day, especially weekends, hikers are frequently audible as well.

ALTERNATIVE 3

Inside the study area, the alternative 3 alignment would follow an existing transmission line corridor that is designated by DEWA as quasi-public land in a special use zone. The surrounding areas are designated as natural zones on the west side of the Delaware River and in the Worthington State Forest on the east side of the Delaware River. As shown on figure 58, sound monitoring was conducted at two locations along this alignment.

Site D: This site is approximately 0.5 mile northeast of the Hialeah Picnic Area on the west bank of the Delaware River. The site is at the existing transmission line ROW approximately 65 feet east of the McDade Trail and 1,100 feet from River Road along the alternative 3 alignment. This site is representative of an accessible riverfront location. The natural ambient sound level at this site was measured at 36 dBA during the day and 30 dBA during the night. Natural sounds included frequent bird calls. The existing ambient sound level at this site was measured at 36 dBA during the day and 31 dBA during the night. The primary human-produced sound at this site was aircraft noise, which was audible 20% to 35% of the time during the day. A fairly consistent hum of distant traffic was audible at this site both night and day. Other sounds included traffic on River Road, construction or heavy equipment noise, and sounds from hikers on the McDade Trail. Between 9:00 a.m. and 12:00 p.m., there was an increase in the human-produced sounds not associated with aircraft. An occasional distant gunshot was also recorded.

Site C: This site is in a fairly remote area of the park near the alternative 3 alignment's crossing of APPA north of Upper Yards Creek Reservoir. This site is approximately 1 mile east of Old Mine Road and overlooks the Delaware River to the west. This site is directly adjacent to the northern edge of the existing transmission line ROW and approximately 65 feet east of APPA. Site C is representative of high land overlooking the river. The natural ambient sound level at this site was measured at 33 dBA during the day and 29 dBA during the night. Natural sounds included substantial wind noise and birds. The existing ambient sound level at this location was measured at 36 dBA during the day and 34 dBA during the night. The primary human-produced noise source at Site C was aircraft noise, which was audible 10% to 35% of the time during the day. Other sounds included people and gunshots.



Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 58
Alternative 3
Sound Monitoring Sites

Source: ESRI ArcGISonline Map Service 2010
NPS 2010, NJOIT-OGIS 2008,
DEWA 2008, PASDA 2010,
Pike County 2010, Monroe County 2010,
Sussex County 2010, Northhampton County 2010
Projection: NAD 83 UTM Zone 18N
Date: July 2012

ALTERNATIVE 4

Inside the study area, the alternative 4 alignment would follow an existing transmission line corridor that is partially designated by DEWA as quasi-public land in a special use zone. The surrounding areas are designated as natural zones. As shown on figure 59, sound monitoring was conducted at one location along this alignment.

Site E: This site is at the alternative 4 alignment's crossing of APPA near Totts Gap. This site is on the western side of the existing transmission line ROW, approximately 100 feet south of APPA and just below the crest of the ridge. Totts Gap is at the height of the ridge that follows APPA in this area. Site E is representative of an area adjacent to the southwestern portion of DEWA. The natural ambient sound level at this location was measured at 36 dBA during the day and 35 dBA at night. The primary natural source of noise was wind, with birds audible in the background. The existing ambient sound level at this site was measured at 37 dBA during the day and 35 dBA at night. The primary human-produced sound at Site E was aircraft noise, which was audible 10% to 35% of the time during the day. Traffic noise was frequently audible in the background, as well as a variety of occasional sounds, including sirens, hikers, off-highway vehicles, dogs, and gunshots. In general, the soundscape at Site E is more residential than the other sites monitored.

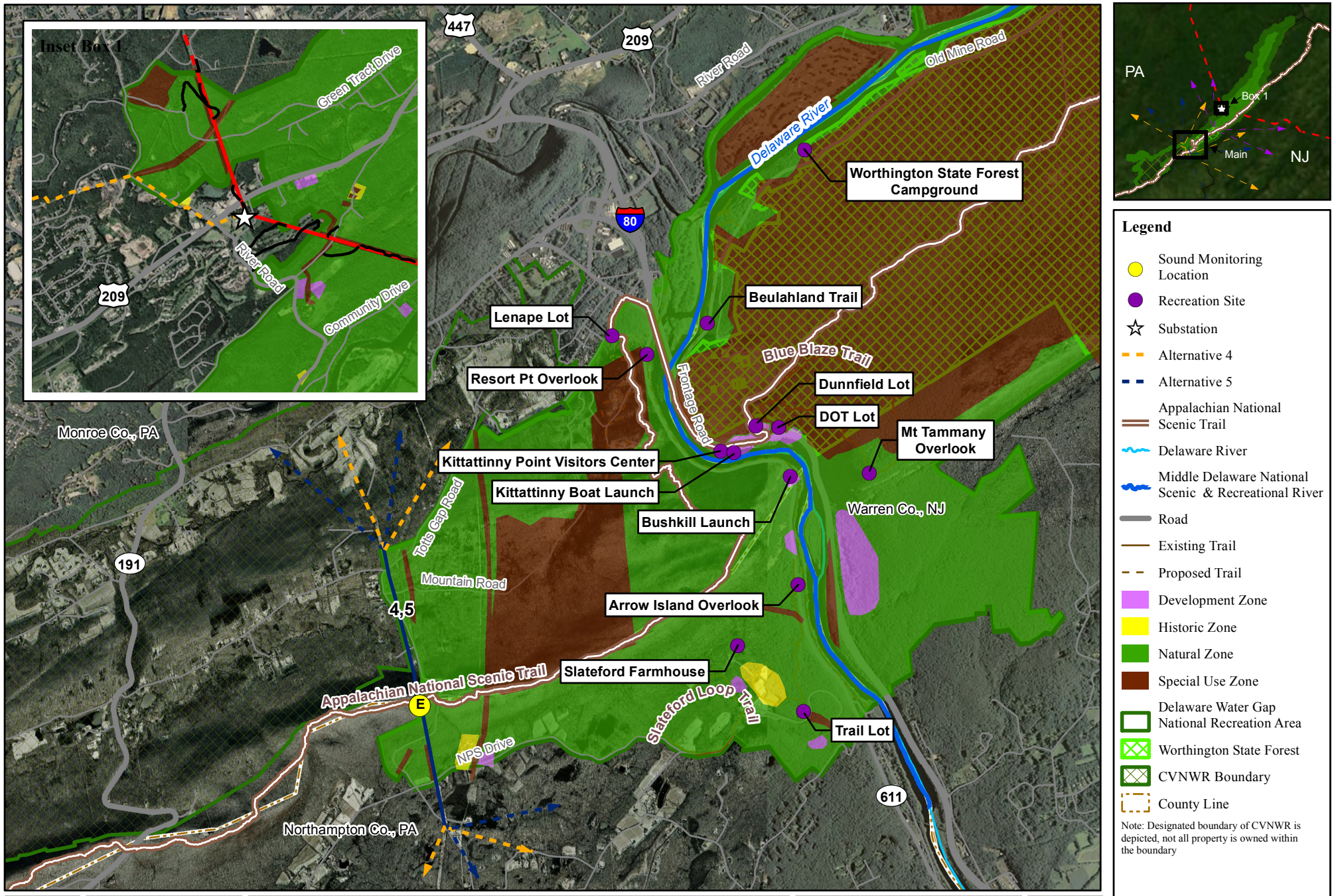
ALTERNATIVE 5

Inside the study area, the alternative 5 alignment would follow the same existing ROWs through DEWA and across APPA as alternative 4, except for the portion of the B-K Line between the western portion of DEWA and the Bushkill Substation. The existing soundscape conditions for alternative 5 would be the same as those described under alternative 4.

OUTSIDE THE STUDY AREA

Outside the study area in Pennsylvania, the S-R Line could pass through Northampton, Monroe, Pike, Wayne, Carbon, Lackawanna, and Luzerne counties. The alignment could traverse state forest land, parks, and game lands, as well as rural, residential, urban, and recreation areas. The alignment could also cross or approach major transportation facilities. Daytime sound levels in sparsely populated areas are expected to be similar to the existing ambient sound levels in the study area. These levels would vary depending on proximity to sources of noise, such as roads. Segments of the line traversing more populated areas and closer to major transportation facilities would likely have higher levels of ambient sound.

Outside the study area in New Jersey, the S-R Line could traverse Warren, Sussex, and Morris counties. The alignment could traverse private land, as well as some state lands designated for wildlife management, forest, parks, and game lands. The private land is agricultural, rural, rural residential, and suburban. The route could also pass through numerous residential areas and close to three airports. Ambient sound levels would generally be greater in areas with a higher occurrence of human-produced sounds.



Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 59
Alternative 4,5
Sound Monitoring Sites

Source: ESRI ArcGISonline Map Service 2010
NPS 2010, NJOIT-OGIS 2008,
DEWA 2008, PASDA 2010,
Pike County 2010, Monroe County 2010,
Sussex County 2010, Northhampton County 2010
Projection: NAD 83 UTM Zone 18N
Date: July 2012

VISITOR USE AND EXPERIENCE

Visitors come to national park system units to enjoy recreational facilities and services and experience the unique characteristics of each unit. For many visitors, being immersed in the natural environment or cultural landscape is the experience they are seeking for spiritual renewal. These two aspects of visitor satisfaction are interrelated — the quality of the recreational opportunities available affect how visitors experience the area, and the experience visitors expect affects which recreational facilities they seek. Each of these components is discussed in more detail below.

The study area for this topic for DEWA and MDSR is from the northernmost point at which the alternatives may be experienced (typically, but not necessarily, seen or heard), i.e., Bushkill Launch, to the southern boundary of DEWA.

VISITOR USE OF RECREATIONAL FACILITIES

This section presents general information about visitation to DEWA, MDSR, and APPA and their respective recreational offerings, as well as specific recreational locations that could be affected by each alternative.

Delaware Water Gap National Recreation Area and Middle Delaware Scenic River

Visitation: As one of the largest public open spaces remaining in the northeastern metropolitan corridor, DEWA provides a broad diversity of close-to-home recreational opportunities to more than 60 million people who live within a 6-hour drive of the park (NPS 2003a, 6). DEWA is located close to major population centers, including New York City and Philadelphia, and their bedroom communities. The park is easily accessible by private vehicles and offers a variety of recreational opportunities, which makes it a popular destination for predominantly urban and suburban residents.

DEWA experienced the fourteenth highest total annual visitation (combined recreation and nonrecreation) of all national park system units in FY 2009. It experienced the eighth highest annual recreation visitation in the same year (NPS 2010y). In seven of the last nine years, DEWA was eighth in visitation. DEWA ranked ninth out of the top 10 most visited national park system units nationwide in 2010 and tenth in 2011, with over 5 million annual visitors each year. Visitation increased in 2010, reaching its highest level since the park's inception (NPS 2012c).

DEWA visitor use data from 1990 indicate that the largest number of visitors live in New Jersey (49 %), with another 22 % from New York and 18 % from Pennsylvania. Twelve % originate from other locales (Madison and Machlis 1990, 5). According to a survey of visitor use conducted in July 1989, approximately 60 % of those sampled were reported to be returning visitors to DEWA. The majority of visitors (71 %) spent less than 8 hours in the park and nearly half (47 %) spent less than 4 hours in the park (Madison and Machlis 1990, 10). (Other visitor studies are planned for the future.) Visitation statistics for APPA are described under "Appalachian Trail," below.

As shown in figure 60, total annual visitation has fluctuated slightly from 2000 to 2010 and has ranged from between approximately 4.8 million visitors in 2001 and 2007 to nearly 5.3 million visitors in 2006 (NPS 2012c).

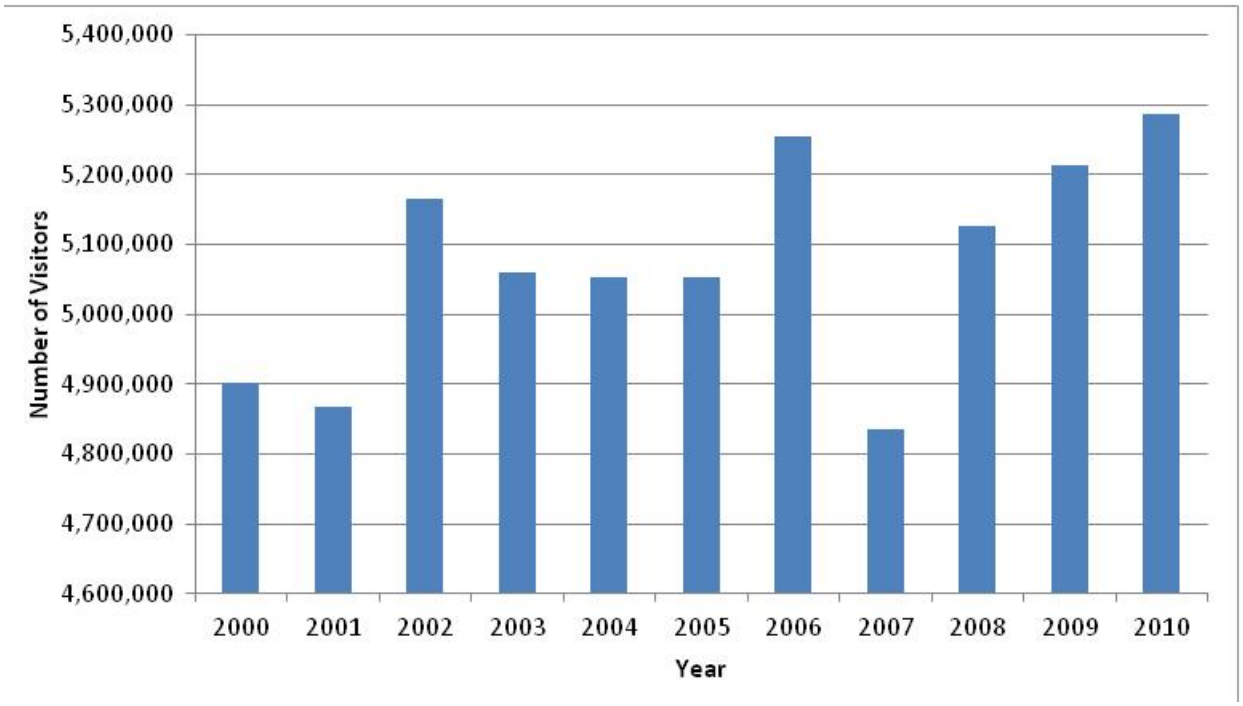


FIGURE 60: DEWA ANNUAL VISITATION – HISTORIC DATE (2000 TO 2010)

Peak visitation occurs in the summer (May through August) and is also high in October, when fall foliage is visible. In 2010, June marked the highest total visitation (approximately 663,000 visitors). February 2010 marked the lowest total visitation, at approximately 252,000 visitors. Overnight stays at campgrounds, in the backcountry, and at other lodging in the park are highest from June through August (NPS 2012c). Figure 61 depicts total (combined recreation and nonrecreation) parkwide visitation for DEWA by month for 2010.

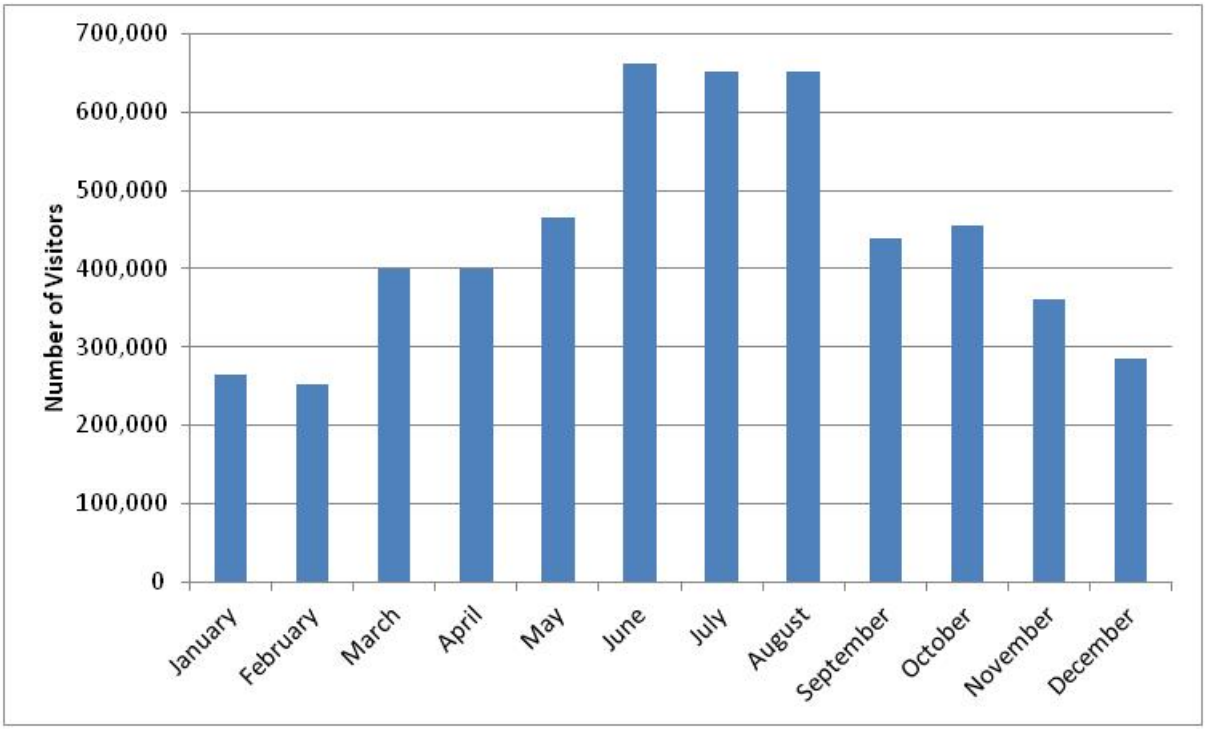


FIGURE 61: DEWA VISITATION BY MONTH

Visitor Activities

DEWA visitors engage in a wide variety of activities and make use of several NPS facilities. Table 40 shows those locations most visited within DEWA.

TABLE 40: MOST VISITED LOCATIONS WITHIN DEWA

Location	% Visitors Reported Visiting Location
Bushkill Access	17
Kittatinny Point Visitor Center	17
Smithfield Beach	17
Millbrook Village	9
Watergate Recreation Site	7
Appalachian Trail	6
Dunnfield Parking Area	4

Source: Madison and Machlis 1990.

Note: Percentages do not add up to 100 because visitors could report more than one activity.

DEWA provides opportunities for boating, scenic driving, camping along the MDSR and APPA, and staying at the Mohican Outdoor Center, as well as visiting historic villages and districts, scenic waterfalls, river beaches, and campgrounds, described in more detail below. Hunting is allowed in most parts of the recreation area in both Pennsylvania and New Jersey (NPS 2010z). The 1989 visitor survey indicates that sightseeing and picnicking were the most common recreational activity, with 56 % and 35 % of visitors (respectively) engaging in those activities. Large numbers of visitors also engage in swimming, hiking,

and canoeing/inner tubing (Madison and Machlis 1990, 11). Table 41 shows the most popular visitor activities at DEWA.

TABLE 41: VISITOR ACTIVITIES ENGAGED IN AT DEWA

Activity	% of Visitors who Engaged in Activity
Sightseeing	56
Picnicking	35
Swimming	32
Hiking	30
Canoeing/tubing	26
Other (i.e., attending craft fair, rafting, relaxing)	21
Visit historic sites	18
Nature study	16
Fishing	16
Camping	16
Boating	7
Hunting	5

Sources: Madison and Machlis 1990; Penn State 1989, 75.
Note: Percentages do not add up to 100 because visitors could report more than one activity.

Upon arrival at DEWA, visitors can obtain information about their visit at visitor centers, entrance stations, DEWA Headquarters, and Millbrook Village. Kittatinny Point Visitor Center is located in the Delaware Water Gap, the park's namesake geological feature, and provides park information, a ranger-staffed desk, restrooms, Eastern National Bookstore, a picnic area, a canoe launch, and scenic viewing. The visitor survey conducted in 1989 indicates that 17 % of visitors visited the Kittatinny Point Visitor Center (Madison and Machlis 1990, 12). Also within the study area, additional information is available for visitors at DEWA Headquarters and south entrance station in Bushkill, Pennsylvania; and Millbrook Village, New Jersey(NPS 2010z). In addition, the Bushkill Meeting Center is used for special events and lectures. Park information is provided by the Friends of DEWA on summer weekends when volunteers are available (NPS 2010z). Outside the study area, visitors may obtain information at the Dingmans Falls Visitor Center and at the DEWA north entrance station.

The Delaware River is one of the park's important focal points, providing opportunities such as canoeing, kayaking, rafting, inner tubing, and swimming. These activities keep the park's three beaches and nine boat access areas very busy, particularly on weekends during the summer (NPS 2003a, 6). A visitor study was conducted of DEWA river users during the summer of 2010. Table 42 provides a profile of river users from that study.

TABLE 42: PROFILE OF RIVER USERS AT DEWA

Group size and type	• Two-person groups: 33% • Groups of six or more: 26% • Groups consisting of family members: 53%
Residence of visitors	United States: 97% • New Jersey: 40% • Pennsylvania: 31% • New York: 19% • Other: 10%
Frequency of visits	• Visited the park six or more times in their lifetime: 40% • First visit in past 5 years: 37%
Reason for visiting	"Recreation" ranked as number one reason for visiting DEWA: 63%
Average length of stay	• Day-use visitors (<24 hours): 5 hours • Overnight visitors (>24 hours): 2.6 days • All visitor groups: 19.9 hours (0.8 day)

Source: Blotkamp et al. 2010, 5-6, 41.

A summary of the most common visitor activities and sites used specifically by river visitors at DEWA is provided in table 43. Recreational activities are described by alternative later in this section.

TABLE 43: SUMMARY OF RIVER USER ACTIVITIES AT DEWA

Locations visited	Most visited: • Milford Beach (34%) (outside the study area) • Smithfield Beach (33%) • Dingmans Boat Launch (30%) (outside the study area) Least visited: • Watergate Recreation Site (1%)
Most common activities	• Swimming (56%) • Viewing scenery/river views/ waterfalls (52%)
Most important activity	Canoeing with private canoes/ kayaks (28%)
Personal canoe/ kayak/boat trips	Personal (non-livery) canoe/kayak/boat trip: 45% • 56% canoes • 44% kayaks

Source: Blotkamp et al. 2010, 43, 45-47

Swimming is one of the park's most common activities and is allowed on the Delaware River at lifeguarded beaches. Lifeguarded swimming is available at three beaches within DEWA — Smithfield Beach and Turtle Beach, which are within the study area, and Milford Beach, outside of the study area. Swimming elsewhere in the river is not recommended due to strong currents, steep drop-offs, and constantly changing river conditions. Swimming is not allowed at Van Campen Glen, within 50 feet of a boat launch or canoe launch, or on top of any waterfall (NPS 2010q, 2010aa).

The park's second most common activity among river users is canoeing, including privately-owned boats and canoe liveries. The NPS Public Use Statistics Office reports that nearly 130,000 annual visitors engaged in day-use canoeing and another 40,000 annual visitors engaged in overnight canoeing in 2009 (NPS 2010v). Many river trips begin at the northern part of the park, such as Milford Beach (outside the study area), and the majority end at locations within the study area, specifically Smithfield Beach and

Kittatinny Point (Blotkamp et al. 2010, 48). Several private liveries provide a range of nonmotorized boat rentals (NPS 2010aa). These companies are permitted to drop off and pick up rentals within the park. Data gathered by the NPS for 2010 indicates that the majority of the canoe liveries operating within DEWA use the park or its resources as a primary or exclusive destination. The amount of time per person spent by the liveries in DEWA generally ranges from 1 hour to 3 days (NPS 2011d). Motorized boating is allowed on the Delaware River with a 10 mph speed limit on the entire length of the river. Information about the Delaware River Water Trail is included under the "Wild and Scenic Rivers" section.

Fishing is permitted throughout the Delaware River with a valid New Jersey or Pennsylvania fishing license. The Delaware River and its tributaries provide a variety of fishing. The "shad run," the annual migration of spawning American shad, up the Delaware passes through DEWA in May and June (NPS 2010z).

Several scenic driving routes provide access to destinations, as well as a way to experience the flora and fauna, historic structures, and scenery in DEWA. Rural scenery and waterfalls are some of the attractions along the park roads (NPS 2010z). Scenic drives are described in more detail by alternative later in this section.

Hiking is also popular at DEWA. The 1989 visitor survey indicates that 30 % of visitors spent time hiking in the park (Madison and Machlis 1990, 11). Approximately 100 miles of trails along streams, ridges, and mountains are found throughout the park, including approximately 27 miles of APPA. Hiking opportunities range from short, easy scenic hikes to overnight hiking on the APPA (NPS 2010z). The total number of annual trail users at DEWA is estimated to be approximately 181,000, which includes 177,000 hikers, 3,500 bicycle users, and 500 horseback riders. Hiking is the dominant trail use in DEWA and most trails do not allow other trail uses (NPS 1999, 53). Bicycling off road is permitted only on the McDade Trail (described in more detail later in this section). Although horseback riding is permitted at specific locations in DEWA, none of these are within the study area (NPS 2010z).

Trails are designated as part of four networks: APPA, Country Road, Gap View, and River Valley networks (NPS 1999, 19). Rather than a geographic focus, each network serves a particular type of visitor experience and provides for specific uses (NPS 2001a, 24). For example, APPA Network provides an isolated, remote, wooded hiking experience, whereas the Gap View Network primarily focuses on the unique scenic view of the Delaware Water Gap and the Delaware River (NPS 1999, 24, 25). The study area includes trails in all four networks. Details about specific trails are described under the alternative descriptions later in this section.

Bicycling is permitted on ungated roads open to vehicle traffic. Road bicycle touring is also allowed on both paved and dirt roads throughout the park; however, due to heavy traffic, bicycling is not recommended on US 209, PA 739, or River Road in Pennsylvania. The McDade Trail in Pennsylvania, the only trail in the park designated for bicycling, is a multi-use trail allowing hiking, bicycling, and cross-country skiing (NPS 2010z). The DEWA trails plan identifies other trails for bicycling use; however, environmental review and planning, as well as special use regulation approvals, are required before they can be developed. This trail is described in more detail later in this section.

Rock climbing is allowed throughout the park and no registration is necessary.

Eagle watching is recommended during the winter months, when bald eagles are active along the Delaware River. The park typically hosts between 10 and 20 wintering bald eagles (NPS 2010z).

Hunting is allowed and occurs throughout the park. All applicable state and additional park-specific federal regulations must be followed. Bow hunting is very popular in the park and is allowed in DEWA

except on Sundays (NPS 2010z). Solitude is an important part of the hunting experience, particularly for bow hunters. Hunters typically hold extremely positive attitudes toward their environment, and place a higher priority on companionship and being outdoors than on shooting an animal. The hunting attitude is strongly affiliated with enjoying camaraderie, aesthetics, and the outdoors (Penn State 1989, 19–20). DEWA hunters have an average of 10 years of experience hunting in the park. The reason most often cited by hunters for hunting in the park was their general "[liking] for the area," followed by "availability of game," and "familiarity with the area," which "reinforces the importance of experience as a motivating factor in using [DEWA]" (Penn State 1989, 56). "The traditional bonds among family and peer groups was also reflected in [hunters'] tenure of use within [DEWA] and their overall positive attitudes and allegiance toward this management area" (Penn State 1989, 71). Annually, hunters spend an average of 10 days hunting in DEWA. DEWA hunters also participate in other activities at the park, most commonly fishing, boating, and camping. Participating in these other activities typically added another six activity days recreating within the park (Penn State 1989, 68).

In DEWA, the most popular hunting season is the deer firearm season. Deer archery, pheasant/rabbit, and small game seasons are also popular (Penn State 1989, 30–32). Deer hunting generally occurs from September through January depending on antlered/antlerless and type of firearm; small game is late September through May depending on the type of game, with woodchuck hunting occurring in the summer in New Jersey (March through September). Some small game seasons are unlimited in Pennsylvania (NJDFW 2010h; PGC 2010b).

Visitors are attracted to specific recreational locations in DEWA, and regularly return to these locations rather than visiting other areas in DEWA. This leads to an imbalance of park usage, as some areas are extremely crowded while others are virtually unoccupied even on a summer weekend day (NPS 2003a, 14).

Visitors can choose from a variety of overnight accommodations when visiting the area. Camping, hotel/motel, and other lodging options are available both in and near the park. More than 60 primitive campsites are available to canoeists and boaters. Numerous private campgrounds are located in both Pennsylvania and New Jersey outside the park. Several Pennsylvania and New Jersey state park campgrounds are also located nearby, as is the Worthington State Forest Campground (NPS 2010z), described in more detail below.

Chain motels are along I-80 near the park, and local motels are along US 209 between Bushkill, Pennsylvania, and East Stroudsburg, Pennsylvania. The majority of local lodging options are at Stroudsburg and East Stroudsburg. Smaller communities in the study area, such as Bushkill and Marshalls Creek in Pennsylvania and Columbia in New Jersey, offer one or two lodging options (US Parks.com 2010). Several bed-and-breakfast establishments are found in Shawnee-on-Delaware, Pennsylvania, and rural western New Jersey. There are also large resorts near Bushkill and Shawnee-on-Delaware, Pennsylvania (NPS 2010z). The Mohican Outdoor Center on Catfish Pond provides hostel-like lodging for backpackers (NPS 2010z), and is frequently used by APPA hikers.

A visitor survey was conducted for DEWA in FY 2009 to measure visitor satisfaction and visitor appreciation. According to the survey, 96% of park visitors are satisfied overall with DEWA facilities, services, and recreational opportunities. This satisfaction measure is a combined percentage of "good" and "very good" responses to survey questions. Although the overall 96% satisfaction level is essentially unchanged from the baseline measurement (FY 2005–FY 2008), there was a noticeable increase of "very good" responses from "good" in the FY 2009 survey. Approximately 94% of 2009 respondents were satisfied overall with walkways, road, and trails; 96% were satisfied overall with campgrounds and/or picnic areas; 78% were satisfied overall with commercial services in the park (the lowest rated category); and 94% were satisfied overall with outdoor recreation opportunities (University of Idaho 2009, 1–4).

Appalachian Trail

Delineated in the 1920s, APPA was the first designated national scenic trail in the United States. The trail extends along the spine of the Appalachian Mountains from Springer Mountain, Georgia, to Katahdin in Baxter State Park, Maine, traversing 2,174 miles through 14 states and various jurisdictions. The 27 miles of APPA within DEWA follows the Kittatinny Ridge west of the Delaware River (NPS 1981). The trail is a unit of the national park system, but is managed cooperatively by the NPS and the Appalachian Trail Conservancy. This nonprofit organization in turn oversees 31 independent hiking clubs that maintain and improve the trail. The two hiking clubs that maintain APPA in DEWA are the New York–New Jersey Trail Conference (NY–NJ Trail Conference) and the Wilmington Trail Club of Delaware. These groups are made up of volunteers who maintain and hike the trail (NPS 2004c, 1–2).

Visitation: The portion of APPA in DEWA is identified as heavily used (NPS 1981, 29). The total number of APPA visitors in DEWA as reported by the NPS Public Use Statistics Office was 66,700 in 2009 (NPS 2010v). "Long-distance hikers" walk the entire trail in one continuous journey. "Section-hikers" piece the entire trail together over years (ATC 2011).

Entering DEWA from the south at Totts Gap, Pennsylvania, APPA travels northward over Mount Minsi to the Borough of Delaware Water Gap, Pennsylvania, and crosses the Delaware River on a walkway alongside I-80. The trail descends from the highway, passes Kittatinny Point and the Kittatinny Point Visitor Center, crosses under the highway, and enters Worthington State Forest at Dunnfield parking area. The trail then climbs Kittatinny Ridge and travels 6 miles through the state forest. The trail exits the state forest, and, still within DEWA, continues 15 miles more, finally exiting the recreation area at Stokes State Forest in New Jersey. There are no trail shelters in DEWA (NPS 2010ab, 1), but primitive camping is allowed for long-distance hikers.

Visitor Activities: The surroundings of the APPA in this segment provide users with an environmental setting that is scarce within this region of the Trail. The vast and pristine natural lands provided by DEWA and the relative dearth of development in the immediate surroundings provides hikers with a wilderness-like aesthetic and mood. This is an uncommon offering in the heavily developed region from where many of APPA's visitors come.

Although APPA provides a unique long-distance hiking opportunity, most visitors are short-term hikers (NPS 1981, 28). In the spring of each year, between 1,700 and 2,500 hikers start north from Springer Mountain to hike the entire length of the trail. Approximately 20% of these long-distance hikers successfully walk the entire trail, normally crossing the Delaware Water Gap in the month of June.

The most popular activities reported on APPA, as reported in a study of APPA users, include day hiking, backpacking, camping, scenic viewing, picnicking, photography, and nature studies (Manning et al. 2000, 17). Backcountry camping is also allowed along APPA (NPS 2010z). Approximately 14,000 overnight stays along the trail's entire length were reported in 2009 (NPS 2010v).

In DEWA the following regulations apply to use of APPA:

- Camping is restricted to hikers who are hiking APPA for 2 or more consecutive days.
- Camping is limited to 1 night per campsite.
- Camping is limited to 10 persons per campsite.
- Hikers must camp a minimum of 50 feet and no more than 100 feet from the trail.
- No fires are permitted.

- Persons may not camp within:
  - 100 feet of any stream/water source, or
  - 0.5 mile of an established road, or
  - 200 feet of another camping party, or
  - the stretch that begins 0.5 mile south of Blue Mountain Lake Road and continues north to the intersection of APPA and Buttermilk Falls Trail (NPS 2004c, 2).

Other Recreation Areas

The following recreation areas lie outside NPS park boundaries but within the study area, and visitors to these sites may be affected by the proposed alternatives.

Worthington State Forest: Worthington State Forest is located on the Delaware River along Old Mine Road within DEWA's legislative boundary, 3.5 miles north of I-80 New Jersey Exit 1 in the Delaware Water Gap (NPS 2010z). Worthington State Forest covers almost 6,584 acres, extending about 7 miles along the southern part of Kittatinny Ridge. Boating and fishing access is provided on the Delaware River, and the forest is almost completely covered in woodland, with opportunities for hiking and camping (NY–NJ Trail Conference 2010). There are over 26 miles of trails within the forest, including 5 miles of canoe trails on the Delaware River Water Trail, the MDSR, and over 7 miles of APPA. All trails within the forest are for hiking only. A demanding climb on the Red Dot (Tammany) Trail (within both Worthington State Forest and DEWA) to the top of Mount Tammany at 1,527 feet AMSL provides the park visitor with a panoramic view of the Delaware Water Gap. A new interpretive trail, the Rockcores Trail, has been developed and offers some natural and historic information to the forest visitor (NJDEP 2010c).

Among the forest's features is a glacial lake, Sunfish Pond, along APPA. At the southern end of Worthington State Forest is the Dunnfield Creek Natural Area. The forest's trails are among the most heavily used in New Jersey, with the summit of Mount Tammany and Sunfish Pond being popular destinations (NY–NJ Trail Conference 2010). Sunfish Pond is reached by a steep and rocky climb along APPA. No swimming or camping is permitted at this area; however, 0.25 mile south of the pond along APPA is a backpacking wilderness camping area (NJDEP 2010c). APPA runs through the center of the forest, and many other trails connect to it, making a variety of loop hikes possible. There are 10 marked trails, many of them rugged, ranging from 0.4 to 6.9 miles (NY–NJ Trail Conference 2010).

The Worthington State Forest Campground is located approximately 1.5 miles north of I-80 on Old Mine Road. The campground provides 69 tent and trailer sites along 2 miles of river with picnic tables and fire rings. Three group sites with a capacity of 35 people each are also provided. Campgrounds are open April 1 through December 31. A small family picnic area has been added to the area under a hemlock grove near the Delaware River. Interpretive programs are offered seasonally from April to October in the campground. Programs are also offered year-round for schools and organized groups (NJDEP 2010c).

Cherry Valley National Wildlife Refuge: In December 2008, Cherry Valley NWR was authorized in Monroe County, Pennsylvania. The first parcel was purchased in 2010 (USFWS 2010f). Ultimately, approximately 20,000 acres are expected to become the Cherry Valley NWR; however, not all of these lands are currently owned or managed by the USFWS. According to the 2008 Cherry Valley final environmental assessment, the refuge would permit public access for day use on many of the newly acquired lands provided there are no expected negative effects on sensitive species or habitats. Generally, the refuge would allow hunting based on the Pennsylvania State hunting seasons and consistent with the Cherry Valley NWR annual hunting plan (once developed). Fishing would be allowed along Cherry

Creek where accessible, and fishing derbies for children may be provided. Working with state and local agencies, the refuge would study the feasibility of converting existing historic logging roads into public use trails. The refuge also may provide interpretive and environmental education programs, and increase partnership opportunities to interpret the cultural and natural resources within the refuge and the watershed. Activities commonly reported in Cherry Creek watershed within Cherry Valley NWR include gardening, bird watching, hiking, biking, hunting, fishing, horseback riding, and cross - country skiing (USFWS 2008, 1, 2, 2-39, 3-23, 3-24, B-13). Cherry Valley NWR expects that the draw of DEWA "would likely contribute to enthusiastic use of a new refuge" (USFWS 2008, 3-24).

Recreation areas between the study area and the Susquehanna and Roseland substations are listed in table 44.

TABLE 44: RECREATION AREAS OUTSIDE THE STUDY AREA

Recreation Areas Outside the Study Area	Alternatives 1, 2, 2b, and 3	Alternative 4	Alternative 5
Outside the study area to Susquehanna	Pike County, PA • Delaware State Forest (south) • Bruce Lake Natural Area (Recreation Area) • Delaware State Forest (north) • State Game Land 183 Wayne County, PA • Varden State Park Lackawanna County, PA • Lackawanna State Forest (north) • State Game Land 300 • Lackawanna Valley State Heritage Region Luzerne County, PA • Lackawanna Valley State Heritage Region • Lackawanna State Forest (south) • State Game Land 260	Same as alternatives 1–3, plus Monroe County, PA • Cherry Valley NWR	Monroe County, PA • Big Pocono State Park • State Game Land 038 • Cherry Valley NWR Carbon County, PA • Hickory Run State Park • State Game Land 043 • Delaware and Lehigh National Heritage Corridor Luzerne County, PA • State Game Land 119 • Nescopeck State Park • Lehigh Gorge State Park • State Game Land 187 • Delaware and Lehigh National Heritage Corridor

Recreation Areas Outside the Study Area	Alternatives 1, 2, 2b, and 3	Alternative 4	Alternative 5
Outside the study area to Roseland	Sussex County, NJ • Smartswood State Park • Kittatinny Valley Wildlife Management Area / Game Land • Weldon Brook Wildlife Management Area/ Game Land Morris County, NJ • Rockaway River Wildlife Management Area / Game Land • Wildcat Ridge Wildlife Management Area / Game Land • Buck Mountain State Par • Great Piece Meadow Wildlife Area/Preserve • Troy Meadows Recreation Area	Warren County, NJ • Limestone Ridge Marsh Wildlife Area/Preserve Sussex County, NJ • Weldon Brook Wildlife Management Area / Game Land Morris County: same as alternatives 1–3 Northampton County, PA • Cherry Valley NWR	Warren County, NJ • Columbia Wildlife Management Area / Game Land • Bear Creek Wildlife Area/ Preserve • Jenny Jump State Forest • Allamuchy Natural Area • Allamuchy State Park Morris County, NJ • Allamuchy State Park • Berkshire Valley Wildlife Management Area / Game Land • Troy Meadows Recreation Area Northampton County, PA • Cherry Valley NWR

VISITOR EXPERIENCE

The general dictionary definition of "experience" is "a particular instance of personally encountering or undergoing something." Visitors come to national parks in part to engage in a specific experience offered by that park, typically a natural or cultural resource experience. Visitors' preferences for experiences, activities, and management decisions differ greatly (Dorwart et al. 2010, 34). The experience sought by each visitor is unique to that person and can serve various purposes, such as relaxing, conquering challenges, developing camaraderie, or sight-seeing. Despite such differences, direct contact with nature, regardless of the method, is believed to increase mental health and psychological development (Davis 2004, 1). Research in environmental psychology has shown that people's desire to experience contact with nature serves an important adaptive function, specifically psychological restoration (van den Berg et al. 2007, 79). Over 100 research studies show that stress reduction is a key perceived benefit of experiencing nature (Davis 2004, 1). People tend to perceive natural environments as more restorative than urban environments, and there is evidence that contact with natural environments can promote restoration from stress and mental fatigue (van den Berg et al. 2007, 82–83). For example, studies have shown that 82% of the general population has "experienced the beauty of nature in a deeply moving way" and 49% felt this had a lasting influence. Approximately 45% of the general population and 50% of a large sample of students said "beauties of nature" led to "an intense spiritual experience." When asked to describe where their peak life experiences had occurred, 78% of a sample of city college students said "outdoors" or in a "natural setting" (Davis 2004, 6–7).

Natural environments provide psychological restoration because they possess several qualities that, in combination, are less common in other environments. These qualities include being away from daily routines, encountering aesthetically pleasing stimuli, being able to explore, and achieving individual recreational goals. This does not mean that restorative experiences only occur in natural environments, but that there is appreciation for their restorative potential. However, people tend to perceive natural environments as more beautiful than urban environments, which is closely related to perceived restorative

quality. Several studies have documented strong relationships between preferences for scenic beauty and perceived restorative quality. Frequent, brief restorative experiences may, over time, offer cumulative benefits (van den Berg et al. 2007, 84–85, 89). In addition, intense experiences are often attained in specific landscapes. For example, solitude in a natural environment can assist a person in gaining life perspectives (Murphy 1999).

The features people notice during their visits to natural settings can affect their overall experiences (Dorwart et al. 2010, 33–34). Studies have shown that the park features most often identified as having an effect on the visitor experience are water, vistas, management features, vegetation, wildlife, and human impacts. Points of interest, views, curves in a path, and waterways attract visitors' attention (Dorwart et al. 2010, 33–35).

Generally, visitors to a natural environment expect certain qualities to be available in particular areas, such as solitude in "wilderness" areas (Murphy 1999). While many nature experiences have a solitary component, many involve a social component as well. Natural environments provide opportunities for affiliation, social support, intimacy, and group bonding in a new setting (Davis 2004, 5). Experiencing or not experiencing desired qualities and characteristics may influence the meaning associated with that place (Murphy 1999).

The various qualities and characteristics visitors expect comprise discrete elements of visitor experience. However, visitor experience is not static; it varies dynamically over the course of the engagement (Hull et al. 1992, 240). A series of changing events contributes to one overall experience, or story. It is theorized that people may seek recreational experiences to provide "stories that enrich their lives" (Patterson et al. 1998, 423). In such cases, the meaning of the experience, i.e., how it is constructed and remembered, is more important than the nature, or characteristics, of the experience (Patterson et al. 1998, 425). The opportunity to reflect on, relive, define the meaning of, and share an experience can be an important component of overall visitor experience, especially for people whose experience was intense (Patterson et al. 1998, 447).

An emotional bond commonly develops between visitors and natural recreation areas during recreation activities. This experience is referred to as place bonding, place attachment, or sense of place. People often develop not only an emotional bond, but a sense of belonging and even a dependence on a natural recreation area, to the extent it becomes "their place," a "favorite place," or the "only place" for their outdoor pursuits. Such emotional bonds may vary in intensity from an immediate sense of familiarity to a long-lasting and deeply entrenched attachment. When the strength and character of a place bond is very strong, visitors will consider no other place to recreate. These place bonds are associated with a set of collectively held images that evolve from direct or indirect interaction with a particular place. A recreational genealogy is associated with these places, rooted in family members, environmental settings, and past experiences. Stories that develop through recreating at rooted places become stable components of the visitor experience. It is usually difficult to shift or distribute use from such places because of these strong emotional place bonds (Hammitt and Cole 1998, 189–191).

The specific experience of visitors to DEWA, MDSR, and APPA reflects the findings from the research highlighted above. Representative comments describing visitor experience at these parks collected during public scoping for this EIS are included below unless otherwise referenced (a full set of comments can be found in appendix I).

> I have been riding and walking parts of … the McDade Trail [at DEWA] for the past year. Last night was near magical—the warm breeze, and the smells of the forest and open fields—was a real tonic. I was there just at dusk when the lightning bugs come out in full force. What a chance to experience nature.

> When I get out in that water [Delaware River], and swimming in the river is like nothing in the universe. It's not a lake. It's not an ocean. It's unique. I don't know any other place you can swim in the river. And there you are, and you turn around and you look at the hills where the Minisink Indians were surrounding you. And you get a sense of what this place looked like 400, 500, 600 years ago.
>
> Part of what makes the simple things in life, like eating fresh picked blueberries on the Appalachian Trail, exploring old cemeteries and copper mines, and canoeing on a river where you can occasionally spy a bald eagle, so great is that they are HERE.
>
> Aside from the historical value of the Delaware Water Gap, it also holds value to many yearly visitors. It provides a place for those people who live in busy areas to escape the hustle and bustle of their everyday lives.
>
> The views seen from throughout DEWA, along the river and the Appalachian Trail are priceless.
>
> One of the most beautiful memories I have as a child was my father bringing me hiking in the mountains and the amazing peace I felt looking down at the world below.
>
> [DEWA] has one of the most spectacular views from a hot air balloon.
>
> Beautiful, scenic. I drive through here a few times a year and marvel (NPS 2011e).
>
> A nice place to hang out with family and friends (NPS 2011e)
>
> The park is wonderful. First time here and would return in a heartbeat (NPS 2011e).
>
> It is a jewel in the crown of the Park Service because of its variety and beauty (NPS 2011e)
>
> Overall it makes for a wonderful outdoor experience (NPS 2011e).
>
> We love this place (NPS 2011e).

These comments on visitor experience at DEWA reflect the park's enabling legislation, which established the park "for public outdoor recreation use and enjoyment of the proposed Tocks Island Reservoir and lands adjacent thereto and for the preservation of the scenic, scientific, and historic features contributing to the public enjoyment of such lands and waters" (PL 89-158; USC § 460). Similarly, the Wild and Scenic Rivers Act specifies that the primary emphasis of rivers such as MDSR "will be given to protect the area's aesthetic, scenic, historic, archeological, and scientific features."

During a 2010 river user survey, DEWA visitors identified specific elements that detracted from their experience. When asked if power lines and signs detracted from their experience, 56% of visitors noted they did not notice these features. Of those who did, 81% said that power lines and signs did not at all distract from their experience. However, when asked if expanding the power lines within the river corridor through a section of DEWA and MDSR would affect their experience, 64% of river users indicated that power line expansion would detract from their park experience, 34% said there would be no effect, and 3% said it would add to their experience (Blotkamp et al. 2010, 70).

Visitor experience as it applies specifically to APPA is addressed by the Appalachian Trail Conservancy policy. This policy states:

> The Trail experience … is intended to represent the sum of opportunities that are available for those walking the Appalachian Trail to interact with the wild, scenic, pastoral, cultural, and natural elements of the Appalachian Trail environment, unfettered and unimpeded by competing sights or sounds and in as direct and intimate a manner as possible. Integral to this Trail experience are:
>
> - Opportunities for observation, contemplation, enjoyment, and exploration of the natural world
> - A sense of remoteness and detachment from civilization
> - Opportunities to experience solitude, freedom, personal accomplishment, self-reliance, and self-discovery
> - A sense of being on the height of the land
> - Opportunities to experience the historic and pastoral elements of the surrounding countryside
> - A feeling of being part of the natural environment
> - Opportunities for travel on foot, including opportunities for long-distance hiking (ATC 1997)

The APPA experience as envisioned by the Appalachian Trail Conservancy is supported by numerous reports. APPA is known worldwide not only for its length and number of visitors, but for the singular experience it provides. “Hiking the Appalachian Trail, as opposed to a lesser-known trail, gives people the feeling of becoming a part of something larger than themselves” (DeGagne 2007, 7). “Mere miles can’t express the significance of the trail — something powerful enough to inspire a man to change not only his lifestyle, but his entire life” (Thorkelson 2002). “This experience, the sheer *opportunity* presented by such a long footpath, has made an indelible impression on many a casual hiker” (DeGagne 2007, 5). People from all over the world and of all ages, levels of experience, and backgrounds come to APPA, each for unique reasons: to escape the stress of city life; reconnect with nature; take in a scenic view; enjoy the sights, sounds, and smells of the forest; explore one’s inner self; get physically fit; and get back to a simpler way of life (McCorkle 2002). The Great Outdoor Recreation Pages, referring to the APPA as “America’s most significant sanity check,” further underscores the iconic nature of the trail:

> There are other long-distance hiking trails in America, to be sure, but none has captured the American imagination, indeed the international imagination, in quite the same way that the Appalachian Trail has. If all people wanted to do was take a hike, any trail in any state or national park or forest would do. America offers a lot of them. But the Appalachian Trail is much more than a walk in the woods. (GORP 2010)

Numerous APPA visitors have described their experiences of hiking the trail. These experiences reflect the Appalachian Trail Conservancy policy; the restorative, aesthetic, and social nature of the experience; and the trail’s iconic nature:

> All throughout the trail I felt as though I was free. I felt as though none of the troubles I had back home could get me here. All I ever saw was nature at its finest. It was as though mankind had never even laid their hand on the entire land (Student Trail Stewards 2009).

> This is a hundred times harder than I ever imagined. And a thousand times more rewarding (McCorkle 2002).
>
> I have seen sights at the mountaintops that no man should be allowed to see till he reaches the gates of heaven (McCorkle 2002).
>
> Number one it is just beautiful and so it's memorable. The scents and the sounds and the sights kind of reminded me of trips we've taken to the northwest … it's almost like nostalgia (Dorwart et al. 2010, 33).
>
> I learned that on the trail, everyone is equal … You begin to look at people the way you're supposed to and what's at their heart and mind and that's all that matters. If we can bring this back to our families and communities [the world] will be a better place to live (McCorkle 2002).
>
> All the strangers that became close friends, the times where I was speechless looking at the mountains, perfect strangers opening their homes to me, slogging through endless rain and the sheer joy of what is ahead. That is what the trail is … My spirit for adventure and the unknown has been woken up and is restless (Everett 2010).
>
> The AT will always be a part of me. I will remember the crunch of fresh snow under my boots, the way the sun feels after many days of rain. The joy a cold soda can bring from a complete stranger. The daily rhythm of hiking that seems to bring tranquility. I have pushed myself physically, mentally, and emotionally. It was not easy to do. But the rewards are many. Horizons are now limitless, what can and cannot be done is redefined. I have learned more about myself than I thought I could know. I now have a better idea of who [I am]. The memories and experiences of the trail will always be a part of me … in my heart and thoughts, I will still be on the trail (NPS 2007d, 6).

As with DEWA and MDSR, these comments on visitor experience at APPA reflect the park's purpose, which is "to provide for maximum outdoor recreation potential as an extended trail and for the conservation and enjoyment of the nationally significant scenic, historic, natural, or cultural qualities of these areas through which the trail passes" (NPS 2008f).

According to a report on APPA published by the National Parks Conservation Association in 2010, the biggest threat to the trail is the encroachment of development, which interrupts natural viewsheds, diminishes the hiking experience, and facilitates illegal motorized vehicle use. A protective corridor that has been acquired along the trail averages 1,000 feet in width. However, that corridor is "vulnerable to adjacent development, as well as energy, communications, and transportation projects." The report notes that "power lines are one example of adjacent development that mars the scenic viewshed along the trail. It is a major priority of the Appalachian Trail Conservancy and NPS APPA office to protect the trail's miles of uninterrupted views by opposing projects that would mar adjacent scenic and historic landscapes." The report cites an example of a voluntary agreement with a telecommunications company to design facilities in a way that protected the trail experience (NPCA 2010, 22).

The following sections further describe visitor use and experience at those locations that would be affected by the alternatives. Where data are available about visitor experience at those areas, they were included. Visitor experience data are not available for all locations.

ALTERNATIVE 1 (NO ACTION), ALTERNATIVE 2, AND ALTERNATIVE 2b

As mentioned above, many DEWA visitors engage in river activities. According to a study of river users, the majority of DEWA river trips end at locations within the study area, specifically Smithfield Beach and Kittatinny Point. Well over half of the park's river users therefore pass under the B-K Line (Blotkamp et al. 2010, 48).

In addition to providing access to recreation destinations, DEWA roads provide a scenic driving experience; 56% of all park visitors engage in sightseeing activities (Madison and Machils 1990). In Pennsylvania, River Road between Bushkill and Shawnee-on-Delaware provides views of hilly farmlands, and was originally a trail used by American Indians along the river. The road was used by European settlers and for various military purposes. The River Road corridor retains a high level of the feeling and association with agricultural and recreational uses. Its rural, narrow, two-lane, meandering character recalls its historic origins as one of the earliest main transportation corridors in Monroe County (NPS 2005d, 1–5).

Visitors seeking to tour the park by automobile are often directed along New Jersey's Old Mine Road (NPS 2009b). The NPS lists Old Mine Road as a scenic route over hills and through villages. The road is considered a cultural landscape and a National Register Historic District. Old Mine Road winds through hills and past historic villages where several historic structures are open for visitors in the summer. The historic road followed a American Indian trail connecting the Hudson River, Port Jervis, and the Philadelphia area. The road passes a copper mining site, a school built in 1881, and Watergate Recreation Site, where only the stone pillars of a dam remain from the once extensive landscaping of the 1950s (NPS 2000b, 1–4). The B-K Line crosses Old Mine Road near Watergate Recreation Site. A 26-mile section of the road is included in the Old Mine Road Historic District Nomination, including where the B-K Line crosses the road. This 26-mile section of the road retains the most substantial historic integrity, based in part on the relative absence of nonhistoric intrusions, as noted in the "Cultural Resources" section. The transmission line clearing creates an opening where it crosses Old Mine Road at mile marker 11, which passes primarily through wooded forests that create an overhead canopy. As noted in the "Vegetation" section, canopy height at lower elevations, such as this location, is approximately 50 to 60 feet. The B-K Line corridor can be seen extending to the east and west, and towers are visible (DEA 2010a).

Old Mine Road is a moderately hilly and scenic touring route for road bicycles. Paved sections of Old Mine Road, combined with NPS 615, provide a paved touring route of more than 20 miles (NPS 2010z). The New Jersey Department of Transportation created a brochure about bicycling on Old Mine Road. The brochure describes the route as moderately hilly with two major climbs and a steep descent, with vehicular traffic likely on summer weekends due to popularity with anglers, hikers, boaters, and rafters. Four separate maps indicate route sections along the entire road (NJDOT 2002, 1–3). The Adventure Cycling Association also identifies Old Mine Road as a component of the Atlantic Coast Bicycle Route (ACA 2007, 18). The Appalachian Trail Conservancy notes that Old Mine Road is a popular destination for bicyclists because traffic is almost exclusively limited to hikers, campers, and anglers (AMC 2010). Bicycle rentals are available near the southern end of DEWA in the communities of Delaware Water Gap and Minisink Hills, Pennsylvania (NPS 2010z).

Bicycling is permitted on portions of the McDade Trail in Pennsylvania. The trail offers a pulverized stone bicycling/hiking trail free from intersections with roads, and the majority of the trail is complete. This trail is suitable for mountain and hybrid bicycles. When completed, the McDade Trail will extend for 37 miles on the Pennsylvania side of the park.

The McDade Trail passes under the B-K Line at Community Drive approximately 0.25 mile south of River Road (Community Drive is located about 0.5 mile north of DEWA headquarters). The transmission

line is noticeable through a large meadow as hikers approach the transmission line from the south. Canopy height at this location is approximately 50 to 60 feet. Where the B-K Line crosses the trail, there currently is no canopy opening and the transmission line is barely noticeable due to heavy growth within the ROW (DEA 2010a). However, this condition may change after the applicant clears the corridor of vegetation.

North of River Road, Bushkill Access provides public river access from which eagles are routinely seen (NPS 2010z). Bushkill Access is a large motorized and nonmotorized boat launch area north of the B-K Line crossing and is accessed from US 209. This is one of the park's most visited locations for river users, with 22% of river users indicating that they used this site (Blotkamp et al. 2010, 43). The B-K Line cannot be seen from this boat launch (DEA 2010a). However, after boaters launch and travel downstream, they would pass under the B-K Line en route to their destinations.

Picnicking is popular at DEWA; 36% of visitors picnicked as part of their trip (Madison and Machlis 1990). Most picnic areas are free of charge; however, some are located within fee areas (as noted). Picnic areas located near the existing B-K Line alignment are listed below.

- Millbrook Village, New Jersey
- Watergate Recreation Site, New Jersey (fee area)
- Van Campen Glen Picnic Site, New Jersey (NPS 2010q, 2010aa)

Watergate Recreation Site is a very large, manicured, grassy picnic area accessed from Old Mine Road. This area is mostly open and wide, with several small ponds and few trees. Some trees surround and delineate the perimeter of the site. The B-K Line is close and is clearly visible, abutting the southern end of the site. This transmission line can be seen from many vantage points, with picnic areas closer to the south more affected than others. The B-K Line ascends hills to the east and west; the eastern ascent can also be seen from the site. A cleared trail approaches the transmission line at the southern end of the site. The trail continues under the transmission line, the corridor of which is obvious to the east and west. Vegetation under the transmission line is about 3 to 7 feet high. The trail then enters deciduous/evergreen woods and leads to the Upper Glen parking area and trailhead. From the Upper Glen parking connector, the Van Campen Glen Trail continues to the Van Campen Glen Picnic Site (Lower Glen parking lot). As at the McDade Trail, canopy height along this trail is approximately 50 to 60 feet (DEA 2010a).

Van Campen Glen Trail connects Watergate Recreation Site at the north with Van Campen Glen Picnic Site to the south, a distance of about 2 miles. The trail is also accessible from the Upper Glen parking lot. The trail follows Van Campen Brook through a scenic glen shaded by shagbark hickories and hemlock trees, and passes a waterfall. Before reaching Watergate Recreation Site to the north, the trail passes directly beneath the B-K Line. The existing cleared corridor creates an abrupt visual change compared with the previously shaded hike (DEA 2011). The grassy-scrub vegetation within the corridor varies from 3 to 7 feet high.

The Hamilton Trail is accessed from two undeveloped and unmarked trailheads on Old Mine Road or from Millbrook Village via the Orchard Trail. The road/trail is a very smooth and flat double track through the woods. At about 0.25 mile, the intersection for the Pioneer Trail appears to the right. The Pioneer Trail makes a loop off Hamilton Ridge and is also crossed by the B-K Line. Continuing on the Hamilton Trail, the road passes two old residences and associated detritus. The B-K Line crosses the trail after approximately 1 mile. The ROW clearing for the transmission line creates a large opening. The transmission line corridor is visible downhill to the west and uphill to the east. Towers are only a few feet from the trail. Canopy height along this trail is approximately 50 to 60 feet (DEA 2010a).

After following the Hamilton Trail for approximately 1 mile, an unofficial trail leads to the river and the Hamilton river campsites. There is a large cornfield between the woods and the camp. These fields are farmed as part of the DEWA agricultural leasing program to help maintain open space and cultural landscapes. The campsite is large, with several trees. The transmission line is visible both from the campsite and from across the river. Twelve designated primitive campsites follow the bank divided by the transmission line, which crosses between campsites 97 (north of the ROW) and 98 (south of the ROW).

The Rivers Bend campground within the study area is available for groups of a minimum of five people and requires reservations. The yearly average use for this campground was 1,852 for 2007–2009, with the majority of visitors staying in June (NPS 2011f). This campground is a large, grassy area high above the river. The river can be seen from an overlook through the trees at the southern end of the campground that provides views of the Walpack Bend region and downstream. Canopy height in this location is approximately 50 to 60 feet. There are also six primitive river campsites, the Peters river campsites, on both sides of the river near Walpack Bend (NPS 2010z).

Visiting historic sites is a popular visitor activity at DEWA. A 2010 study of river users indicated that 13% experienced historic sites as part of their trip to DEWA (Blotkamp et al. 2010, 45). Several historic sites are open to visitors interested in experiencing local history. Millbrook Village, New Jersey, is a historic village with several historic structures in DEWA and the study area. Craft demonstrations and house tours are available on summer weekends. A series of historic activity days are also offered on topics such as “Victorian Holidays” and “Maple Sugaring” throughout the year. Hands-on History days are open to the general public. Several public events are also held throughout the year, including Millbrook Days in October. In 2010, seven special events were held during the year, during which interpretive staff and volunteers presented over 6,000 craft and skill demonstrations to more than 25,000 visitors. Approximately 8,000 visitors were drawn to the demonstrations, exhibits, games, and nineteenth century music presented by costumed volunteers from the Millbrook Village Society and park staff (NPS 2010ac). The B-K Line would be visible from Millbrook Village.

Visitors to DEWA from 2007 to 2009 made the following comments about their experience at Millbrook Village (NPS 2011e):

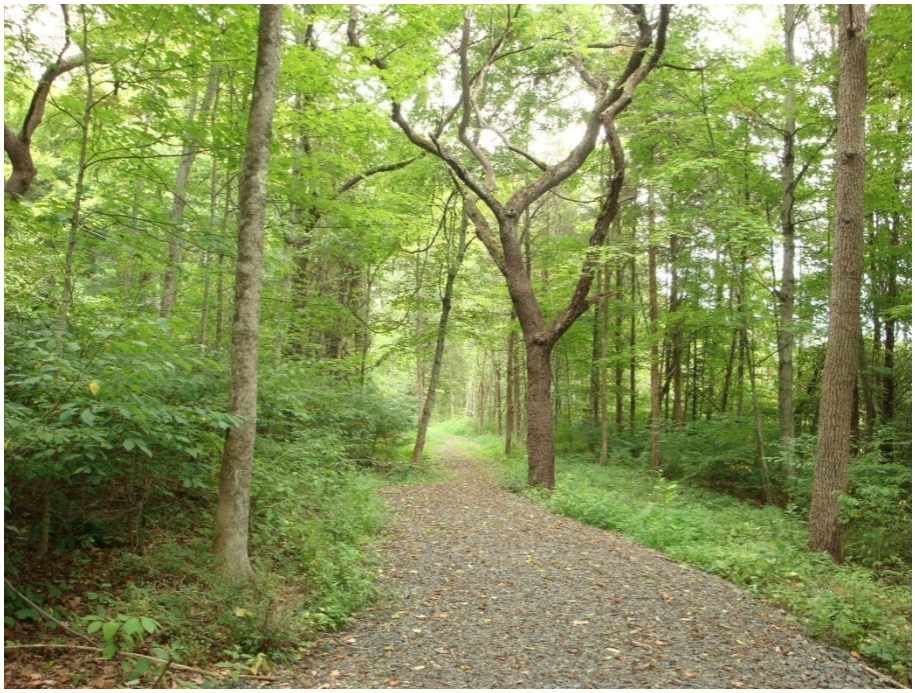
> We visited Millbrook Historical Town—a wonderful history lesson for my children.
>
> Millbrook Village is awesome!!!!
>
> Millbrook Village is a little piece of history that we were glad could be shared [with our] 10-year-old daughter who is interested in this time period.
>
> Millbrook Village is a living park important for generations of young people to enjoy and experience. Frankly, I was pleasantly surprised by the quality of Millbrook Village considering there was no entrance fee.
>
> Millbrook Village holds intrinsic historical value. We live close—visit often—always find something that holds priceless value to us and many others.
>
> Millbrook Village is the hidden gem. It needs better publicity.
>
> We enjoyed learning about the area from the historian of Millbrook.
>
> Excellent historical events.

The alignment for alternatives 1, 2, and 2b would cross APPA near the eastern boundary of DEWA west of Sand Pond in New Jersey. The trail passes beneath the B-K Line at the high point of the Kittatinny Ridge escarpment. The trail enters the cleared ROW and follows the corridor for 400 to 500 feet before reentering the woods. Hikers pass close by two large galvanized-steel lattice tower structures. The clearing creates views both east and west. Looking west, the view overlooks the Delaware River Valley, and the cleared corridor is clearly discernible for several miles.

More details about activities and recreational provisions at specific sites are provided in the *2010 Visitor Use Technical Report* (DEA 2010a).

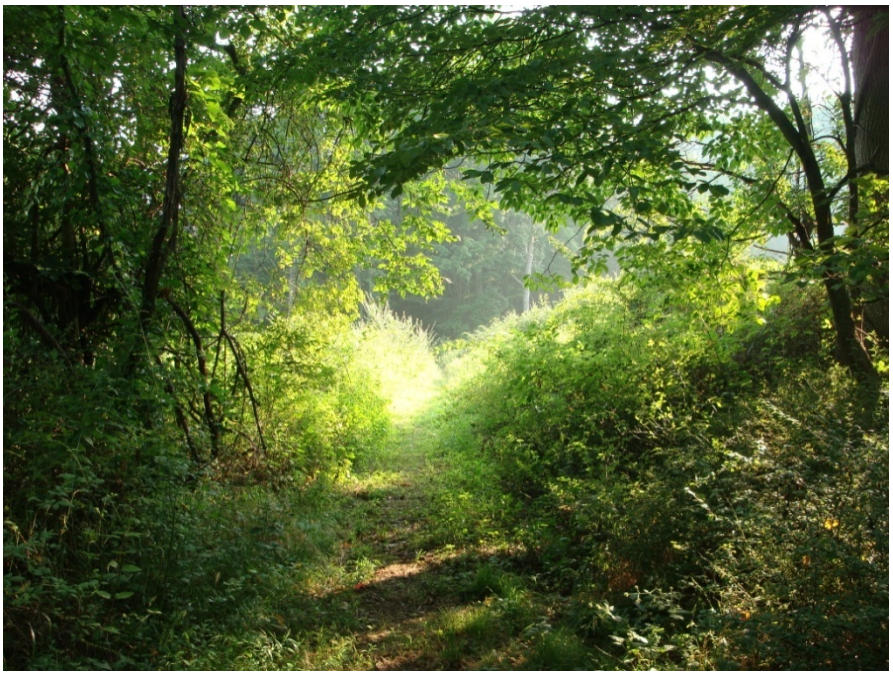
Alternatives 1, 2, and 2b Photographs

View of existing B-K Line corridor looking west from Old Mine Road.



B-K Line corridor where it presently crosses McDade Trail, looking east. The B-K Line is virtually invisible.

B-K Line corridor where it crosses Watergate Recreation Site, looking west.



B-K Line corridor where it crosses Hamilton Ridge Trail, looking north.

Looking north from Hamilton Campsite #98 at B-K Line corridor.

ALTERNATIVE 3

As mentioned previously, swimming is one of the most popular activities at DEWA, and 56% of river users engage in that recreational activity when they visit (Madison and Machlis 1990; Blotkamp et al. 2010, 44). Lifeguarded swimming is provided within the study area at Smithfield Beach, a large, open, grassy recreation area accessed from River Road. This is one of the most visited locations in DEWA, and 33% of river users indicated that they used this site (Blotkamp et al. 2010, 43). There is a small, grassy

swim beach in the center of the Smithfield Beach area, surrounded by picnic areas and a large, grassy expanse. Several picnic areas are close to the river (DEA 2010a). Picnicking was rated as the second most popular activity at DEWA; 35% of visitors engage in that recreational activity when they visit (Madison and Machlis 1990). Smithfield Beach is also identified by NPS as a good location from which to view wintering bald eagles from December through March. Views of the river and the opposite side are screened by tall vegetation. Canopy height in this area is approximately 50 to 60 feet. The existing transmission line that alternative 3 would follow is very close to this area. The existing transmission line and corridor can be seen across the river from the swim area and boat launch to the south (DEA 2010a).

Turtle Beach also provides lifeguarded swimming within the study area, and is accessed from Old Mine Road north of the existing alternative 3 transmission line. Visitors pass a large picnic area en route to the beach. Large deciduous trees to the south and west of the picnic area block views; the transmission line that alternative 3 would follow cannot be seen from here. The beach itself is farther south and is entirely grass (no sand). It is a large, open expanse. Another picnic area is located farther inland; many large trees to the south block views to that direction. The existing transmission line cannot be seen (DEA 2010a).

Formal launches for nonmotorized and motorized boats are available at Smithfield Beach. Poxono Access, New Jersey, is another formal boat launch (NPS 2010q; 2010aa). Poxono Access is a small boat launch area north of the alternative 3 crossing and is accessed from Old Mine Road. The transmission line that alternative 3 would follow cannot be seen from Poxono Access (DEA 2010a). However, boaters would pass under the existing transmission line as they continue their trip downstream.

Inside the study area, River Road, Old Mine Road, and McDade Trail, as described for alternatives 1, 2, and 2b, would also be affected under alternative 3. The alternative 3 transmission line would cross Old Mine Road within Worthington State Forest just south of the northern Rockcores Trailhead. The NPS road bicycle touring brochure lists Old Mine Road as a moderately hilly and scenic touring route for road bicycles, and describes a 20-mile route starting from the Douglas parking area at the north end of Worthington State Forest. The clearing created for the existing transmission line that alternative 3 would follow is obvious as drivers come through a shaded canopy of trees into a bright, open area. Canopy height in this area is approximately 50 to 60 feet. The wooden poles and towers are visible to the west, where the line descends gently to the river, crosses it, and ascends the hill on the other side. The corridor and three wooden transmission line poles are also visible at the top of a steep rise to the south, marking the sharp turn in the alignment to the northeast. The continuation of corridor cannot be seen after that point (DEA 2010a).

A trailhead for McDade Trail is located just north of the Hialeah Picnic Site, from which the trail is accessed, and the trail travels north. This section of the trail is mostly level, but with some steep climbs and descents. The trail takes a steep drop through a wooded area, approaching river level. The hill to the west and the vegetation block views all around. At the bottom of the hill, a spur trail leads to river camp #106. From the river's edge at camp #106, the existing transmission line that alternative 3 would follow can be seen where it crosses the river to the north. The corridor on the opposite side of the river is barely visible due to distance. The campsite itself is on higher ground and is mostly surrounded by vegetation (DEA 2010a).

About 1 mile north of the trailhead, the trail crosses the existing transmission line. Double-pole wood towers are close to the trail. Not much of the transmission line can be seen to the west due to a sharp topographic incline. However, the corridor opening is an obvious change in a mostly wooded area. Just north of the crossing, the trail turns sharply west and vegetation blocks views of the transmission line. Canopy height in this area is approximately 50 to 60 feet. Just north of the crossing, the trail opens to another cornfield to the west, and the existing transmission line that alternative 3 would follow can be seen when looking back to the south (DEA 2010a).

Picnic areas located near alternative 3 are listed below. Most picnic areas are free of charge; however, some are located within fee areas (as noted).

- Hialeah Picnic Site, Pennsylvania
- Smithfield Beach, Pennsylvania (fee area)
- Hidden Lake Recreation Site, Pennsylvania
- Turtle Beach, New Jersey (fee area) (NPS 2010q; 2010aa)

Hialeah Picnic Site is a large picnic area accessed from River Road that hugs the river's edge, although views of the river are screened by tall vegetation. This developed area is enclosed by tall deciduous and evergreen trees. The existing transmission line that alternative 3 would follow is about 1 mile northeast of this area but cannot be seen due to the distance and the dense vegetation (DEA 2010a). Canopy height in this area is approximately 50 to 60 feet.

Two local clubs fly their radio-controlled model aircraft in DEWA. Visitors are welcome to watch. Within the study area, the Roxbury Area Model Airplane Club uses the Hialeah Air Park in Pennsylvania on River Road just north of Smithfield Beach. The park is a large, open, grassy area close to River Road. The existing transmission line that alternative 3 would follow can be seen on the other side of the river to the south, but not on the west side of the river (DEA 2010a).

A popular rock-climbing area within the study area is Ricks Rocks, approximately 1 mile east of Millbrook Village (NPS 2010z). There is a small parking area on CR 602 near the alternative 3 transmission line, just within the eastern DEWA boundary. Rock steps signify a trailhead here but it is not marked. The trail is faint and extremely steep and rocky. The alternative 3 transmission line can barely be seen through the trees from this location due to distance and dense vegetation (DEA 2010a).

APPA crosses Camp Road just south of the Mohican Outdoor Center, which is a popular overnight location for trail users. The trail climbs gently to the northeast through deciduous woods and follows the ridgeline, where the trail is mostly level with some rocky sections. As the trail more closely approaches the eastern edge of the ridge, the existing transmission line that alternative 3 would follow, which parallels the trail, becomes visible below. The line can be seen for miles to the north and south. As vegetation begins to give way farther north, the transmission line that alternative 3 would follow becomes apparent below the trail and for long distances to the north and south. Very little vegetation blocks the views. Eventually the trail reaches an intersection with the Rattlesnake Swamp Trail. APPA then veers west, away from the exposed ridge rim, and vegetation blocks views of the transmission line (DEA 2010a). However, during leaf-off seasons, the transmission line may be visible from this area.

More details about activities and recreational provisions at specific sites are provided in the *2010 Visitor Use Technical Report* (DEA 2010a).

Alternative 3 Photographs

Looking east from Old Mine Road at transmission line corridor that alternative 3 would follow.

Looking west from Old Mine Road at alternative 3 transmission line corridor.

McDade Trail where alternative 3 transmission line corridor would cross the trail, looking south.

View to the southeast from Smithfield Beach of alternative 3 transmission line corridor.

View to the east from Smithfield Beach boat launch of alternative 3 transmission line corridor.

View to the southeast from Hialeah Air Park of alternative 3 transmission line corridor.

View to the southeast from APPA near Mohican Outdoor Center of alternative 3 transmission line corridor.

ALTERNATIVE 4

Inside the study area, those sites described for alternative 3 along the west side of the Delaware River would also apply to alternative 4. In addition, the following information describes more details about locations near the south end of DEWA where the alternative 4 alignment would cross the parks.

Scenic viewing and photography opportunities are available throughout both DEWA and APPA, particularly at the Delaware Water Gap itself. PA 611, south of I-80, provides scenic views of the Delaware Water Gap with three formal overlooks: Resort Point Overlook, Point of Gap Overlook, and Arrow Island Overlook. Kittatinny Point Visitor Center, in the Delaware Water Gap, also provides scenic views, as do many other nondesignated sections throughout the parks. In addition, eagle watching and photography is recommended at Kittatinny Point Visitor Center (NPS 2010z). Kittatinny Point also offers free picnicking sites and a motorized boat launch. The Kittatinny Point Visitor Center is one of the most commonly visited sites at DEWA and is one of the top three most widely used take-out points for river users (Blotkamp et al. 2010, 43, 48). None of the proposed alternatives would affect these overlooks or the visitor center.

The Red Dot (Tammany) Trail starts at the Dunnfield parking lot, which is accessed from westbound I-80 within the Delaware Water Gap. The trail climbs 1,250 feet in 1.5 miles and is steep and rocky. The trail is forested with deciduous trees, and no views can be seen until a small southeast-facing clearing about halfway to the top, from which Mount Minsi can be clearly seen approximately 1 mile to the south. Mount Minsi is a high point in the Delaware Water Gap, beyond which the alternative 4 transmission line would be located. The trail then becomes wooded again, with views obscured by vegetation. A small clearing appears near the summit, providing views to the south, partially blocked by foreground vegetation. At the 1,527-foot summit of Red Dot (Tammany) Trail, Mount Minsi (which is at a slightly lower elevation at 1,463 feet) can be seen again. Some foreground vegetation interferes with the views as well. These views would be more prominent during leaf-off conditions.

APPA climbs northeast from the trailhead parking at Dunnfield, just off westbound I-80 on the north side of the Delaware River. After about one-half mile, the Dunnfield Hollow Trail branches to the right, following a creek. APPA climbs about 4 miles and 300 feet northeast to Sunfish Pond. The Worthington State Forest map indicates that Sunfish Pond is at a high point of about 1,400 feet elevation AMSL (NJDEP 2010d).

APPA is also accessible from PA 611 across from Resort Point Overlook on the south side of the Delaware River. The trail roughly parallels I-80 for approximately 1 mile. The area is heavily wooded, following the contours of a hillside to the south. The trail veers away from the highway en route to a high overlook approximately 1 mile into the hike. From the overlook, hikers can see canoes and kayaks at the Kittatinny Point Visitor Center canoe launch. The trail turns sharply south en route to Mount Minsi. As hikers proceed farther south along the trail, they would cross the alternative 4 transmission line ROW near Totts Gap Road (DEA 2010a).

The Farview Trail originates in Worthington State Forest and is accessed from Old Mine Road. It heads east and eventually intersects APPA, as well as other trails that lead to Sunfish Pond. The trail is a gently climbing, wide, double track surrounded by deciduous vegetation. Noise from I-80 can be heard to about 1,200 yards (DEA 2010a).

The Karamac Trail is accessed from Old Mine Road just east of the point where I-80 bridges the Delaware River. The trail follows a segment of a former railroad line (NPS 2003d). The trail closely hugs the river, which is many feet below. Stone support piers in the river visible from the northern end of the trail are all that remain of the railroad's truss bridge. No existing transmission structures are visible (DEA 2011).

The Worthington State Forest campground is approximately 1.5 miles north of I-80 on Old Mine Road. The campground is heavily wooded to the south and east. The topography also rises to the east. The alternative 4 transmission line cannot be seen from the southernmost campsite in this campground (DEA 2010a).

Alternative 4 Photograph

View of Mount Minsi looking south from Red Dot (Tammany) Trail toward the alternative 4 alignment.

ALTERNATIVE 5

Inside the study area, the same area would be affected as described for alternative 4.

Outside the Study Area

Outside the study area, the S-R Line could cross any of the recreation sites shown in table 44. Specific areas in Pennsylvania include sections of Delaware State Forest lands in Pike County, as well as recreational areas and state game lands en route to Susquehanna. The line could also cross Varden State Park in Wayne County; Lackawanna State Forest and Lackawanna Valley State Heritage Region in Lackawanna and Luzerne counties; Delaware and Lehigh National Heritage Corridor in Luzerne County; and Hickory Run State Park, Delaware and Lehigh National Heritage Corridor, and Weiser State Forest in Carbon County. Potential routes to the south could cross Cherry Valley NWR.

Outside the study area in New Jersey, the S-R Line could traverse Smartswood, a very small state park, and Kittatinny State Park in Sussex County. The line could also cross Columbia Wildlife Management Area / Game Land and possibly Jenny Jump State Forest and Bear Creek Wildlife Area/Preserve in Warren County, as well as Allamuchy Natural Area in Warren County and Allamuchy State Park in both Warren and Morris counties. In Morris County, the line could cross game land areas, Berkshire Valley Wildlife Management Area / Game Land, and Troy Meadows, a small natural area near the Roseland Substation.

WILD AND SCENIC RIVERS

In November 1978, PL 95-625, section 705, section 3 (a) of the Wild and Scenic Rivers Act was amended, establishing MDSR. Title 16 USC § 1274 page 1592, (20) stipulates the following:

> DELAWARE, NEW YORK, PENNSYLVANIA, AND NEW JERSEY – The segment from the point where the river crosses the northern boundary of the Delaware Water Gap National Recreation Area to the point where the river crosses the southern boundary of such recreation area; to be administered by the Secretary of the Interior. For the purposes of carrying out this Act with respect to the river designated by this paragraph, there are authorized to be appropriated such sums as may be necessary. Action required to be taken under subsection (b) of this section with respect to such segment shall be taken within one year from the date of enactment of this paragraph, except that, with respect to such segment, in lieu of the boundaries provided for in such subsection (b), the boundaries shall be the banks of the river. Any visitor facilities established for the purposes of use and enjoyment of the river under the authority of the Act establishing the Delaware Water Gap National Recreation Area shall be compatible with the purposes of this Act and shall be located at the appropriate distances from the river.

The Classification Map of MDSR was published in the *Federal Register Notices* on January 17, 1980 (vol. 45 no. 12, 3397), and is also found in appendix A of the DEWA GMP (NPS 1987, 110). The northern 35 miles of the MDSR are designated a national scenic river of the national wild and scenic rivers system, and the remaining 5 miles within DEWA are designated a recreational river of the national wild and scenic rivers system (distances are approximate).

The Wild and Scenic Rivers Act defines scenic river areas as those rivers or sections of rivers that are free of impoundments, with shorelines or watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads.

Recreational river areas are defined in the Wild and Scenic Rivers Act as those rivers or sections of rivers that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past.

Section 10 (a) of the Wild and Scenic Rivers Act stipulates "…that each component of the national wild and scenic rivers system shall be administered in such manner as to protect and enhance the values which caused it to be included in (the wild and scenic rivers) system without …limiting other uses that do not substantially interfere with public use and enjoyment of these values. In such administration primary emphasis shall be give to protect (the area's) esthetic, scenic, historic, archaeological, and scientific features. Management plans…may establish varying degrees of intensity for (the area's) protection and development, based on the special attributes of the area." The Interagency Wild and Scenic Rivers Coordinating Council interprets Section 10(a) as a "nondegradation and enhancement policy for all designated river areas, regardless of classification;" therefore, each alternative will be reviewed for effects on the resource values that supported the establishment of MDSR.

A 1986 amendment to the Wild and Scenic Rivers Act requires the administrating agency of designated units to develop a comprehensive river management plan within 1 year of establishment. MDSR was created prior to this requirement, and therefore does not have its own specific comprehensive river management plan. Instead, the DEWA GMP provides management guidance for the resources of MDSR and DEWA. Although MDSR is an individual park unit, it is administered by DEWA. The DEWA GMP states, "Although the national recreation area and the scenic and recreational river have separate legislative origins, the land and water areas are considered as an integrated whole for the purposes of this document. Therefore, whenever the term national recreation area is used, the scenic and recreational river is also meant, unless otherwise noted" (NPS 1987, 3).

The statement in the GMP is consistent with section 10(c) of the Wild and Scenic Rivers Act, which stipulates "…that any component of the national wild and scenic rivers system that is administered by the Secretary of the Interior through the National Park Service shall become a part of the national park system, and any such component that is administered by the Secretary through the Fish and Wildlife Service shall become a part of the NWR system. The lands involved shall be subject to the provisions of this Act and the Acts under which the national park system or NWR system, as the case may be, is administered, and in case of conflict between the provisions of these Acts, the more restrictive provisions shall apply." The Interagency Wild and Scenic Rivers Coordinating Council interprets section 10(c) to mean that the NPS and USFWS are allowed to use their general statutory authorities to protect wild and scenic river values. Thus, the resource values, goals, and desired conditions identified in the DEWA GMP include the resource values that could potentially be affected by alternatives crossing MDSR. The resource values (more fully described under individual resource topics in this EIS) and descriptions relevant to MDSR (from Walpack Bend downstream to the southern boundary of MDSR) include the following.

Water Resources: The entire Delaware River segment within the national recreation area is free-flowing, without impoundments or areas of slack water, and the water quality is high enough to support aquatic life and allow for recreational use. The water quality is of such high value that the Delaware River Basin Commission adopted special protection water standards in 1992 to prevent measurable change in water quality except toward natural conditions. These antidegradation standards were adopted, in part, to protect the exceptional water quality that originally qualified the river for designation under the Wild and Scenic Rivers Act.

Scenery: The DEWA landscape consists of heavily wooded Pennsylvania and New Jersey uplands, forested areas in various stages of succession, and historic farm fields. Views from the river corridor include riparian forest, the forested slopes of the Hogback and Kittatinny ridges, the Delaware Water Gap,

and largely uninterrupted views of a free-flowing river. Occasional views of historic farm fields and roads are reminders of past land use. The scenery is a combination of the cultural landscapes, geologic features, and vegetation. Together these form the mosaic of color, form, and texture that has resulted from a blending of natural and cultural resources within the Delaware River Valley.

Recreation: The Delaware River continues to be the focus of recreational activities in DEWA, as identified in the GMP. Canoeing, inner tubing, rafting, and swimming dominate the river-based activities in warmer months. Eagle watching is a popular river-based activity in winter months. Fishing occurs throughout the year and limited waterfowl hunting occurs from fall through spring. Campsites along the river offer the only backcountry camping opportunities in DEWA.

Wildlife: The Delaware River provides habitat for a wide variety of local wildlife and a migratory corridor for fish and birds. The mostly ice-free conditions during the winter months provide foraging habitat for both wintering and resident bald eagles. The forested shorelines provide nesting habitat for bald eagles, which use the river for foraging. The adjacent Kittatinny Ridge is a migratory corridor for raptors, which likely use the river corridor for foraging. Migrating songbirds use the river valley for foraging and resting during migration and migrating waterfowl use the river for similar purposes. Some migratory songbirds such as cerulean warbler nest in the riparian corridor. Wading birds such as great blue heron and green heron are numerous along the river's shorelines during the summer months and both resident and migratory waterfowl use the river.

Vegetation: From the perspective of someone on the river the vegetation appears as mostly unbroken forest. Some open farmland is visible from the river corridor between Depew Island and Tocks Island. This section of river also contains three NPS river access points.

Section 12(a) of the Wild and Scenic Rivers Act stipulates the following:

> The Secretary of the Interior, the Secretary of Agriculture, and the head of any other Federal department or agency having jurisdiction over any lands which include, border upon, or are adjacent to, any river include within the National Wild and Scenic Rivers System or under consideration for such inclusion, in accordance with section 2(a)(ii), or 5(a), shall take such action respecting management policies, regulations, contracts, plans, affecting such lands, following the date of enactment of this sentence, as may be necessary to protect such rivers in accordance with the purposes of this Act. Such Secretary or other department or agency head shall, where appropriate, enter into written cooperative agreements with the appropriate State or local official for the planning, administration, and management of Federal lands which are within the boundaries of and rivers for which approval has been granted under section 2(a)(ii). Particular attention shall be given to scheduled timber harvesting, road construction, and similar activities which might be contrary to the purposes of the Act. The Interagency Wild and Scenic Rivers Coordinating Council interprets this section as being applicable to activities conducted by a federal department or agency that are within or proximate to a WSR designated under Sections 2(a)(ii) or 3(a).

Figures 62 and 63 show existing conditions of the river at the proposed crossings for alternatives 1, 2, 2b, and 3.

FIGURE 62: DELAWARE RIVER NEAR THE PROPOSED CROSSING FOR ALTERNATIVES 1, 2, AND 2b, LOOKING SOUTH

FIGURE 63: DELAWARE RIVER NEAR THE PROPOSED CROSSING FOR ALTERNATIVE 3, LOOKING EAST

PARK OPERATIONS

This section refers to the current management and operations of the parks to adequately protect and preserve vital park resources and provide for an effective visitor experience. Approximately 90 permanent staff members and 75 seasonal employees manage the 70,000 acres of DEWA park lands, including all of MDSR and portions of APPA (NPS 2010ac, 1). As of December 2010, the operations and maintenance of the parks includes the following programs: resource management and science division; interpretation, education, and partnership; visitor management and resource protection; maintenance; and management, as well as volunteers. APPA staff includes 9 full-time employees, which includes 2 park rangers, 1 natural resource specialist, 1 project manager, 1 GIS specialist, 1 management assistant, 1 deputy superintendent, 1 superintendent; and 1 environmental protection specialist; DEWA staffing is discussed in the following sections. Daily, the park staff provides the services necessary to support park activities, upkeep and maintenance, and safety within the parks, including trash and litter pickup, upkeep and general maintenance of public use facilities (comfort stations, picnic areas, campgrounds, swimming areas, bridges, other structures, and parking areas), law enforcement, routine patrols by NPS rangers, visitor information, interpretative programs, and research activities.

FUNDING SOURCES

The largest source of park funding is congressionally appropriated funds (includes base and nonbase funding). Appropriated base funds are a significant portion of the total funding, which cover most of the parks' operations. Appropriated nonbase funding is requested by the parks to satisfy specific needs and nonrecurring projects and varies each year. In the past, significant nonbase funding was provided for projects including storm damage repair, dam repair, and land acquisition. Park revenue is small due to factors such as multiple park entrances and challenges in achieving true cost recovery. The NPS would require that the applicant be responsible for costs associated with the NPS managing the permit under 16 USC § 3a, "Recovery of Costs Associated with Special Use Permits."

RESOURCE MANAGEMENT AND SCIENCE

The division of resource management and science includes cultural and natural resource staff responsible for identifying, protecting, and/or restoring the natural, cultural, and scenic resources of the parks. Currently, the natural resource staff includes four full-time employees and one seasonal employee. Cultural resource staff includes two full-time and two part-time employees. The total annual budget for the division is $1.17 million.

In general, resource management and science staff tasks include research, restoration efforts, species-specific management programs, archives/collection management, historic site protection, and information integration activities. The resource management and science staff spends most of its time safeguarding sensitive habitats and protecting historically significant sites in compliance with state and federal resource conservation laws. With the increases in visitation and resident population, the natural and cultural resource protection programs at the parks are facing greater demands, from monitoring endangered species to patrolling historic structures and archeological sites.

The cultural resource management staff is responsible for the management, preservation, and protection of the 458 archeological sites, four visitor exhibits, and 1.2 million collected artifacts in DEWA (NPS 2003a, 16). This includes activities in the program areas of American Indian affairs, anthropology, cultural landscapes, ethnography, historic structures, history, and museum management. Cultural resource staff members provide support to other divisions within the parks, coordinate with regional cultural resource programs, and create and maintain cultural resource databases. Currently, this program is

understaffed and lacks essential full-time personnel, including a museum curator and technicians; however, in 2010 staff members rehoused 90 boxes of archeological objects and over 2,000 historical objects. Staff members also cleaned over 2,000 historical objects to remove agents of deterioration and photographed over 600 museum objects to improve access to collections (NPS 2010ac, 25).

The natural resources program covers three primary work functions, which include resource stewardship, inventory and monitoring, and planning and compliance. Work elements range from water resource and endangered species management to monitoring vegetation and integrated pest management. Listed species in the parks include approximately 49 plant species, 9 fish species, 13 mammal species, 7 reptile species, and 10 amphibian species. The parks also contain about 150 natural and artificial lakes, 600 wetland areas, and several waterfalls that are managed by natural resource staff. Natural resource staff members are responsible for monitoring vegetation management related to the existing transmission line. It takes approximately three staff members 40 hours (1 week) each to review vegetation maintenance plans. In addition, it takes one natural resource staff member approximately 80 hours (2 weeks) to monitor the resultant actions. The natural resource staff continues to implement a long-term ecological monitoring plan where field crews have been monitoring vegetation, streamside birds, water quality, and aquatic macroinvertebrates in watersheds throughout the parks.

The GIS section of this division coordinates the GIS programs at DEWA and MDSR. The GIS unit is responsible for supporting and enhancing natural and cultural resource management, providing support to other divisions within the parks, coordinating with regional GIS programs and technical support units, and creating and maintaining spatial datasets, as well as purchasing and maintaining GIS-related software and hardware. In 2010, the GIS team completed over 200 maps and other products in support of the parks' missions, including a hazardous structures database, regional planning projects, river campsite and planning efforts, and land/property issues (NPS 2010ac, 20).

INTERPRETATION, EDUCATION, AND PARTNERSHIP

The division of interpretation, education, and partnership includes all park activities directly related to providing visitors with a safe and educational experience while at the parks. The staff manages partnership, volunteer, interpretive, educational, and visitor center programs for DEWA. This division is responsible for staffing the visitor centers, producing written products, presenting programs to a wide variety of audiences, and meeting with current and potential partners and volunteers to collaborate on various projects. Interpretive rangers typically split their time between operation of the visitor centers, formal interpretive programs, and informal roving interpretation. Currently, the total number of interpretation, education, and volunteer coordination staff members is 26. This includes 6 full-time employees, 1 part-time employee, and 19 seasonal employees. Staff numbers in this division have decreased and park rangers now spend approximately 80% of their time on the operation of the visitor centers. In the last fiscal year, the total annual budget was $535,170.

VISITOR MANAGEMENT AND RESOURCE PROTECTION

The visitor management and resource protection division includes law enforcement. Currently there are 17 full-time rangers and 2 seasonal rangers during the summer months. Law enforcement also includes 5 full-time dispatchers with 2 permanent intermittent employees. During the summer months, the staff would include 2 additional student hires. Law enforcement functions include highway, river, and trail patrol; search and rescue; emergency medical response; enforcement of boating, fishing, and hunting regulations; investigations; wildland firefighting; and general law enforcement. During the weekdays, an average of 4 law enforcement rangers patrol the parks. During the weekend, an average of 7 law enforcement rangers patrol the parks. Enforcement activities are conducted out of three primary ranger stations on the Pennsylvania side of DEWA, including the South Zone Office (Jackson House), North

Zone Office (Dingman's Schoolhouse), and the River District Office. DEWA law enforcement staff members are also responsible for covering APPA within DEWA and responding outside the park for emergencies and assisting with investigations when requested. In 2010, law enforcement managed seven park fires.

MAINTENANCE

Maintenance division staff members are responsible for all activities required to manage and operate the park's infrastructure on a daily basis. The DEWA infrastructure includes 575 buildings, 157 miles of roads, 176 miles of trails, 112 dams, 69 parking areas, 20 road bridges, and 14 boat and canoe launches. Currently there are 25 full-time employees and 17 seasonal employees. The total budget in 2010 was $3.04 million. The responsibilities and daily tasks associated with this division include maintenance, repair, and operation of park infrastructure, including buildings, utilities, roads, trails, campgrounds, and dams. The parks' infrastructure requires a range of operational activities from basic sanitation to snowblowing to water testing. Some other maintenance responsibilities include hazardous-tree removal, snow and ice control, vegetation clearing, maintenance of ground structures, trash collection, and dam inspection and maintenance. Maintenance staff members are critical for ensuring open, safe, sanitary facilities for park visitors and employees, as well as to protect the cultural and natural resources of the parks. Staff members are responsible for year-round cleaning and sanitation care of the 15 park administrative buildings and 5 comfort stations. From mid-April to mid-October, the seasonal operation is responsible for cleaning 11 park visitor use areas and 5 remote composting-toilet facilities. Staff members are also responsible for the daily pickup and removal of trash from grounds and trash receptacles throughout the parks. Staff members also manage the paved roads, unpaved roads, parking lots, boat launch ramps, and bridges within the parks. This division ensures that park roads are open and safe for travel. Trails at the parks receive little attention. Frontcountry trail operations include the inspection and assessment of boardwalks, sidewalks, treadway and other trail structures, sign installation, and the removal of trees that pose a safety hazard to visitors and employees. On average, maintenance staff members spend 25% of their time on maintaining or rehabilitating structures; 25% maintaining utilities and infrastructure (trails, roads, and parking lots); 10% on landscaping, repairing, and installing fences and gates; 20% on cleaning restrooms and collecting trash; and 20% on other tasks and responsibilities. Currently, the maintenance division has no responsibilities associated with the existing transmission line.

MANAGEMENT

Management and administration includes all parkwide management and administrative support activities. The total annual budget for the office of the superintendent (management division) is $1.68 million. This division includes the office of management and budget and the office of planning and design. Some of the positions include the management assistant, budget officer, budget technician, project managers, compliance managers, and the chief. Responsibilities include safety, lands, compliance, review and input for resource management, and oversight by the superintendent and the deputy. Responsibilities may also include all park communications and external affairs activities, park-level planning, human resource management, information technology, park leadership, and financial management.

VOLUNTEERS

In 2010, over 1,100 volunteers contributed 189,434 hours of service, at a value of nearly $4 million, to DEWA. APPA's volunteer service hours are the highest in the northeast region (6,128 volunteers contributed 213,913 hours of service), while DEWA's are the second highest. Every year, volunteers contribute immensely to the preservation of the parks' natural and cultural resources.

The range of volunteer opportunities at the parks is very broad. For interpretation and education, volunteers participate in living history programs at park sites, provide educational programs for visitors, serve as docents at park sites, give visitor information at the visitor centers, and provide park advocacy. Volunteers also spend many hours aiding the maintenance division. Volunteer maintenance tasks include trail maintenance, trail assessment, river cleanup, building and landscape maintenance, lawn mowing, painting, janitorial services, tree trimming, chainsawing, hazardous fuel reduction around park structures and fire roads, graffiti removal, and trash cleanup. For the visitor management and resource protection division, volunteers perform boundary inspections and marking, provide volunteer bicycle patrols, identify and remove unauthorized geocaches, provide hiking patrols, participate in high-angle rescue teams, monitor resources, and provide river safety patrols. Some volunteers help the resource management and science division by cataloging and preserving artifacts, assisting archeology staff, performing water testing, assisting in the removal of invasive plants, performing GIS-related functions, planting native plants at approved sites, restoring habitat, managing open space, and monitoring resources through bird counts and other resource surveys. Volunteers also help the management division with filing papers and other administrative/clerical work.

HUMAN HEALTH AND SAFETY

The health and safety of visitors, park staff, and volunteers are of paramount concern to the NPS. NPS *Management Policies 2006* summarizes the commitment of the NPS to providing appropriate, high-quality opportunities for visitors while striving to protect human life and providing for injury-free visits (NPS 2006a, 105). Director's Order 83, *Public Health*, outlines what the NPS will do to ensure compliance with prescribed public health policies, practices, and procedures. This order establishes NPS policy with respect to all public health activities within areas of NPS jurisdiction, regardless of whether those activities are carried out by NPS or other federal employees, or by other organizations, including the U.S. Public Health Service. Public health includes illnesses associated with drinking water, wastewater, food safety, animal vectors, animal reservoirs, hazardous wastes, indoor air pollution, institutional sanitation, radiation safety, medical wastes, solid wastes, air pollution, and other related areas of environmental health. The *Strategic Plan* for DEWA sets the following goal for public safety: visitors safely enjoy and are satisfied with the availability, accessibility, diversity, and quality of park facilities, services, and appropriate recreational opportunities (NPS n.d.a).

In 2010, the overall number of reported injuries was reduced; however, the parks did not meet their Government Performance and Results Act goal for employee injuries. Recordable incidents were attributed primarily to sprains/strains of the knee, ankle, back, and shoulder. The visitor management and resource protection staff includes 9 first responders, 15 emergency medical technicians, and 1 park medic. The park has met the visitor injury goal for the last 5 years. The majority of visitor injuries in 2010 (approximately 65%) were the result of motor vehicle accidents (NPS 2010ac, 12). In 2010, approximately 35% of other injuries to park visitors were attributed to recreational activities related to hiking, climbing, boating, hunting, and bicycling. Park efforts to minimize risks to both employee and visitor safety have been ongoing, with measures such as traffic studies; CPR [cardiopulmonary resuscitation], automated external defibrillator, and defensive driver training; and safety inspections of fuel tanks, fire extinguishers, and park housing. The parks also provide their staff with safety tips on various topics, including Lyme disease prevention; heat, stress, and cold injury prevention; driving and fatigue; electrical safety; and fire prevention (NPS 2010ac, 13).

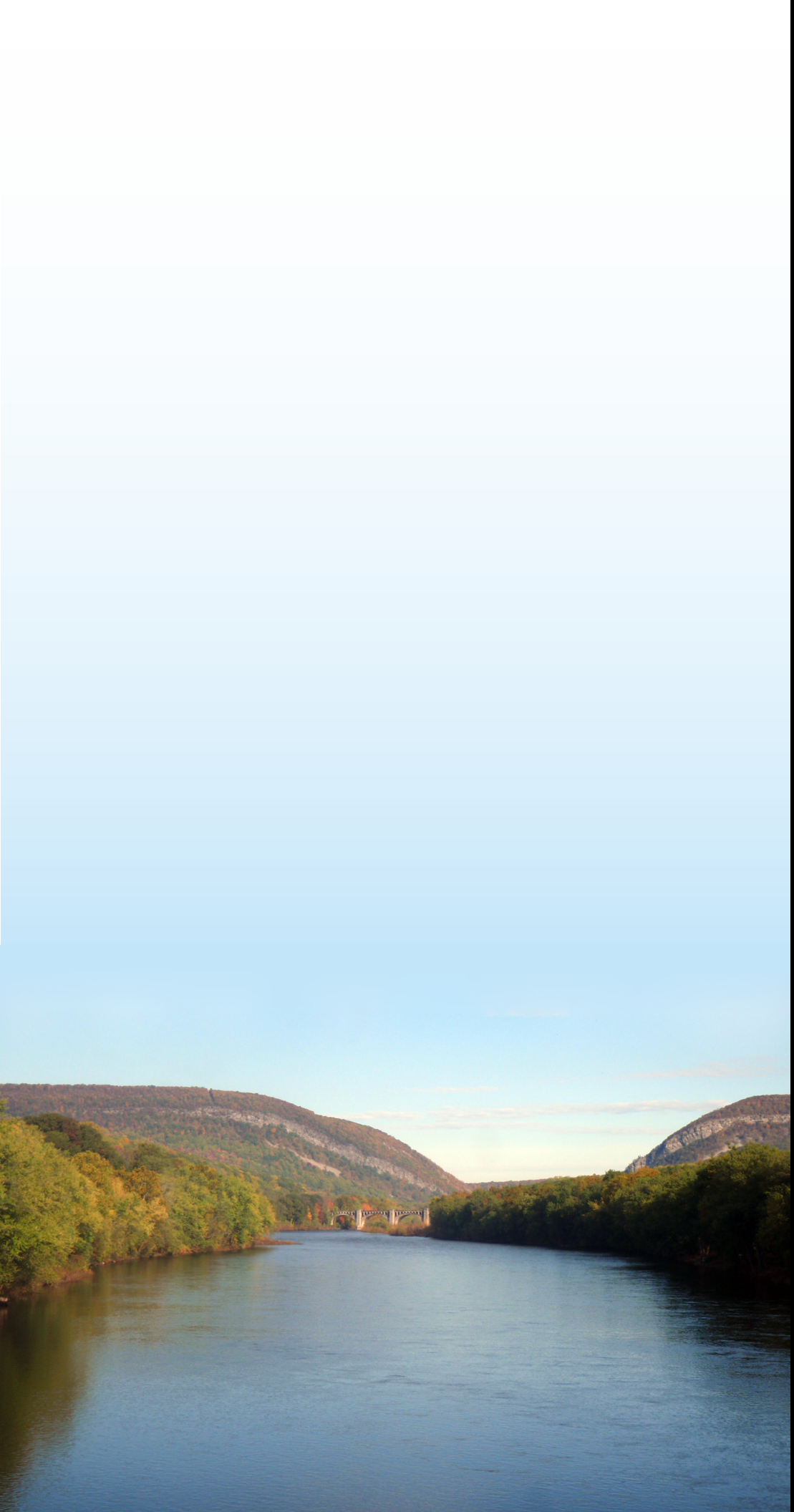
There have been no documented safety incidents concerning the B-K Line that runs through the parks.

ELECTROMAGNETIC FIELDS

Electromagnetic fields (EMFs) exposure related to transmission lines was identified during the public scoping process as a topic of concern; therefore, it is included in this EIS. EMFs occur both naturally and as a result of human activities. Natural EMFs are produced within the atmosphere in association with thunderstorms. Human-influenced EMFs occur as a result of household appliances, mobile phones, and transmission lines. EMFs are made of two components: electric fields and magnetic fields. Electric fields are created when a positive or negative electrical charge is present. These are present in homes where appliances are plugged in, even if they are switched off. Generally, electric fields are not of concern in the home or near transmission lines because these fields are weakened by trees, buildings, and human skin. Magnetic fields are those produced by current. Magnetic fields are typically of concern because they are not easily weakened by most material and pass through most materials. Both types of fields decrease in strength rapidly with increased distance from the source (WHO 2010, 1–2).

Research in this area has been ongoing for over two decades and the results are still inconclusive. Numerous panels of national and international expert scientists have convened to review data relevant to the question of whether exposure of power-frequency EMF is associated with adverse health effects. Many of the scientific panels have found that the scientific evidence suggesting health risks is weak. Despite more than two decades of research to determine whether elevated EMF exposure, principally to magnetic fields, is related to an increased risk of childhood leukemia, there is still no definitive answer. According to the USEPA (2006, 1), the general scientific consensus is that, thus far, the evidence available is "not sufficient to establish a definitive cause-effect relationship." For these reasons, EMF is not considered in this EIS as a National Environmental Policy Act (NEPA) issue.

A number of counties, states, and local governments have adopted or considered regulations or policies related to EMF exposure. In New Jersey, exposure limits for electric fields at the edge of a ROW have been established at 3 kV/m (UEI 2006, 49). New Jersey has no formal exposure limit for magnetic fields. No formal regulations or policies for EMF exposure have been adopted in Pennsylvania. The International Radiation Protection Association, in cooperation with the World Health Organization, has recommended guidelines for EMF exposure. The recommended limit of electric field exposure is 4.2 kV/m and 833 mG for magnetic fields (International Commission on Non-ionizing Radiation Protection 1998). Although these organizations have no governmental authority, most utilities and regulators consider these guidelines because they were developed by a broad range of scientists. Although the USEPA has conducted investigations into EMF related to power lines and health risks, no national standards have been established.



Chapter 4
Environmental Consequences

CHAPTER 4: ENVIRONMENTAL CONSEQUENCES

INTRODUCTION

This chapter describes the potential environmental consequences of implementing any of the alternatives being considered. It is organized by resource topic and provides a standardized comparison among alternatives based on topics discussed in chapter 1 and further described in chapter 3. In accordance with the Council on Environmental Quality (CEQ) regulations, direct, indirect, and cumulative impacts are described and significance of the impacts is assessed in terms of context, intensity, and duration (40 CFR § 1502.16). Mitigating measures for adverse impacts are also described. The analysis for each impact topic includes the methods used to assess the type of impact. As required by the CEQ regulations implementing National Environmental Policy Act (NEPA), a summary of the environmental consequences for each alternative is provided in table 4, which can be found at the end of chapter 2. Because this document addresses compliance with Section 106 of the National Historic Preservation Act of 1966 (NHPA), the analysis of cultural resources also contains an assessment of effect. Integration of the requirements of Section 106 of the NHPA into the NEPA process and documentation are accomplished by meeting the criteria set forth in 36 CFR § 800.8(c)(1)-(4). The information required by the criteria set forth at 36 CFR § 800.8(c)(1)(ii)-(v) is incorporated into the analysis in this chapter.

GENERAL METHODOLOGY FOR MEASURING IMPACTS BY RESOURCE

General Analysis Methods

The analysis of impacts follows CEQ guidelines and Director's Order 12 procedures (NPS 2011g). The analysis incorporates the best available scientific literature applicable to the region and setting, the species and areas being evaluated, and the actions being considered in the alternatives. For each resource topic addressed in this chapter, the applicable analysis methods are discussed, including assumptions.

Assumptions

Several guiding assumptions were made to provide context for this analysis. These assumptions are described below. Additional assumptions about construction and mitigation can be found in chapter 2 and "Appendix F: Mitigation Measures."

Analysis Period

Goals, objectives, and specific implementation actions needed to manage the parks are established for the next 15 years. All actions would be assessed for impacts up to 15 years, the period of analysis for this environmental impact statement (EIS); however, impacts that are deemed permanent would be defined as such, and are expected to last the duration of the transmission line's existence.

Geographic Area Evaluated for Impacts

The geographic study area for this EIS is defined in terms of visual split locations (VSLs). VSLs are the points outside the parks' boundaries beyond which the route chosen by the applicant could vary, as described in chapter 2 in the "Alternatives Development Process" section. The study area includes the areas inside the VSLs for each alternative (see figure 2 in chapter 2). The VSLs include portions of Delaware Water Gap National Recreation Area (DEWA), Middle Delaware National Scenic and

Recreational River (MDSR), and Appalachian National Scenic Trail (APPA) in Pennsylvania and New Jersey. Areas inside the VSLs are evaluated for direct impacts.

Outside the study area, only indirect impacts are evaluated, because the impacts related to constructing and operating the Susquehanna-to-Roseland (S-R Line) would not be caused by activities permitted by the National Park Service (NPS). This generally includes indirect impacts in the counties each alternative traverses, but may follow the specific alignment. But because the NPS cannot require the applicant to follow a certain route beyond the park boundary, the applicant would ultimately be responsible for the exact line routing from the Susquehanna Substation to the Roseland Substation. Specific impacts outside the study area generally cannot be determined because of the physical distance from NPS-authorized activities and the specific resources that would be affected by the transmission line outside the study area cannot be identified until the route is chosen by the applicant.

Study areas vary depending on the resource evaluated; therefore, the specific study area for each impact topic is defined at the beginning of each resource topic discussion.

Transmission Line Impacts

The following assumptions were factored into the impact analysis for the various transmission line alternatives.

- Construction staging locations would be located outside the study area. Therefore, no impacts would occur from staging areas inside the study area. Staging areas are only required during construction; therefore, impacts would be temporary. Staging areas would be located on existing developed or disturbed areas if possible, and if any undeveloped or undisturbed areas are used for staging areas they would be restored to original conditions following construction.
- Construction would include a double circuit line, which would be hung on the proposed new towers. Each circuit would be capable of carrying 500-kilovolt (kV).
- Pulling and splicing sites could be located inside or outside the study area and would require spur roads connecting to the associated tower inside the proposed right-of-way (ROW). These locations are considered temporary; therefore, most impacts would also be temporary. Impacts from tree clearing (loss of habitat) would be permanent. The pulling and splicing sites would be located on existing developed or disturbed areas, if possible. If undisturbed or undeveloped areas are used, restoration of these areas must commence after construction is completed. While complete recovery is not likely to occur, restoration efforts would be monitored to ensure that these areas recover to the greatest extent possible.
- Staging, tower, and pulling and splicing sites would be located to avoid wetlands and sensitive areas inside and outside the study area wherever possible. During planning, design engineers would work closely with park staff to avoid sensitive areas within park boundaries.
- New transmission towers would be permanent, resulting in impacts both inside and outside the study area.
- During construction, access roads would be 20 feet wide, located both inside and outside the study area, and composed of compacted dirt or gravel. Once construction is complete, the access roads would be narrowed to 15 feet wide. The wider width would be needed during construction to accommodate large construction vehicles. Access roads are considered permanent because they would be used for maintenance activities once construction is complete. Therefore, permanent impacts would occur from access roads inside and outside the study area.

- Spur roads (such as those for the pulling and splicing sites) would also be needed. These would be 20 feet wide and composed of compacted dirt or gravel. These roads are only needed during construction and would be restored to original conditions following construction.
- For alternatives 3 through 5, each ROW has an existing transmission line. The proposed alternatives would include existing facilities in addition to the proposed transmission towers and lines.
- Vegetation clearing for construction would comply with North American Electric Reliability Corporation (NERC) standards (NERC 2009).

Duration and Type of Impacts

The following definitions are used for all impact topics unless otherwise noted:

Beneficial: An impact that would result in a positive change to the resource when compared to the existing conditions.

Adverse: An impact that causes an unfavorable result to the resource when compared to the existing conditions.

Direct: Impacts that would occur as a result of the proposed action at the same time and place of implementation (40 CFR § 1508.8).

Indirect: Impacts that would occur as a result of the proposed action but later in time or farther in distance from the action (40 CFR § 1508.8).

Future Trends

Visitor use and demand are anticipated to follow trends similar to recent years. DEWA has generally received more than 5 million visitors per year in the last few years (NPS 2012c). In the absence of notable anticipated changes in facilities or access, this average visitation is expected to continue and be reflected across user groups.

Cumulative Impact Analysis Method

The CEQ regulations that implement NEPA require the assessment of cumulative impacts in the decision-making process for federal projects. Cumulative impacts are defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, or reasonably foreseeable future actions regardless of what agency (federal or nonfederal) or person undertakes such other actions" (40 CFR § 1508.7). As stated in the CEQ handbook, *Considering Cumulative Effects under the National Environmental Policy Act* (CEQ 1997), cumulative impacts need to be analyzed in terms of the specific resource, ecosystem, and human community being affected and should focus on impacts that are truly meaningful. Cumulative impacts are considered for all alternatives, including alternative 1, the no-action alternative.

Cumulative impacts were determined by combining the impacts of the proposed alternative being considered and other past, present, and reasonably foreseeable actions that would also result in beneficial or adverse impacts. If the impacts of the proposed alternative being considered are major, the relative contribution to the cumulative impact would be greater. Therefore, it was necessary to identify other ongoing or reasonably foreseeable projects and plans at DEWA, MDSR, and APPA as well as in the

surrounding area. A complete list of past, present, and reasonably foreseeable actions is included in appendix H. The list is organized by type of project (e.g., infrastructure, restoration).

Adverse impacts from climate change may contribute to the adverse impacts expected from the proposed S-R Line on the different resources. Climate change may interact with and amplify the stress to resources from the construction and maintenance activities associated with the S-R Line. In addition, physical and natural resources are currently under pressure from a number of other stressors, including habitat loss and degradation, development, pollution, toxic chemicals, invasive species, pests, disease outbreaks, habitat fragmentation, and wildfires, making them highly vulnerable to additional impacts such as those from climate change (NABCI 2010, 44). Even though climate change may contribute to the adverse impacts from the proposed S-R Line, this increase would not be expected to change the intensity of the impact that was found for the various S-R Line alternatives presented in this chapter.

Assessing Impacts Using CEQ Criteria

The impacts of the alternatives are assessed using the CEQ definition of "significantly" (1508.27), which requires consideration of both context and intensity:

(a) Context – This means that the significance of an action must be analyzed in several contexts such as society as a whole (human, national), the affected region, the affected interests, and the locality. Significance varies with the setting of the proposed action. For instance, in the case of a site-specific action, significance would usually depend upon the effects in the locale rather than in the world as a whole.

(b) Intensity – This refers to the severity of impact. Responsible officials must bear in mind that more than one agency may make decisions about partial aspects of a major action. The following should be considered in evaluating intensity:

(1) Impacts that may be both beneficial and adverse. A significant effect may exist even if the federal agency believes that on balance the effect would be beneficial.

(2) The degree to which the proposed action affects public health or safety.

(3) Unique characteristics of the geographic area such as proximity to historic or cultural resources, parklands, prime farmlands, wetland, wild and scenic rivers, or ecologically critical areas.

(4) The degree to which the effects on the quality of the human environment are likely to be highly controversial.

(5) The degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks.

(6) The degree to which the action may establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration.

(7) Whether the action is related to other actions with individually insignificant but cumulatively significant impacts. Significance exists if it is reasonable to anticipate a cumulatively significant impact on the environment. Significance cannot be avoided by terming an action temporary or by breaking it down into small component parts.

(8) The degree to which the action may adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places (National Register) or may cause loss or destruction of significant scientific, cultural, or historical resources.

(9) The degree to which the action may adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act of 1973.

(10) Whether the action threatens a violation of federal, state, or local law or requirements imposed for the protection of the environment.

For each resource topic analyzed, the potential significance of the impacts is assessed in the conclusion section that follows the discussion of the impacts for each alternative.

Context includes both overall context and resource-specific context. Overall context is presented here in the "General Methodology for Measuring Impacts by Resource" section because it is based on purpose and significance of the three national park units and applies across all resource topics. Resource-specific context is presented in the "Methodologies" section under each resource topic and applies across all alternatives.

Intensity of the impacts is discussed using the applicable factors from the list in (b) above. Intensity factors that do not apply to a given resource topic and/or alternative are not discussed.

Overall Context for Assessing the Impacts of the Alternatives

The project proposed by the applicant would cross three separate units of the national park system. Alternatives being analyzed would cross various combinations of those units and some cross the newly established Cherry Valley National Wildlife Refuge (NWR). There are no action alternatives possible that would not cross the APPA.

DEWA, established by Public Law 89-158 on September 1, 1965, created what is now the second largest unit (measured by acreage) in the Northeast Region of the NPS and normally the eighth most visited unit of the entire system with twice as many visitors as many of the most famous parks in the nation. Its location in the most populated area of the United States makes it a destination within an easy drive of at least 50 million people. Located on both sides of the Delaware River in New Jersey and Pennsylvania and barely outside of New York State, it became a designated national park for the three states in this tri-state area.

In addition to providing outstanding nature based recreational opportunities and to administering the unit in accordance with the NPS Organic Act of 1916 (Organic Act) and the General Authorities Act, the NPS is charged specifically with "preservation of the scenic, scientific and historic features contributing to public enjoyment of such lands and waters" (PL 89-158). DEWA is one of the most important archeological areas in this nation and is culturally significant to several tribes that are closely associated with the lands. The Tribes work closely with the NPS on numerous issues.

Also contained within the DEWA boundaries are the MDSR and the globally important Appalachian Trail. For the more than 5 million visitors who enjoy these resources annually the park is a remarkable place where national heritage and spiritual replenishment are enhanced by a myriad of recreational opportunities. The Delaware River is the longest undammed river in the Eastern United States and portions of the Upper Delaware, Middle Delaware, and Lower Delaware Rivers are designated as scenic and recreational rivers under the Wild and Scenic Rivers Act. Combined, over three quarters of the non-tidal Delaware River are included in the national wild and scenic rivers system. The Wild and Scenic Rivers Act calls for protection of rivers that "possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural and other similar values" (16 USC §§ 1271, 1526). The Delaware River includes all of these attributes.

Since the establishment of DEWA and MDSR, the entire ecosystem has mostly reverted to forest. The adjacent New Jersey State lands enhance the overall opportunities for a natural experience and create a large area of contiguous habitat that is one of the largest and most intact in the Northeast Region of the United States. In conjunction with the public lands in Pennsylvania that are still connected to DEWA through private undeveloped lands and therefore New Jersey State lands, the contiguous habitat is nearly a half a million acres of wildlife habitat and watershed. There are little or no intrusions on the hiking and river experience on the MDSR and in DEWA or along the Appalachian Trail within DEWA. The rare opportunity for such a solitary experience in the mostly developed metropolitan complex of the Northeast is the core experience the NPS is trying to preserve. Tens of thousands of hikers, birders, and other natural and cultural enthusiasts flock to DEWA weekly to enjoy the Appalachian Trail in what is one of the most pristine areas in Pennsylvania, New Jersey, or nearby states. Places like Sunfish Pond, Crater Lake, and Camp Mohican create a memorable experience for the day hiker and the through hiker alike. The 32-mile long McDade Trail shadows the river through the woods providing cyclists, photographers, and birders a unique place to enjoy nature without traveling across the country or crossing excessively difficult terrain. The very nature of the parks makes it possible for children, the elderly, and physically limited people to enjoy experiences often denied to them. Partners in historic and cultural preservation and environmental education service hundreds of thousands of visitors. Swim beaches along the river are well used and busy anytime weather allows. Canoeists, kayakers, and others crowd the river and shoreline throughout the warm seasons. Never is there a time, however, when one cannot find solitude and scenic wonder on one of the cliff trails, especially in the Pennsylvania portion of the park.

The parks are part of a cultural landscape. This area is a tapestry woven of natural and cultural resources. Together these parks and the natural features are inextricably interwoven with the history and culture of the Delaware River Valley. Remnants of early Americans, the Dutch, the colonists, and the French and Indian War are found even today extending out from Old Mine Road in New Jersey and the River Road in Pennsylvania. Some of the oldest extant buildings in the area are found in the park and many villages are kept alive through the work of partner organizations. Tens of thousands of people attend the one weekend event known as Millbrook Days. On a daily basis, the parks provide educational opportunities for school children in history and culture.

Visitors and citizens of the United States, on whose behalf national park units are managed, have expectations that parks in the national park system are representative of the pristine remnants of the national heritage of our great and vast nation. Whether they never visit the parks or frequent them on a daily basis, they expect those places to hold a special meaning and to be unimpaired for them and for the future generations. The Organic Act guarantees that expectation. The park created by a movement of citizens has virtually the same vision as the internationally unique Appalachian Trail.

A natural landscape from the mountain top in Pennsylvania to the mountain top in New Jersey, with the longest undammed river in the eastern United States at its center, is what visitors expect when they visit DEWA.

People expect to come to a pristine place, and perhaps hike along one of the most famous trails in the world; to view the magnificent vistas, wildlife, waterfalls; and to escape the mundane trappings of civilization for a few hours, days, or weeks. Hunters, fishermen, hikers, windshield tourists, swimmers, canoeists, boaters, and other tourists expect to find and explore what they do not find in their everyday environments. They expect what the Organic Act, the enabling legislation of all three units, the Redwood Act amendments, and General Authorities Act dictate.

GEOLOGIC RESOURCES (GEOLOGY, PALEONTOLOGY, AND RARE AND UNIQUE GEOLOGIC FEATURES)

In this section, impacts on geologic resources are evaluated. Included in the overall analysis is an evaluation of the alternatives as they relate to impacts on geology in general, as well as potential impacts on topography, rare and unique geologic features, and paleontological resources.

METHODOLOGIES

Potential impacts on geologic resources are assessed based on the continued ability of natural geologic processes to proceed unimpeded, changes in the topography of the area, and disturbance to rare and unique geologic features that contain karst, shale, and limestone. Karst and shale may contribute to unique geologic features including sinkholes, sinking streams, springs, and small caves, while limestone formations contribute to the presence of some rare and unique plant communities. For a description of rare and unique geology, please see the "Geologic Resources" section of chapter 3. Impacts on paleontology were assessed based on the potential loss of this resource. Primary steps for assessing impacts on geologic resources include identifying

- potential changes in geology from construction activities, including drilling and excavation for structures (towers), access roads, temporary staging areas, temporary splicing and pulling areas, and the ROW itself
- potential changes to the local topography that would occur beyond that which would result from natural erosion and deposition
- potential changes to unique geologic features containing limestone, shale, and karst during construction activities
- potential direct or indirect loss of paleontological resources

Resource-specific context for assessing impacts of the alternatives to geologic resources includes the following:

- the uniqueness of the geologic formations found in the parks, including the regionally significant valley-and-ridge formations and the renowned feature of the Delaware Water Gap
- the presence of unique limestone formations, which are the foundation of many rare and unique vegetation communities that, in turn, support several special-status species
- the characteristics of geologic resources such as the tendency of limestone to fracture which can have effects on other resources such as groundwater

Geologic resources were identified based on available information and confirmed during geologic surveys. The alternatives were evaluated based on their potential to impact geologic resources.

STUDY AREA

The study area for geologic resources includes the ROWs for each alternative and any area outside the ROWs where necessary pulling and splicing sites, staging areas, and access road development are proposed or would be expected. Because the location of the S-R Line outside the study area cannot be determined at this time, the indirect impacts on geologic resources cannot be evaluated per alternative.

The potential impacts outside the study area are generally addressed; however, further surveys by the applicant may be needed prior to construction of the S-R Line.

CUMULATIVE IMPACTS COMMON TO ALL ALTERNATIVES

Actions inside and outside the parks can affect the geologic resources of the parks, including geology, topography, rare and unique geologic features, and paleontology. Projects that cause disturbance of these resources would include activities such as excavation, grading, or construction below grade. Past, present, and reasonably foreseeable activities that would have beneficial or adverse impacts on geologic resources inside and outside the study area are listed below. These projects were taken from a list of potential cumulative projects developed for the S-R Line that can be found in appendix H. Cumulative impacts were then determined by combining the impacts of the alternative being considered with the impacts from the projects listed below. An overall cumulative impacts analysis was determined for each alternative and is presented at the end of the impacts analysis discussion for each alternative.

Projects Inside the Study Area

Inside the study area, cumulative projects that would result in adverse impacts on geologic resources include the following road and utility projects: the Pennsylvania Department of Transportation (PADOT) SR 2001 road project, the Tennessee Gas Line Proposal (addition to an existing gas pipeline), the Columbia Gas Transmission Company pipeline (replacement of an existing gas pipeline), and the Northeast Supply Link Expansion (Palmerton Loop gas pipeline). These projects would result in adverse impacts on geology from construction activities that would include the excavation of underlying geologic formations, the potential for fracturing, the grading of topography, and the potential disturbance of paleontological resources. The cumulative impacts on geologic resources inside the study area from these projects would be adverse. The cumulative impacts of these projects would depend on the extent of disturbance to geologic resources under these projects.

Projects Outside the Study Area

Outside the study area, cumulative projects that would result in adverse impacts on geologic resources include the following utility projects and wind projects: Marcellus shale natural gas drilling, the Tennessee Gas Line Proposal (addition to an existing gas pipeline), the Columbia Gas Transmission Company pipeline (replacement of an existing gas pipeline), the Dominion/Allegheny Power Transmission Line Project (reconfiguration of the existing line), Pennsylvania Fish and Boat Commission (PFBC) natural gas leasing and water access programs, Blue Mountain Ski Resort community-scale wind turbines, and wind turbines in northeastern Pennsylvania. Proposed residential and commercial developments in New Jersey and Pennsylvania would also cause adverse impacts on geology. Adverse impacts on geologic resources would result from construction activities including the excavation of underlying geologic formations, the potential for fracturing, the grading of topography, and the potential disturbance of paleontological resources. Several land protection programs could provide beneficial impacts on geologic resources. The beneficial effects of many of these programs are dependent on the availability of funding for specific projects, which is uncertain and could vary throughout the period of analysis: therefore, the level of benefit resulting from the implementation of any project is also variable. Although these projects could help conserve geologic resources, the beneficial impacts would not outweigh the adverse impacts from the above-mentioned projects. Cumulative impacts on geologic resources outside the study area would be adverse. The cumulative impacts of these projects would be dependent on the extent of disturbance to geologic resources under these projects.

IMPACTS OF THE ALTERNATIVES ON GEOLOGIC RESOURCES

Common to All Alternatives

Vegetation Maintenance: PPL and Public Service Electric and Gas Company (PSE&G), as separate utilities operating in different states, have separate vegetation management plans; however, vegetation management for both utilities would occur annually, at a minimum according to the new NERC standards. The details of vegetation management plans and techniques for clearing vegetation are explained in chapter 2. No impacts on geology or topography would be expected during maintenance activities because no excavation would be needed. Ground disturbance beyond the soil layer is unlikely. Vegetation maintenance would have adverse impacts on paleontological sites from an increase in accessibility and visibility following vegetation maintenance. Vegetation maintenance could result in increased collection or vandalism of resources; however, it is unlikely that this would result in a measurable change to the paleontological resources in the parks.

Mitigation Measures: Mitigation measures would be implemented to reduce impacts on geologic resources and are taken into consideration in the impact analysis. Mitigation measures are described in appendix F.

Outside the Study Area: Outside the study area, regardless of which action alternative is selected, the transmission line could pass through Carbon, Lackawanna, Luzerne, Monroe, Northampton, Pike, and Wayne counties in Pennsylvania and Morris, Sussex, and Warren counties in New Jersey. Geologic formations underlying each county are described in appendix G-3.

Construction activities relating to the transmission line outside the study area would be consistent with those activities inside the study area. The direct impacts from the construction of the transmission line outside the study area cannot be determined, as described in the introduction of this chapter. Once a route is determined, a thorough subsurface investigation would be required before initiating construction activities. These investigations should include local geologic mapping, geotechnical test boring, and possible geophysical surveys to establish subsurface conditions. Impacts on geology and topography would be adverse. There is a potential for the siting of towers and associated crane pads, which would require drilling and excavation to be located in areas with slopes greater than 10% and may include unstable surfaces. There would be no impact on geologic features under the no-action alternative because there would be no ground disturbance beyond the initial soil layer.

There would be no impact on geologic resources outside the study area under the no-action alternative because there would be no ground disturbance beyond the soil layer. Under all action alternatives, potential adverse impacts on geologic resources would be expected. Although the exact route for the transmission line has not been decided, it is likely that some towers would be sited in areas with steep slopes or in unstable, weathered areas. A thorough subsurface investigation would be required before initiating construction activities.

Cumulative projects outside the study area would result in adverse impacts on geologic resources as described previously in the “Cumulative Impacts Common to All Alternatives” section. When the adverse impacts on geologic resources as a result of activities outside the study area are combined with other past, present, and reasonably foreseeable projects in the study area, an overall adverse cumulative impact would be expected.

Alternative 1: No Action

Geologic formations along the existing line in the study area are described in chapter 3 and are depicted in figure 11 (in chapter 3). Of these formations, the Buttermilk Falls limestone through Esopus formation, undivided, and the Decker formation through Poxono Island formation, undivided, are considered rare or unique geologic features due to the presence of limestone and shale. The Ridgeley formation through Coeymans formation, undivided, is considered unique due to the presence of limestone. Vegetation would continue to be managed within the existing ROW and no measurable effects on the geologic resource would take place under alternative 1.

There are several paleontological sites near the existing line. Particularly fossil-rich geologic formations found along alternative 1 include the Martinsburg formation, the Bloomsburg formation, the Decker formation, the Coeymans formation, the Buttermilk Falls formation, and the Mahantango formation. Fossil resources associated with these formations in DEWA are described in chapter 3. Additionally, two recognized paleontological sites, which included specimens, are located partially or completely within the existing ROW. Both sites included several brachiopods. Specimens were from smaller individuals. It is possible that vegetation maintenance could increase access to and visibility of paleontological specimens, particularly at previously identified sites. This could result in increased collection or vandalism of resources; however, it is unlikely that this would result in a measurable change to the paleontological resources in the parks.

Overall, there would be no impact or adverse impacts on geologic resources under alternative 1. Because no excavation or grading would be required during the maintenance of the existing line, geologic formations and topography would not be affected. Adverse impacts could result at paleontological sites from an increase in accessibility and visibility following vegetation maintenance.

Cumulative Impacts

Cumulative impacts on geologic resources inside the study area from past, present, and reasonably foreseeable projects would be adverse, as described previously in the “Cumulative Impacts Common to All Alternatives” section. When adverse impacts on paleontological resources as a result of alternative 1 are combined with other projects in the study area, an overall adverse cumulative impact would be expected. Alternative 1 would not alter the level of impact.

Conclusion

Under the no-action alternative, no impacts on geology and topography would be expected inside the study area; however, adverse impacts would be expected from increased accessibility and visibility after vegetation maintenance.

Alternative 1 would cross rare and unique geologic formations and paleontological sites but would not result in any changes to geology, topography, or the unique geologic features. Alternative 1 may result in loss of paleontological resources if the additional vegetation clearing exposes more paleontological resources to collection or attracts the attention of collectors or vandals. However, this risk is considered to be low because it is likely to involve relatively few individuals at a level of collection that would not threaten to destroy the resource nor diminish the resource to a point at which it would no longer serve as a source of scientific information. Thus, although alternative 1 may have adverse impacts to paleontological resources, the adverse impacts would not likely be significant and would be consistent with the purpose and significance of the park units and NPS conservation policies.

Common to All Action Alternatives

Removal of Existing Structures: All action alternatives (2, 2b, 3, 4, and 5) include the removal of all or a portion of the Bushkill-to-Kittatinny Line (B-K Line) as described in chapter 2.

The removal of the existing transmission line would result in adverse impacts on geology. Some excavation would be required to remove the equipment associated with the transmission line, such as the counterpoise. Impacts would be minimized because the foundations of the towers would remain underground to reduce the amount of ground disturbance along the existing ROW.

Topography would also be adversely impacted by removal of the existing structures. Grading would occur to backfill over the foundations (which would be left in place) to create a natural cover; backfill would also be used to cover areas of disturbance caused by the removal of the towers, the counterpoise, and the ground wire. Although grading would occur, the change in topography would be slight and relatively undetectable.

Vegetation Clearing: The ROWs would be cleared of vegetation for the construction of the new double 500-kV transmission line for alternatives 2 through 5. Alternatives 2, 3, 4, and 5 include clearing up to 350 feet; the ROW would be extended up to 175 feet from either side of the centerline of the existing ROW. Under alternative 2b, the applicant proposes to operate the S-R Line within the existing ROW. The NPS anticipates that the applicant would require additional area for construction; therefore, it is estimated that under alternative 2b, the applicant would expand the ROW to the extent of their deeded property rights, which ranges from 100 feet to 380 feet. For alternative 2b, the ROW would be cleared on either side of the centerline to an appropriate width based on the deeded property rights. Clearing would be complete for all action alternatives, with the exception of the 50-foot buffer near intermittent streams/wetlands and the 100-foot buffer near perennial waterways such as the Delaware River (PPL and PSE&G 2008, 7). During the clearing of vegetation, no impacts on geology or topography would be expected because no excavation would be needed. Ground disturbance beyond the soil layer would not be expected. Vegetation clearing would have adverse impacts on paleontological sites, from an increase in accessibility and visibility following clearing, which would increase exposure of paleontological sites. This could result in increased collection or vandalism of resources; however, it is unlikely that this would result in a measurable change to the paleontological resources in the parks.

Following the construction of the transmission line, the vegetation along the proposed ROW would be maintained on an annual basis at minimum, according to the new NERC standards. No impacts on geology or topography would be expected during maintenance activities because no excavation would be needed. Ground disturbance beyond the soil layer is unlikely.

Construction Components: Construction activities are described in detail in chapter 2; the activities that would affect geologic resources include the construction of access roads, crane pads, tower foundations, wire pull locations, pulling and splicing sites, and staging areas. Access roads, wire pull locations, and pulling and splicing sites could impact paleontological resources, but geology and topography would not be altered. Staging areas would be located outside the study area on previously disturbed properties or abandoned parking lots. The construction staging areas would result in little to no ground disturbance and impacts would be undetectable. Construction of tower foundations and crane pads could result in adverse impacts to geology, topography, and paleontological resources due to construction and drilling activities and leveling areas of steep slope. This could have an adverse impact on geologic resources on steep slopes or areas of glacial till, which are more prone to landslides.

Alternative 2: Applicant's Proposed Route

The geologic formations that are considered rare and unique due to limestone and/or shale (the Buttermilk Falls limestone through Esopus formation, undivided, and the Decker formation through Poxono Island formation, undivided) and those considered rich in fossils (the Martinsburg formation, the Bloomsburg formation, the Decker formation, the Coeymans formation, the Buttermilk Falls formation, and the Mahantango formation) along alternative 2 would be the same as those described under alternative 1 and are described in detail in chapter 3. There are two recognized paleontological sites that include several brachiopod specimens located in the corridor of alternative 2, as described for alternative 1. The construction of new access roads would affect one of these sites.

The construction of transmission line components such as wire pulls and pulling and splicing sites would have adverse impacts on geology because ground disturbance would be expected. It is unlikely that the removal of material extending deeper than the soil layer would be needed; therefore, the underlying bedrock and geologic formations would remain unaltered by the construction of wire pulls, pulling and splicing sites, and access roads. There would be a low risk of ground disturbance associated with these activities, and disturbance of geologic formations that are considered rich in fossils is unlikely. The disturbance of the soil layer and the creation of access roads could result in increased access to and/or visibility of paleontological resources, which may result in increased collection or vandalism of resources. Access road construction would include grading activities, the addition of a gravel layer, and compaction.

During drilling and excavation for the construction of the tower foundations, it is important that excavation occur in competent bedrock and/or sound material. Geotechnical boring would determine the depth to the competent bedrock. Additionally, the planned placement of tower foundations in unstable, weathered material could result in unacceptable design criteria and the applicant would need to resite tower locations or to provide alternative foundation designs. The following formations located along the alternative 2 alignment are considered to have fair to poor stability where weathered or deeply weathered material occurs: Buttermilk Falls limestone, Ridgeley formation, and the Decker formation (appendix G-1). These three formations are located adjacent to the Delaware River in Pennsylvania (see figure 11 in chapter 3). Seven towers are proposed in these unstable areas (table 45). Geotechnical boring would be required to determine the appropriate depth to which to remove soils and weathered bedrock to reach sound material where the tower foundations would be installed.

TABLE 45: NUMBER OF TOWERS CONSTRUCTED IN RARE OR UNSTABLE FORMATIONS AND IN AREAS WITH SLOPES GREATER THAN 10%

Tower Location	Alternatives				
	2	2b	3	4	5
Rare or unique geologic features	7	7	11–15	0	0
Slope greater than 10%	12	12	25 or more	2	1
Unstable geologic formations	7	7	11–15	2	2

Several of the geologic formations crossed by alternative 2 are known for being rich in fossil resources. The discovery of highly sensitive paleontological sites has occurred in other areas near the parks in the same geologic formations as those found along alternative 2. Construction activities would occur in these same formations and could affect unknown paleontological resources. Drilling and excavation would also have impacts on a known paleontological site in the ROW for alternative 2. Additionally, increased soil erosion from ground disturbance associated with tower construction could result in increased access to and/or visibility of paleontological resources, which may result in increased collection or vandalism of resources.

The three unique geologic formations along the alternative 2 alignment belong to the Middle Devonian to Upper Silurian period and contain up to 1,500 feet of limestone, shale, siltstone, sandstone, and dolomite, with formations ranging from 3 to 180 feet in thickness (Epstein 2006, 3). The presence of limestone in an area creates unique habitat for both plants and wildlife. Limestone develops solution cavities that contain and yield groundwater for surface-water features such as streams and wetlands (PADCNR 2000, 2). Limestone creates potential construction problems (sinkhole and conduit development) due to the presence of solution cavities and bedrock irregularities (PADCNR 2000, 2). Sinkholes are subsidence features that are the result of water moving residual material and soil through subsurface pathways caused by the weathering process. The permeable nature of limestone also makes these formations natural conduits for conveying solid and liquid wastes, allowing contaminants to rapidly enter the groundwater system and travel underground (PADCNR 2000, 2).

Under alternative 2, seven towers would be constructed in rare or unique geologic features (table 45). The effects of drilling in limestone would create concern, especially the opportunity for ground vibrations to cause fracturing of the limestone. Fracturing of limestone from drilling could create additional solution cavities for surficial, or shallow, groundwater movement where none existed before construction. The required drilling has the potential to connect existing solution features in the limestone and possibly change the groundwater flow path. This, however, is considered unlikely since shallow drilling may not intercept the water table. The probability of boreholes intercepting solution features (which typically make up only 1% to 10% of the saturated rock mass, and usually closer to 1%) is extremely low, and a cross-connection over the short depth of the foundation drilling is unlikely to change the greater groundwater flow regime, especially since the boreholes will be filled by grouting. Groundwater withdrawal and diversion of surface water may cause aboveground and underground hydrologic systems to dry up (USGS 2001, 13). Drilling also creates the possibility of groundwater contamination.

Twelve of the proposed tower locations and associated crane pads are in areas with slopes ranging from 10% to 30% (table 45). Where slopes are greater than 10%, the areas would need to be leveled in order to provide a safe, level pad for large cranes to mobilize, set outriggers, and aid in the erection of transmission line towers. Additionally, leveled areas would be needed for the placement of the towers. Areas with higher slopes would require additional excavation of soil and bedrock because large cuts in the bench would be necessary for the level pads. Construction with large excavations and fill in mountainous areas creates the potential for landslides. Landslides occur primarily in areas with loose soil and debris on steep slopes. According to the USGS, glacial till is common throughout the area and landslides may be anticipated in areas where the bases of steep slopes are excavated (Epstein 2001). Following construction, excavated areas could not be restored to preconstruction conditions; therefore, the potential for landslides could exist because some slopes may be unstable. The remaining 14 towers and associated crane pads proposed under alternative 2 would be constructed in areas with a slope of less than 10%. Minor grading would be required in these areas for the placement of the crane pad. It is likely that excavation extending deeper than the soil layer would not be required.

After construction of the S-R Line, vegetation maintenance would occur annually, at minimum. Because no excavation or grading would be required during the maintenance of the existing line, geologic formations and topography would not be affected. Impacts on paleontological sites could result from an increase in accessibility and visibility following vegetation maintenance, potentially resulting in increased collection or vandalism of resources.

Overall, alternative 2 would result in adverse impacts on geology, topography, and paleontological resources.

Cumulative Impacts

Cumulative impacts on geologic resources inside the study area from past, present, and reasonably foreseeable projects would be adverse, as described previously in the "Cumulative Impacts Common to All Alternatives" section. When the adverse impacts on geologic resources as a result of alternative 2 are combined with other projects in the study area, an overall adverse cumulative impact would be expected. Alternative 2 would not alter the level of impact.

Conclusion

Alternative 2 would result in adverse impacts on geologic resources from the following: installation of towers in areas with a high slope, in unstable or weathered areas, and in rare or unique geologic features; the potential for nearby surface-water or groundwater features to be affected; changes to slope and grade; leveling areas with steep slopes that could not be restored; the potential for changes or disturbance of paleontological resources from drilling and excavation activities; and the installation of towers in fossil-rich geologic formations. The adverse impacts from alternative 2, combined with the adverse impacts from past, present, and reasonably foreseeable projects on geologic resources, would result in adverse cumulative impacts.

Alternative 2 would cross the same rare and unique geologic formations and paleontological sites as alternative 1. Under alternative 2, drilling required to install towers has the potential to damage these geologic formations. There is an unknown risk of landslides from construction of towers on steep slopes in areas of glacial till where post-construction slopes cannot be made stable. Alternative 2 would likely result in increased loss of paleontological resources compared to alternative 1 due increased damage and exposure of known and unknown sites by vegetation clearing and access road construction. The uncertainty of the nature and extent of these potential impacts increases when considered cumulatively with the impacts of other projects that involve excavation of underlying geologic formations, the potential for fracturing, and grading in steep slopes. And the loss or damage of paleontological resources inside the parks may be more important because these resources may not receive the same level of protection elsewhere, or may not be protected at all. Geologic formations and paleontological sites are non-renewable resources and once lost or damaged, cannot be replaced or made whole. Due to the high potential for adverse impacts to rare and unique geologic features and paleontological resources, especially those that involve unknown risks from building, drilling, and landslides relating to construction activities, alternative 2 could result in significant impacts on geologic resources. While the loss of geologic resources under alternative 2 would not specifically violate a law, regulation, or policy, in the context of the purpose of DEWA and MDSR to protect and preserve the resources of the river valley, of which the geology is an integral component, the adverse impacts to geologic resources under alternative 2 would not further the park's purpose and significance.

Alternative 2b

The geologic formations, rare or unique geologic features, topography, and paleontological resources found along the alternative 2b alignment would be the same as those in alternative 2; these resources are described in detail in chapter 3.

The installation of temporary transmission line components (wire pulls, pulling and splicing sites, and spur roads) and access roads would result in the same impacts on geologic resources as under alternative 2. The underlying bedrock and geologic formations would remain unaltered. The disturbance of geologic formations that are considered rich in fossils is unlikely.

Although alternative 2b would require more towers than alternative 2, the same number would be required in rare or unique features, in areas with slopes greater than 10%, and in unstable geologic formations. Drilling and excavation under this alternative could have greater impacts from the need for a greater number of towers, which require the crushing and removal of more rock. The effects of drilling during the construction of tower foundations and associated crane pads could also result in a decrease in groundwater availability and quality, which could alter wetland habitat, though this is unlikely because shallow drilling may not intercept the water table; an increased potential for landslides; an increased potential for changes to or disturbance of paleontological resources; and disturbance to areas that could not be restored to preconstruction conditions after excavation.

As stated under alternative 1, vegetation maintenance would not require excavation or grading and would not affect geologic formations or topography. Due to an increase in accessibility and visibility, the amount of collection or vandalism could increase following vegetation maintenance; however, it is unlikely that this would result in a measurable change to the paleontological resources in the parks.

Overall, impacts on geologic resources from construction activities under alternative 2b would be adverse.

Cumulative Impacts

Cumulative impacts on geologic resources inside the study area from past, present, and reasonably foreseeable projects would be adverse, as described previously in the "Cumulative Impacts Common to All Alternatives" section. When the adverse impacts on geologic resources as a result of alternative 2b are combined with other projects in the study area, an overall adverse cumulative impact would be expected. Alternative 2b would not alter the level of impact.

Conclusion

Alternative 2b would result in adverse impacts on geology. Alterations to geology from construction of towers and associated crane pads would occur in areas with a 10% to 30% slope and in areas that are weathered or unstable. Additionally, tower foundations would be constructed in rare geologic features containing limestone. Impacts on geology may include tower failure; landform destruction; creation of additional conduits for groundwater, which may potentially lead to a decrease in groundwater availability and quality; and alteration of wetland habitats. Impacts on topography would be expected because slopes greater than 10% would be leveled and graded for the installation of towers and associated crane pads. These areas could not be returned to preconstruction conditions. Paleontological sites could be changed or disturbed during construction activities. When the adverse impacts from alternative 2b are combined with the adverse impacts from past, present, and reasonably foreseeable projects, adverse cumulative impacts on geologic resources would be expected.

Alternative 2b would cross the same rare and unique geologic formations and paleontological resources as alternative 2 and would have the same adverse impacts and uncertainties. Therefore, alternative 2b could result in significant impacts due to the high potential for adverse impacts to rare and unique geologic features and paleontological resources, especially those impacts that involve unknown risks from building, drilling, and landslides relating to construction activities. With regard to geologic resources, alternative 2b would not further the purpose and significance of DEWA and the MDSR, of which the geology of the river valley is an integral component.

Common to Action Alternatives 3, 4, and 5

Restoration of the B-K Line: For alternatives 3, 4, and 5, the portion of the B-K Line between the Bushkill Substation and the eastern boundary of DEWA would be permanently removed and the ROW would be restored, as described in chapter 2. Impacts on geologic resources from the removal of the existing structures would be the same as those described under Common to All Action Alternatives. Restoration of the ROW would not have an impact on geologic resources.

Alternative 3

Inside the study area, the geologic formations including rare or unique geologic features and those considered rich in paleontological resources underlying the proposed alternative 3 ROW are the same as those described for alternative 2. Therefore, the construction of wire pulls, pulling and splicing sites, and access roads would have impacts on geology similar to those described for alternative 2. It is unlikely that the removal of material extending deeper than the soil layer would be needed; therefore, the underlying bedrock and formations would remain undisturbed by the construction of these S-R Line components.

Under alternative 3, approximately 11 to 15 tower foundations would be constructed in unstable formations (table 45). If these areas are not excavated to competent bedrock, drilling could fracture the rock, resulting in additional solution cavities for surficial groundwater movement where none existed before construction and a change or loss of surface-water features (USGS 2001, 4). The required drilling has the potential to connect existing solution features in the limestone and possibly change the groundwater flow path. This, however, is considered unlikely since shallow drilling may not intercept the water table. The same number of tower foundations would be installed in rare or unique geologic formations. Drilling and excavation would also have adverse impacts on paleontological resources, affecting unknown paleontological resources, as well as one known paleontological site in the ROW for alternative 3. Additionally, increased soil erosion from ground disturbance associated with tower construction could result in increased access to and/or visibility of paleontological resources, which may result in increased collection or vandalism of resources.

Most of the slopes along the alternative 3 corridor range from 10% to 30%; there are relatively few areas with a slope less than 10%. In addition, a few areas with a slope of 40% to 50% occur along the proposed transmission line route. More than 25 of the towers required for alternative 3 would be constructed in areas with a slope of greater than 10% (table 45). Excavation beyond the soil layer would be necessary to create level areas for these towers and associated crane pads. Impacts on geology and topography would be similar to those under alternative 2. Tower locations and associated crane pads must be located on level surfaces; therefore, additional excavation and grading would be needed in areas with slopes greater than 10%, which could result in unstable areas leading to landslides (PADCNR n.d., 1).

Vegetation maintenance would not affect geology, rare or unique geologic features, or topography; however, paleontological resources could be collected or vandalized due to increased visibility and ease of access after vegetation removal.

Overall, adverse impacts on geologic resources would result from the construction and maintenance of the S-R Line under alternative 3.

Cumulative Impacts

Cumulative impacts on geologic resources inside the study area from past, present, and reasonably foreseeable projects would be adverse, as described previously in the “Cumulative Impacts Common to All Alternatives” section. When the adverse impacts on geologic resources as a result of alternative 3 are

combined with other projects in the study area, an overall adverse cumulative impact would be expected. Alternative 3 would not alter the level of impact.

Conclusion

Alternative 3 would result in adverse impacts on geology due to the drilling and excavation activities associated with the installation of towers and associated crane pads. Impacts would occur because at least 25 towers and associated crane pads would be constructed in areas with slopes greater than 10% and because 11 to 15 towers would be sited in unstable areas. The same number of proposed towers would be constructed in rare or unique geologic features containing limestone. Impacts on geology may include tower failure, landform destruction, and creation of additional conduits; these impacts could lead to a decrease in groundwater availability and quality, and the alteration of wetland habitats. The installation of wire pulls, pulling and splicing sites, and access roads would not require excavation deeper than the soil layer. Overall impacts on paleontology from construction and clearing inside the study area would be due to direct damage, collection, or vandalism of paleontological sites. When the adverse impacts from alternative 3 are combined with the adverse impacts from past, present, and reasonably foreseeable projects, adverse cumulative impacts on geologic resources would be expected.

Alternative 3 would cross the same rare and unique geologic formations and paleontological resources as alternatives 1, 2, and 2b. The type of impacts that could occur are the same as described above for action alternatives 2 and 2b (i.e., fracturing in unexpected ways that affects groundwater movement, changing the flow of surface waters and wetlands, altering functions and changing habitat upon which rare and unique ecological communities depend, destabilization of underlying rock that increases risk of landslides, and loss or damage of rare geologic and paleontological resources). However, alternative 3 has much higher risk that these adverse impacts would occur or the adverse impacts would be more widespread because almost double the number of towers would be built in rare and unique geologic formations, in unstable formations, and on steep and very steep slopes that would likely remain unstable after construction. As previously noted, the uncertainty of impacts such as fracturing and landslides increases when considered cumulatively with the impacts of other projects that involve excavation of underlying geologic formations, the potential for fracturing, and grading in steep slopes. This is also true for cumulative impacts to paleontological resources and the loss or damage of paleontological resources inside the parks may be more important because these resources may not receive the same level of protection elsewhere, or may not be protected at all. Geologic formations and paleontological sites are non-renewable resources and once lost or damaged, cannot be replaced or made whole. Thus, alternative 3 is likely to result in significant impacts to the human environment with a much higher risk of such impacts occurring than the other action alternatives. With regard to geologic resources, alternative 3 would not further the purpose and significance of DEWA and the MDSR, of which the geology of the river valley is an integral component.

Alternative 4

The alternative 4 alignment contains three formations that are considered rich in fossils (the Martinsburg formation, the Bloomsburg formation, and the Mahantango formation), but no rare or unique geologic features. The number of rare or unique and fossil-rich geologic features are fewer than those underlying alternatives 1 through 3, but the types of impacts that would result from the construction and vegetation maintenance activities under alternative 4 would be similar to those previously described.

The construction of temporary transmission line features and access roads would not affect geologic formations because there would be a low risk of ground disturbance. However, disturbance of the soil layer and the creation of access roads could result in increased access to and/or visibility of paleontological resources, which may result in increased collection or vandalism of resources.

The majority of the towers (14) required for alternative 4 would be constructed in areas where the stability of the underlying geology is rated good. The basal portion of the Martinsburg formation contains limestone, which may contain solution openings. Drilling and excavation for two towers would occur in the Martinsburg formation (table 45). In DEWA, the thickness of the Martinsburg formation is approximately 12,000 feet and includes thick sequences of slate and greywacke (Epstein 2006, 3). If excavation and drilling occurs in limestone with solution openings, fracturing and changes to groundwater availability may occur; however, this is unlikely under this alternative because drilling and excavation would not extend deeper than 30 feet and would occur in slate and greywacke layers, and shallow drilling may not intercept the water table.

Increased soil erosion from ground disturbance associated with the construction of tower foundations could affect unknown paleontological resources and could result in increased access to and/or visibility of paleontological resources, which may result in increased collection or vandalism of resources.

The majority of the alternative 4 alignment is relatively flat with slopes of 0% to 10%. An increase in the slope (10% to 30%) occurs on the north and south side of APPA, which is located on Kittatinny Ridge. Of the 16 towers and associated crane pads proposed, two towers and associated crane pads would be installed in areas with slopes of greater than 10% (table 45). Additional excavation would occur to level and grade these areas for installation of the towers. Because few tower foundations would be constructed in areas with a slope of greater than 10%, the potential for landslides to occur would be low (PADCNR n.d., 1).

Similar to previous alternatives, vegetation maintenance would have a potential impact on paleontological resources due to collection and vandalism of sites; geology and topography would not be affected by vegetation maintenance.

Overall, adverse impacts on geologic resources would result under alternative 4.

Cumulative Impacts

Cumulative impacts on geologic resources inside the study area from past, present, and reasonably foreseeable projects would be adverse, as described previously in the “Cumulative Impacts Common to All Alternatives” section. When the adverse impacts on geologic resources as a result of alternative 4 are combined with other projects in the study area, an overall adverse cumulative impact would be expected. Alternative 4 would not alter the level of impact.

Conclusion

Alternative 4 would have adverse impacts on geology caused by the construction and installation of wire pulls, pulling and splicing sites, tower foundations and associated crane pads, and access roads. It is expected that approximately two towers would be sited in areas with a slope of greater than 10%; therefore, additional excavation to level the land would be necessary. The underlying formations for the tower locations are rated good for stability, and no towers would be constructed within rare or unique geology inside the study area. Impacts on paleontology from construction and clearing inside the study area would result from direct damage, collection, or vandalism of paleontological sites. When the adverse impacts from alternative 4 are combined with the adverse impacts from past, present, and reasonably foreseeable projects, adverse cumulative impacts on geologic resources would be expected.

Alternative 4 would cross three fossil-rich formations but no rare or unique geologic features, which is far fewer than alternatives 2, 2b, and 3. The adverse impacts of alternative 4 could be significant because of the loss of paleontological resources from construction activities; uncertainties associated with potential

impacts to undiscovered paleontological sites whose extent and importance is not known; and the inherent uncertainties of drilling and excavation in formations containing limestone and on steep slopes. However, the potential for significant impacts under alternative 4 is considerably less than that of alternatives 2, 2b, and 3 because alternative 4 would cross half as many fossil-rich formations, would require two towers located on steep slopes or areas with unstable geologic formations, and would not result any impacts to rare and unique geologic features. With regard to geologic resources, alternative 4 could result in significant impacts but with a low risk of occurrence such that alternative 4 may be considered to be in keeping with the purpose and significance of DEWA and the MDSR, of which the geology of the river valley is an integral component.

Alternative 5

The alignment for alternative 5 would follow the same route through DEWA and APPA as alternative 4, with the exception of the portion of the B-K Line from the Bushkill Substation to the western boundary of DEWA. Like alternative 4, alternative 5 would not cross any rare or unique geologic features. Alternative 5 would cross two of the three fossil-rich formations discussed for alternative 4: the Martinsburg formation and the Bloomsburg formation. Therefore, impacts for alternative 5 would be nearly identical to those described for alternative 4.

The construction of wire pulls, pulling and splicing sites, and access roads would not require excavation extending deeper than the soil layer; therefore, the underlying bedrock and formations would remain undisturbed. This construction would disturb the soil layer, which could result in increased access to and/or visibility of paleontological resources, potentially increasing collection or vandalism of resources.

For alternative 5, 8 of the 10 required towers would be in areas where the stability of the underlying geology is rated good. Drilling and excavation for two towers would occur in the Martinsburg formation (table 45). No substantial changes in topography or grade would result from the construction and installation of the new transmission line except for two areas on slopes leading to APPA. These areas would be leveled and would not return to preconstruction conditions. Only one tower and associated crane pad would be installed in areas with slopes of greater than 10%; the potential for landslides to occur would be low.

Adverse impacts on geologic resources would result from the construction and maintenance of the S-R Line under alternative 5.

Cumulative Impacts

Cumulative impacts on geologic resources inside the study area from past, present, and reasonably foreseeable projects would be adverse, as described previously in the “Cumulative Impacts Common to All Alternatives” section. When the adverse impacts on geologic resources as a result of alternative 5 are combined with other projects in the study area, an overall adverse cumulative impact would be expected. Alternative 5 would not alter the level of impact.

Conclusion

Under alternative 5, adverse impacts on geologic resources at DEWA and APPA would result mainly from drilling and excavation activities associated with the installation of tower foundations and associated crane pads. Under alternative 5, two tower foundations would be constructed in unstable geologic formations, and one would be constructed in an area with a slope greater than 10%. Impacts on paleontology from construction and clearing inside the study area would be due to direct damage, collection, or vandalism of paleontological sites. When the adverse impacts from alternative 5 are

combined with the impacts from past, present, and reasonably foreseeable projects, adverse cumulative impacts on geologic resources would be expected.

Alternative 5 would cross two fossil-rich formations, which is fewer than alternative 4, and no rare or unique geologic features, which is the same as alternative 4 and far fewer than alternatives 2, 2b, and 3. As with alternative 4, the adverse impacts of alternative 5 could be significant because of the loss of paleontological resources from construction activities; uncertainties associated with potential impacts to undiscovered paleontological sites whose extent and importance is not known; and the inherent uncertainties of drilling and excavation on steep slopes. However, the potential for significant impacts under alternative 5 is somewhat less than alternative 4 and considerably less than that of alternatives 2, 2b, and 3 because alternative 5 would cross only two fossil-rich formations, would require two towers located on steep slopes, and would not result in any impacts to rare and unique geologic features. With regard to geologic resources, alternative 5 could result in significant impacts but with a low risk of occurrence such that alternative 5 may be considered to be in keeping with the purpose and significance of DEWA and the MDSR, of which the geology of the river valley is an integral component.

FLOODPLAINS

METHODOLOGIES

The evaluation of impacts on floodplains was based on both a quantitative (acreage affected) and a qualitative assessment of how each proposed alternative would affect floodplain function. Primary steps for assessing impacts on the floodplain included identifying the floodplain in areas likely to be affected by the proposed alternatives. The Federal Emergency Management Agency normally maps floodplains, although not typically on federal land. The NPS provided Geographic Information System (GIS) data and floodplains maps to use for impacts analysis calculations in this document, which is the best available data for the Delaware River within DEWA.

Resource-specific context for assessing impacts to floodplains includes the following:

- Executive Order 11988 directs all federal agencies to avoid long- and short-term impacts associated with occupancy, modification, and development of floodplains when possible.
- NPS Director's Order 77-2 implements Executive Order 11988 and established NPS policy to preserve floodplain values and minimize potentially hazardous conditions associated with flooding.
- The floodplain within DEWA and MDSR lies along the entire length of the Delaware River and at the confluences of larger tributaries to the Delaware River and is relatively intact with little development or manipulation.
- Floodplain functions and values (store floodwaters, minimize erosion of adjacent soils, provide riparian habitat, etc.) are intrinsic to floodplains and cannot be easily duplicated or replaced.

STUDY AREA

The study area for floodplains includes the ROW for each alternative and any area outside the ROWs where necessary pulling and splicing sites, staging areas, and access road development are proposed or would be expected. Because the location of the S-R Line outside the study area cannot be determined at this time, general impacts outside the study area are also addressed, which includes the counties and surface waters with associated floodplains that the alternative alignments could traverse.

CUMULATIVE IMPACTS COMMON TO ALL ALTERNATIVES

Actions inside and outside the parks can affect floodplains. Impacts on floodplains arise from development in the floodplain and actions that inhibit the natural flow of rivers and streams. Past, present, and reasonably foreseeable project activities that would have beneficial or adverse impacts on floodplains inside and outside the study area are listed below. These projects were taken from a list of potential cumulative projects developed for the S-R Line that can be found in appendix H. Cumulative impacts were then determined by combining the impacts of the alternative being considered with the impacts from the projects listed below. This cumulative impact analysis was completed for each alternative and is presented at the end of the impact analysis discussion for each alternative.

Projects Inside the Study Area

The study area is almost entirely within DEWA, and there would be few large development projects because the area is generally protected as part of the national park system, and floodplain mitigation is required by the NPS on NPS lands or through NPS-funded projects. As development continues outside the parks, a relatively undeveloped natural floodplain within NPS boundaries will become more important for maintaining river function as well as important habitat for native wildlife and vegetation. Inside the study area, cumulative projects that would result in adverse impacts on floodplains include the PADOT SR 2001 road project (road reconstruction), which may affect flood elevations as a result of increased pavement and bridges. The Kittatinny Point Visitor Center storm recovery (a project that involved removal of a building in the floodplain and construction of a new building on piers above flood elevation) would result in adverse impacts on floodplains. Beneficial impacts on floodplains are expected from the rehabilitation and repair of road bridges throughout the parks that specifically include the repair of failing Watergate Dam #10 and the US Route 209 rehabilitation and replacement of Toms Creek Bridge. These projects include elements to reduce flooding and erosion problems. The majority of these projects would protect floodplain functions, so the beneficial impacts are expected to outweigh the adverse impacts from the above-mentioned projects. Additionally, there are several land protection programs that could protect floodplain functions and values. The beneficial effects of many of these programs are dependent on the availability of funding for specific projects, which is uncertain and could vary throughout the period of analysis: therefore, the level of benefit resulting from the implementation of any project is also variable. Cumulative impacts on floodplains inside the study area would be beneficial.

Projects Outside the Study Area

Outside the study area, adverse cumulative impacts on floodplains would be expected from residential, commercial, and transportation development of the area. Adverse cumulative impacts would result from these projects due to the continued growth and urbanization in the area outside the parks, which may reduce natural floodplain functions through direct impacts, such as the placement of structures in the floodplain, or indirect impacts, such as increased runoff due to increased impervious surfaces. Several land protection programs could provide beneficial impacts on floodplain functions. As stated above, the funding for these programs is uncertain and could vary throughout the period of analysis: therefore, the level of benefit resulting from the implementation of any project is also variable. There would be adverse cumulative impacts on floodplains outside the study area.

IMPACTS OF THE ALTERNATIVES ON FLOODPLAINS

Common to All Alternatives

Vegetation Management: Vegetation would be cleared or managed in floodplain areas for all alternatives. PPL and PSE&G have separate vegetation management plans because they are distinct utility

companies working in different states. The details of the applicant's vegetation management plans and clearing techniques are explained in chapter 2. The periodic maintenance of the transmission line, specifically the clearing of vegetation in the ROW in the floodplain, would adversely affect natural floodplain values (which include vegetation) that contribute to ecosystem quality (NPS 2002b). However, the periodic clearing of vegetation in the ROW in floodplain areas would not alter floodplain storage or obstruct floodwaters.

Mitigation Measures: Mitigation measures would reduce impacts from construction, operation, and maintenance activities for all action alternatives (as described in chapter 2 and appendix F). None of the mitigation measures would eliminate impacts on floodplains; however, measures would minimize the potential of flooding or adverse impacts on floodplains.

Outside the Study Area: Alternative 1 would require occasional removal of vegetation during maintenance activities, which could impact natural floodplain values. For all action alternatives (2, 2b, 3, 4, and 5), efforts would be made to avoid construction, clearing, and development in the floodplain outside the study area. However, if the construction of towers (and associated crane pads), access roads, and pulling and splicing sites in floodplains outside the study area cannot be avoided, adverse impacts on floodplain function would result. The Pennsylvania counties outside the study area, Carbon, Lackawanna, Luzerne, Monroe, Northampton, Pike, and Wayne, are rich with surface waters and associated floodplains. Within these counties, the S-R Line could cross major tributaries of the Delaware River basin, the Susquehanna River basin, and the Lehigh River. Some of these tributaries include Bushkill Creek, Cherry Creek, Lackawaxen River, and Marshall Creek in the Delaware River basin; Big Wapwallopen Creek, Lackawanna River, and the mainstem Susquehanna River in the Susquehanna River basin; and Jonas Creek, Pond Creek, and Stony Creek in the Lehigh River basin. Outside the study area in New Jersey, the route could cross the major tributaries of the Delaware River basin, the Passaic River basin, and the Raritan River basin. Some of these tributaries include the mainstem of the Delaware River, Paulins Kill, Pohatcong Creek, and Martins Creek in the Delaware River basin; Rockaway River, Delawanna Creek, and Whippany River in the Passaic River basin; and South Branch Raritan River and Lamington River in the Raritan River basin. The majority of these surface waters have associated floodplains and could be adversely impacted by the project outside of the study area. Although the exact route outside of the study area cannot be determined at this time, indirect adverse impacts on floodplains are unknown. When the indirect adverse impacts outside the study area are combined with the adverse impacts of other past, present, and future projects outside the study area, adverse cumulative impacts would result.

Alternative 1: No Action

Inside the study area, no widening of the ROW would occur as part of the no-action alternative. The existing line and ROW span approximately 700 feet of the floodplain of the Delaware River in DEWA (MDSR) and of Bushkill Creek in DEWA. Overhead transmission line crossings such as this have no impact on the floodplain. Two existing transmission line structures (approximately 30 feet by 30 feet) are in the floodplain. No new development or new structures would be placed in the floodplain under alternative 1. The periodic maintenance of the transmission line, specifically the clearing of vegetation in the ROW in the floodplain, would adversely affect natural floodplain values (which include vegetation) that contribute to ecosystem quality (NPS 2002b). However, the periodic clearing of vegetation in the ROW in floodplain areas would not alter floodplain storage or obstruct floodwaters and no new development would occur in the floodplain under alternative 1.

Cumulative Impacts

Cumulative impacts on floodplains inside the study area from past, present, and reasonably foreseeable projects would be beneficial, as described previously in the "Cumulative Impacts Common to All Alternatives" section. When the adverse impacts on floodplains as a result of alternative 1 are combined with the other projects in the study area, an overall beneficial cumulative impact would be expected. Alternative 1 would not alter the level of impact.

Conclusion

Adverse impacts on the floodplains of water bodies in the study area would result under alternative 1 from vegetation clearing and maintenance to the extent of the existing ROW corridor. Cumulative impacts inside the study area would be beneficial when combined with other past, present, and future projects.

Alternative 1 crosses the floodplains of Bushkill Creek and the Delaware River, which are unique in the Northeast for being relatively intact in an otherwise highly developed region. Under alternative 1, vegetation clearing would result in adverse impacts on some floodplain functions and values such as an increase in bank erosion and changes in habitat composition but would not likely impede or reduce overall functions and values of the floodplains nor would alternative 1 change the relatively intact condition of the floodplains. In the context of the laws and policies that govern protection of floodplains, the adverse impacts of alternative 1 are not likely to be significant because the impacts would be localized, could be effectively mitigated through required consultation and permitting processes, and the largely unimpeded functions and values of the floodplains would continue.

Common to All Action Alternatives

Removal of Existing Structures: All action alternatives (2, 2b, 3, 4, and 5) would involve the removal of the B-K Line from the Bushkill Substation to the eastern boundary of DEWA, as discussed in chapter 2. This would include removal of the B-K Line structures, but the foundations for these structures would remain in place. For alternatives 2 and 2b, the S-R Line would be constructed along the same alignment. The removal of the structures would require the construction of access roads (either permanent or temporary, depending on the alternative) along the B-K Line to allow access to and removal of the structures. The impacts of removing the structures are discussed under each alternative.

Vegetation Clearing: The ROWs would be cleared of vegetation for the construction of the new double 500-kV transmission line for alternatives 2 through 5, which could affect floodplains. Alternatives 2, 3, 4, and 5 include clearing up to 350 feet; the ROW would be extended up to 175 feet from either side of the centerline of the existing ROW. Under alternative 2b, the applicant proposes to operate the S-R Line within the existing ROW. The NPS anticipates that the applicant would require additional area for construction; therefore, it is estimated that under alternative 2b, the applicant would expand the ROW to the extent of their deeded property rights, which ranges from 100 feet to 380 feet. For alternative 2b, the ROW would be cleared on either side of the centerline to an appropriate width based on the deeded property rights. Clearing would be complete for all action alternatives, with the exception of the 50-foot buffer near intermittent streams/wetlands and the 100-foot buffer near perennial waterways such as the Delaware River (PPL and PSE&G 2008, 7). The impacts of vegetation clearing are discussed under each alternative below.

Construction Components: Construction activities are described in detail in chapter 2; the activities that would affect floodplains include the construction of access roads, tower foundations, crane pads, wire pull locations, pulling and splicing sites, and staging areas. All action alternatives would require drilling as

part of the construction process, but because drilling is unlikely to affect groundwater (see discussion in "Geologic Resources") it would not affect floodplains in the vicinity and is not discussed further. The impacts of construction components and acreages of floodplain impacts are discussed under each alternative below.

Alternative 2

Under alternative 2, vegetation clearing to prepare for construction could be nearly complete in the 350-foot corridor. Vegetation clearing would be avoided in sensitive areas such as riparian corridors along the Delaware River (PPL and PSE&G 2008, 7), which support floodplain vegetation. Specifically, vegetation would not be cleared in the floodplain in the 50-foot buffer near intermittent streams/wetlands or in the 100-foot buffer near perennial waterways such as the Delaware River (PPL and PSE&G 2008, 7). Even so, some vegetation beyond the buffer areas would be cleared in the floodplain and would affect natural floodplain values (which include vegetation) that contribute to ecosystem quality (NPS 2002b). A maximum of 14.3 acres of vegetation in the floodplain would potentially be maintained and could be removed if incompatible plant species exist.

The overhead transmission line for alternative 2 would cross approximately 700 feet of the floodplain of the Delaware River in DEWA (MDSR) and Bushkill Creek in DEWA. The overhead transmission line crossing would have no impact on the floodplain, but associated activities may adversely affect floodplains. An existing tower is partially located in the floodplain of Bushkill Creek and a second existing tower is partially located in the floodplain of Sand Hill Creek. The applicant would place two new, larger towers (including associated crane pads) in the same locations, over an area of approximately 0.002 acre. The construction of these support structures for the transmission line would not result in any increase in flood hazard either as a result of increased flood elevations or changes in flow carrying capacity of any of the streams being crossed by the overhead lines. However, portions of the access roads required for maintenance and construction purposes would be located in some floodplain areas. Access roads would affect 0.14 acre of the floodplain. Once the transmission line is operational, vegetation maintenance would be required in the new ROW, including floodplains as described for alternative 1. Overall, adverse impacts on floodplains would result from access roads, new crane pads, and vegetation clearing within floodplains. To minimize adverse impacts on natural and beneficial floodplain values, mitigation measures would be implemented as discussed previously, best management practices (BMPs) would be used during construction activities, and certain areas would be revegetated per the vegetation plans developed by the applicant and approved by the NPS to reduce erosion into streams, wetlands, and floodplains.

Cumulative Impacts

Cumulative impacts on floodplains inside the study area from other past, present, and reasonably foreseeable projects would be beneficial, as described previously in the "Cumulative Impacts Common to All Alternatives" section. When the adverse impacts on floodplains as a result of alternative 2 are combined with the other projects in the study area, an overall adverse cumulative impact would be expected. Alternative 2 would contribute an appreciable adverse impact to the overall cumulative impact level.

Conclusion

Alternative 2 would have adverse impacts on the floodplains of water bodies inside the study area as a result of the loss of approximately 0.14 acre of floodplains for construction of tower pads and access roads plus the loss of approximately 14 acres of floodplain vegetation that would be cleared and

permanently maintained along the ROW corridor. Cumulative impacts inside the study area would be adverse when combined with the impacts of alternative 2.

Alternative 2 would cross the floodplains of the Bushkill Creek, Sand Hill Creek, and the Delaware River, which, as noted above, are unique because they are relatively intact. Vegetation clearing and maintenance under alternative 2 would result in the loss of some floodplain functions and values by reducing the amount of floodplain habitat or changing the composition of floodplain habitat and increasing the potential for soil erosion. The loss of these functions and values would be greater than the no-action alternative because of the larger ROW corridor and more clearing but would not likely impede or reduce overall functions and values of the floodplains. Nor would alternative 2 change the relatively intact condition of the floodplains. Some of the adverse impacts would be mitigated through consultation and permitting processes. Alternative 2 would result in the permanent loss of floodplain area due to construction of towers and access roads in floodplains; however, this is unlikely to reduce the overall function and value of the floodplains for controlling flood waters because the area would be very small (less than two-tenths of an acre). In the context of the laws and policies that govern protection of floodplains, the adverse impacts of alternative 2 are not likely to be significant because the impacts would be localized, could be effectively mitigated through required consultation and permitting processes, and the largely unimpeded functions and values of the floodplains would continue.

Alternative 2b

Under alternative 2b, vegetation would be cleared in the corridor of the proposed ROW under alternative 2b, except in sensitive areas such as the riparian buffer along the Delaware River (PPL and PSE&G 2008, 9) and buffers as described for alternative 2. However, some vegetation beyond the buffer areas would be cleared in the floodplain, which would affect natural floodplain values (which include vegetation) that contribute to ecosystem quality (NPS 2002b). A maximum of 8.35 acres of vegetation in the floodplain would potentially be maintained and could be removed if incompatible plant species are present.

The overhead transmission line for alternative 2b would cross approximately 700 feet of the floodplain of the Delaware River in DEWA (MDSR) and the floodplain of Bushkill Creek in DEWA. Overhead transmission line crossings would have no impact on floodplains; however, structures, clearing, and access roads may adversely affect floodplains. An existing tower is partially located in the floodplain of Bushkill Creek and a second existing tower is partially located in the floodplain of Sand Hill Creek. Similar to alternative 2, the applicant would place two new, larger towers (including associated crane pads) in the same locations, over an area of approximately 0.002 acre. Additionally, the construction of access roads would affect approximately 0.14 acre of the floodplain under alternative 2b.

Floodplains would be adversely impacted as a result of construction of access roads, crane pads, and new tower foundations and vegetation clearing in floodplains under alternative 2b. To minimize adverse impacts on natural and beneficial floodplain values, BMPs would be used during construction activities as described for alternative 2.

Cumulative Impacts

Cumulative impacts on floodplains inside the study area from other past, present, and reasonably foreseeable projects would be beneficial, as described previously in the “Cumulative Impacts Common to All Alternatives” section. When the adverse impacts on floodplains as a result of alternative 2b are combined with the other projects in the study area, an overall adverse cumulative impact would be expected. Alternative 2b would contribute an appreciable adverse increment to the overall cumulative impact.

Conclusion

Alternative 2b would have adverse impacts on the floodplains of water bodies inside the study area as a result of the loss of 0.14 acre of floodplains for construction of tower pads and access roads plus the loss of approximately 8 acres of floodplain vegetation that would be cleared and permanently maintained along the ROW corridor. Cumulative impacts inside the study area would be adverse when combined with the impacts of alternative 2b.

As with alternative 2, alternative 2b crosses the floodplains of the Bushkill Creek, Sand Hill Creek, and the Delaware River, which, as noted previously, are unique because they are relatively intact. Vegetation clearing and maintenance under alternative 2b would be about half that of alternative 2 (more than 8 acres versus more than 14 acres) but would be greater than the no-action alternative, which would result in the loss of some floodplain functions and values by reducing the amount or changing the composition of floodplain habitat and increasing the potential for soil erosion. The loss of these functions and values would be greater than the no-action alternative because of the larger ROW corridor and more clearing but would not likely impede or reduce overall functions and values of the floodplains nor would alternative 2b change the relatively intact condition of the floodplains. Some of the adverse impacts would be mitigated through consultation and permitting processes. Alternative 2b would result in the permanent loss of floodplain area due to construction of towers and access roads in floodplains; however, this is unlikely to reduce the overall function and value of the floodplains for controlling flood waters because the area would be very small (less than two-tenths of an acre). In the context of the laws and policies that govern protection of floodplains, the adverse impacts of alternative 2b are not likely to be significant because the impacts would be localized, could be effectively mitigated through required consultation and permitting processes, and the largely unimpeded functions and values of the floodplains would continue.

Common to Action Alternatives 3 through 5

Restoration of the B-K Line: Under alternatives 3, 4, and 5, the portion of the B-K Line between the Bushkill Substation and the eastern boundary of DEWA would be permanently removed and the ROW would be restored, as described in chapter 2. Although the removal of this portion of the B-K Line would not be conducted in floodplain areas, floodplains would benefit from forest restoration (53 acres total), creating larger patches of contiguous habitat and reducing fragmentation in the core of the park. The ROW (approximately 53 acres within NPS boundaries) would be allowed to ultimately return to forested habitat over the long term. While natural communities would not return to mature conditions in the period of analysis of this EIS, the process would begin and would create a beneficial impact on floodplains.

Alternative 3

Construction and vegetation clearing would occur in floodplain zones under alternative 3. Vegetation would be cleared in the 350-foot corridor, except in sensitive areas such as riparian corridors along the Delaware River (PPL and PSE&G 2008, 9) as described for alternative 2. However, some vegetation would be cleared in the floodplain, which would affect natural floodplain values (which include vegetation) that contribute to ecosystem quality (NPS 2002b). A maximum of 7.93 acres of vegetation in the floodplain would be cleared if incompatible plant species are present. Overhead transmission line crossings would have no impact on the floodplain, but associated activities may adversely affect floodplains. Approximately 0.06 acre within the floodplain would be cleared and adversely affected by proposed access roads in the study area for alternative 3. For alternative 3, tower foundations, crane pads, and pulling and splicing sites are unknown at this time.

In addition to the paragraph above, alternative 3 would also include the removal and upgrade of the B-K Line from the Bushkill Substation to the western boundary of DEWA would adversely affect floodplains.

The applicant would place two tower foundations, and associated crane pads within floodplains, totaling approximately 0.002 acre. The construction of these support structures for the transmission line would not result in any increase in flood hazard either as a result of increased flood elevations or changes in flow carrying capacity of any of the streams being crossed by overhead lines. Portions of access roads required for maintenance and construction purposes would be located in floodplain areas. Specifically, alternative 3 would require the development of two access roads by Bushkill Creek to remove and upgrade the B-K Line; these access roads would impact 0.16 acre in the floodplain.

Overall, a total of 0.222 acre of the floodplain (0.06 acre + 0.16 acre + 0.002 acre) would be affected by permanent access roads and new tower foundations and (crane pads); vegetation would be cleared in the floodplain under alternative 3. These activities would adversely impact floodplains, but BMPs would be used during construction activities as described in appendix F to minimize impacts on natural and beneficial floodplain values.

Cumulative Impacts

Cumulative impacts on floodplains inside the study area from other past, present, and reasonably foreseeable projects would be beneficial, as described previously in the "Cumulative Impacts Common to All Alternatives" section. When the adverse impacts on floodplains as a result of alternative 3 are combined with the other projects in the study area, an overall adverse cumulative impact would be expected. Alternative 3 would contribute an appreciable adverse increment to the overall cumulative impact.

Conclusion

Alternative 3 would have adverse impacts on the floodplains of water bodies inside the study area as a result of the loss of approximately 0.2 acre of floodplains for construction of tower pads and access roads plus the loss of approximately 8 acres of floodplain vegetation that would be cleared and permanently maintained along the ROW corridor. Additional tower pads may need to be constructed in floodplains but these locations are not known at this time. Cumulative impacts inside the study area would be adverse when combined with the impacts of alternative 3.

Alternative 3 crosses the floodplains of the Bushkill Creek and the Delaware River, which, as noted previously, are unique in that they are relatively intact. Vegetation clearing and maintenance under alternative 3 would be greater than the no-action alternative and similar to alternative 2b, resulting in the loss of some floodplain functions and values by reducing the amount and/or changing the composition of floodplain habitat and increasing the potential for soil erosion. The loss of these functions and values would not likely impede or reduce overall functions and values of the floodplains nor would alternative 3 change the relatively intact condition of the floodplains. Some of the adverse impacts would be mitigated through consultation and permitting processes plus implementation of BMPs to minimize impacts during construction. Alternative 3 would also result in the permanent loss of floodplain area due to construction of two towers and possibly more, plus access roads; however, this is unlikely to reduce the overall function and value of the floodplains for controlling flood waters because the area of permanent encroachment for each pad is 0.0001 acre so that even with additional tower pads, the total area of floodplain permanently impacted would likely be small. In the context of the laws and policies that govern protection of floodplains, the adverse impacts of alternative 3 would not likely be significant because the impacts would be localized, could be effectively mitigated through required consultation and permitting processes, and the largely unimpeded functions and values of the floodplains would continue.

Alternative 4

Alternative 4 would adversely impact floodplains along the B-K Line from the Bushkill Substation to the western boundary of DEWA. The placement of the tower foundations, crane pads, and access roads would be the same as described for alternative 3, resulting in impacts to approximately 0.162 acre of floodplains.

Overall, approximately 0.162 acre of the floodplain (0.16 acre + 0.002 acre) would be affected by construction of access roads, tower foundations, and crane pads. To minimize adverse impacts on natural and beneficial floodplain values, BMPs would be used during construction activities as described in appendix F.

Cumulative Impacts

Cumulative impacts on floodplains inside the study area from other past, present, and reasonably foreseeable projects would be beneficial, as described previously in the "Cumulative Impacts Common to All Alternatives" section. When the adverse impacts on floodplains as a result of alternative 4 are combined with the other projects in the study area, an overall adverse cumulative impact would be expected. Alternative 4 would contribute an appreciable adverse increment to the overall cumulative impact.

Conclusion

Alternative 4 would adversely impact a very small area of floodplains (less than two-tenths of an acre) within the boundaries of DEWA from construction of tower pads and access roads but there would be no clearing or maintenance of vegetation along the ROW. Cumulative impacts inside the study area would be adverse when the impacts of alternative 4 are combined with other past, present, and future projects.

Alternative 4 crosses the floodplain of the Delaware River but has no effect on floodplain functions and values because there would be no clearing. Alternative 4 would result in permanent loss of a small area of floodplains (less than two-tenths of an acre) from construction of tower pads and access road to upgrade the existing B-K Line; however, this impact would likely cause little or no loss of floodplain functions and values because the area would be very small, localized, and adverse impacts would be minimized by consultation and permitting processes and application of BMPs during construction. Overall, alternative 4 would likely result in less adverse impacts on floodplains than the no-action alternative, and much less than alternatives 2, 2b, or 3, because there would be no vegetation clearing or maintenance in floodplains. In the context of the laws and policies that govern protection of floodplains, the adverse impacts of alternative 4 would not likely be significant because the impacts would be localized, could be effectively mitigated through required consultation and permitting processes, and the largely unimpeded functions and values of the floodplains would continue.

Alternative 5

No construction or vegetation clearing would occur in any floodplain zones within the boundaries of DEWA, APPA, or MDSR under alternative 5. Impacts from vegetation maintenance along alternative 5 would occur as described above in the "Common to All Alternatives" section. The B-K Line from the Bushkill Substation to the western boundary of DEWA would be maintained periodically as described for alternative 1, but would not be part of the S-R Line. Specifically, clearing vegetation in the ROW in the floodplain would adversely affect natural floodplain values (which include vegetation) that contribute to ecosystem quality (NPS 2002b). However, the periodic clearing of vegetation in the ROW would not alter floodplain storage or obstruct floodwaters, and there would be no development in the floodplain.

Cumulative Impacts

Cumulative impacts on floodplains inside the study area from other past, present, and reasonably foreseeable projects would be beneficial, as described previously in the "Cumulative Impacts Common to All Alternatives" section. When the adverse impacts on floodplains as a result of alternative 5 are combined with the other projects in the study area, an overall beneficial cumulative impact would be expected. Alternative 5 would not alter the level of impact.

Conclusion

Alternative 5 would have some adverse impacts on the floodplains of water bodies in the study area from vegetation maintenance, similar to current vegetation maintenance described under alternative 1. Cumulative impacts inside the study area would be beneficial when the impacts from alternative 5 are combined with other past, present, and future projects.

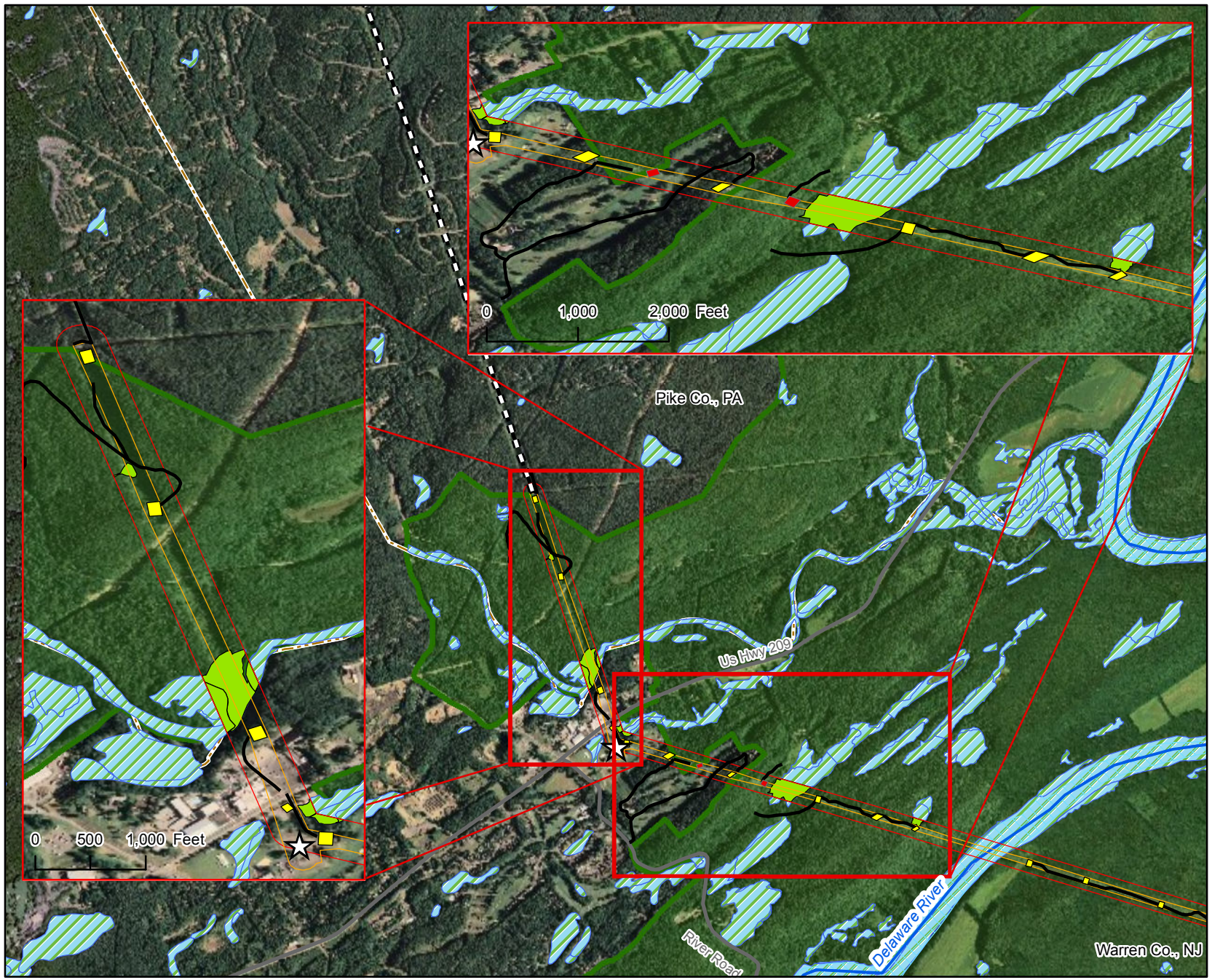
Overall, alternative 5 would likely result in adverse impacts to floodplains that are similar to that of the no-action alternative and much less than any of the other action alternatives because there would be no vegetation clearing or construction in floodplains. In the context of the laws and policies that govern protection of floodplains, the adverse impacts of alternative 5 would not likely be significant because the impacts would be localized and could be effectively mitigated through implementation of BMPs during maintenance, and the largely unimpeded functions and values of the floodplains would continue.

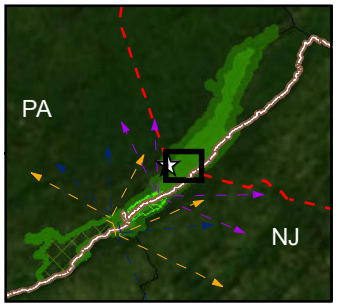
WETLANDS

METHODOLOGIES

The evaluation of impacts on wetlands was based on both a quantitative (acreage affected) and a qualitative assessment of how each proposed alternative would affect wetland functions. A detailed discussion of wetlands and descriptions of wetland types is included in chapter 3. Impacts were determined based on changes to wetland functions and values, including the ability of the wetland to support vegetation and wildlife. In addition, impacts were based on the quality of the existing wetland, including impacts on rare and unique wetland communities; changes to hydrology; impacts on water quality from runoff and sedimentation; stormwater impacts; changes to the abundance and diversity of wetland plant species and wildlife use; the size and type of wetland affected; the area of disturbance; and wetland connectivity to adjacent habitats.

All available information regarding wetland resources was reviewed, including previous reports and data, field surveys that were conducted along the alternative routes, and wetland resources mapped by the National Wetlands Inventory (NWI). The naming conventions used for wetlands correspond with either the names used to identify these wetlands in the Louis Berger report (2010a) or the names used previously by PSE&G (2009). Detailed wetland delineation methodologies are included in chapter 3. The impact analysis included a quantification of wetland habitat loss based on the Cowardin method (Cowardin et al. 1979) for impacts on wetlands and a determination of other potential direct and indirect effects. Maps of all wetland resources were overlaid with the alternative routes, and the area (acreage) of wetlands affected by each alternative was estimated and evaluated for the appropriate impact threshold (figures 64 through 69). In this section, permanent and direct impacts on wetlands are quantified by acre, whereas indirect impacts are described as part of the narrative. It should be noted that impacts include direct and indirect impacts on wetlands and wetland buffers (50 feet). Wetlands that are also considered rare and unique communities are analyzed under both resource topics.





Legend

- Substation
- Crane Pad for Proposed Tower*
- Crane Pad for Existing Tower Removal
- Outside Study Area
- Existing ROW in Study Area
- 350 ft Corridor
- Delaware River
- Proposed Access Road
- Road
- Delaware Water Gap National Recreation Area
- Wetlands within 350ft buffer
- Wetlands
- County Line

** Crane pads for proposed towers will also be used for the removal of existing towers, where applicable*

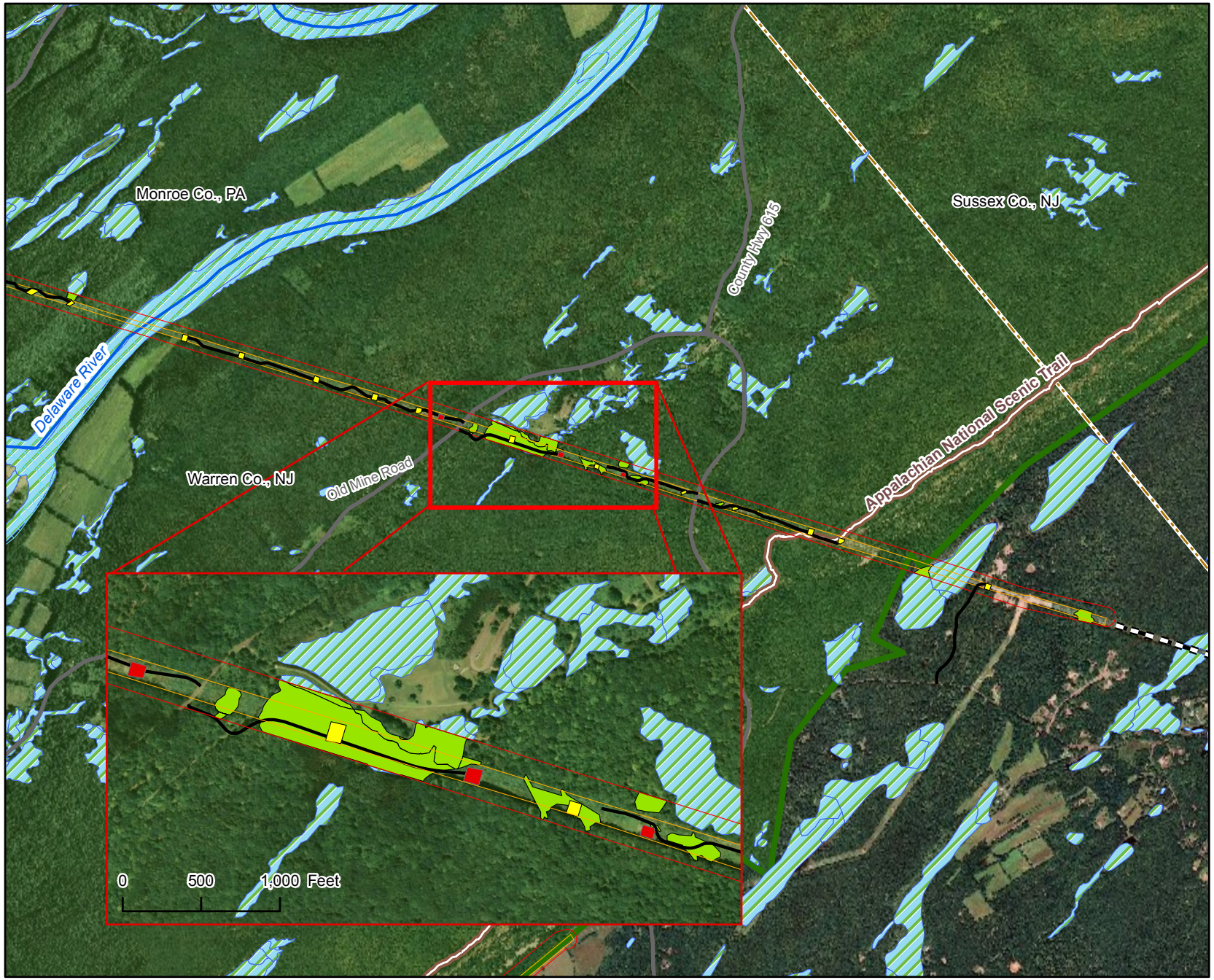
0 1,250 2,500 Feet

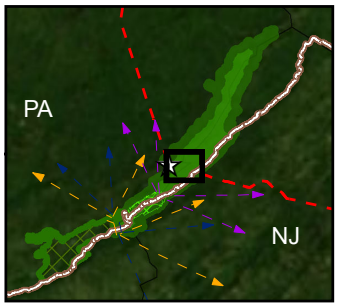
Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 64
Alternative 2 Wetlands in Pennsylvania

Source: ESRI Streetmap 2006, Penn State 2010, ESRI ArcGISonline Map Service 2010, PennDOT 2011, USGS 2006, NJ DEP 2008, NWI 1977

Projection: NAD 83 UTM Zone 18N
Date: July 2012





Legend

- Substation
- Crane Pad for Proposed Tower*
- Crane Pad for Existing Tower Removal
- Outside Study Area
- Existing ROW in Study Area
- 350 ft Corridor
- Appalachian National Scenic Trail
- Delaware River
- Proposed Access Road
- Road
- Delaware Water Gap National Recreation Area
- Wetlands within 350ft buffer
- Wetlands
- County Line

** Crane pads for proposed towers will also be used for the removal of existing towers, where applicable*

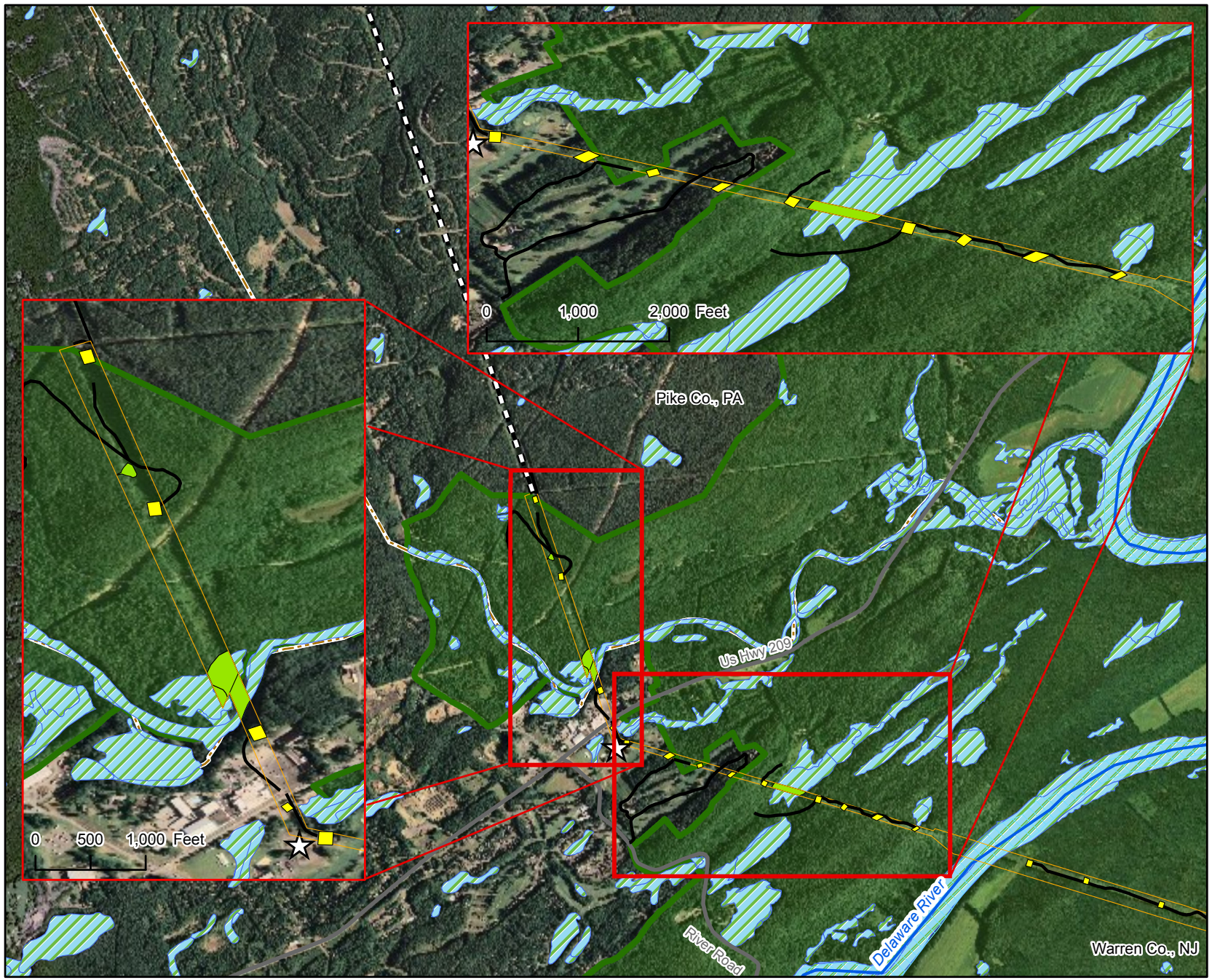
0 1,250 2,500
Feet

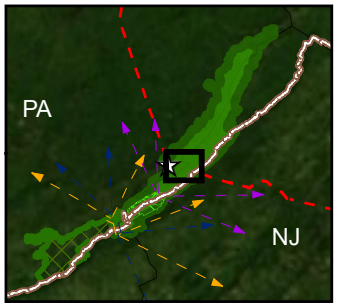
Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 65
Alternative 2 Wetlands in New Jersey

Source: ESRI Streetmap 2006, Penn State 2010, ESRI ArcGISonline Map Service 2010, PennDOT 2011, USGS 2006, NJ DEP 2008, NWI 1977

Projection: NAD 83 UTM Zone 18N
Date: July 2012





Legend

- Substation
- Crane Pad for Proposed Tower*
- Crane Pad for Existing Tower Removal
- Outside Study Area
- Alternative 2b Corridor
- Appalachian National Scenic Trail
- Delaware River
- Proposed Access Road
- Road
- Delaware Water Gap National Recreation Area
- Wetlands in Alternative 2b Corridor
- Wetlands
- County Line

** Crane pads for proposed towers will also be used for the removal of existing towers, where applicable*

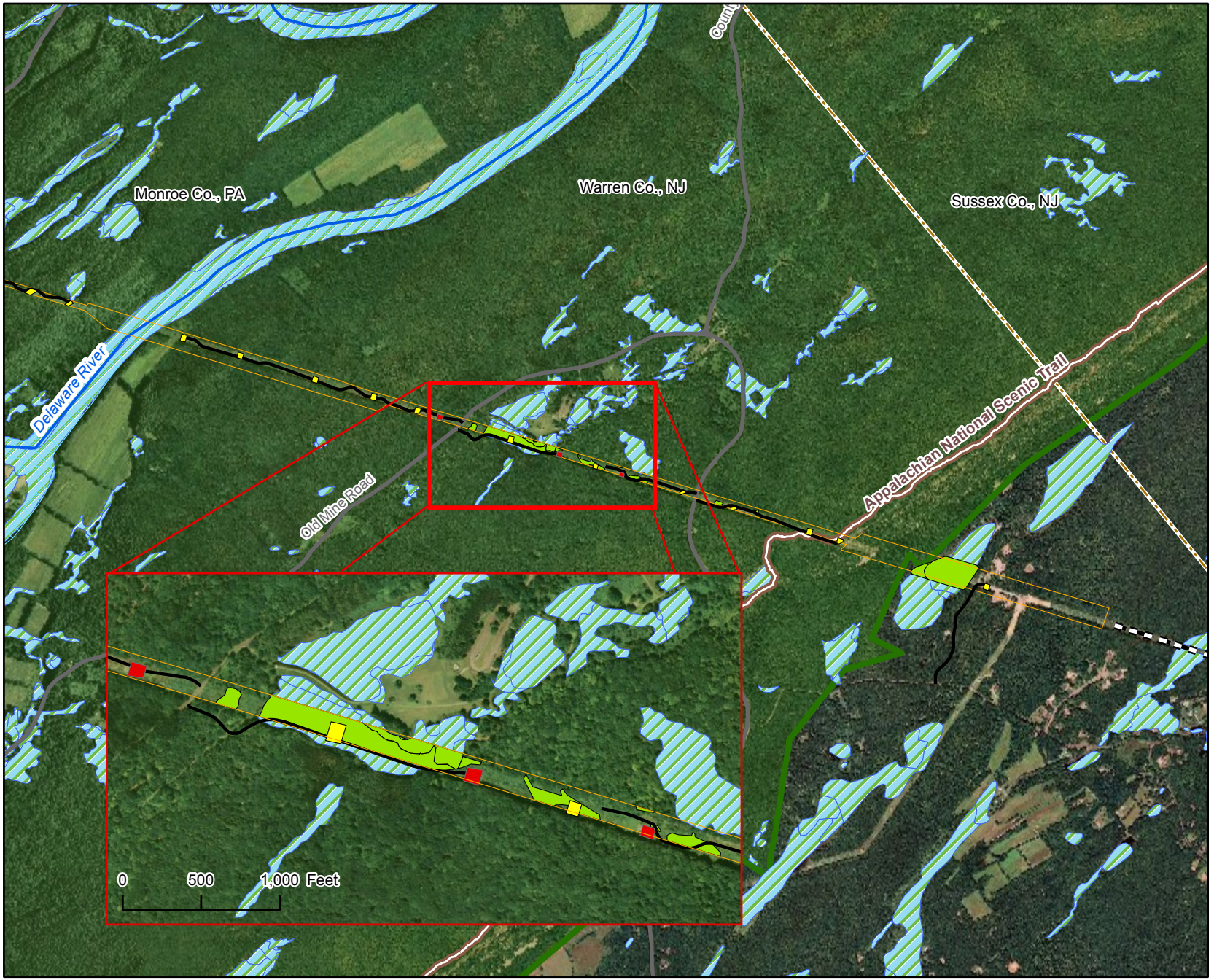
0 1,250 2,500
Feet

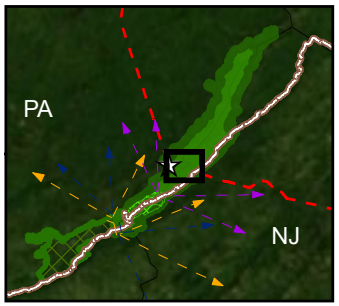
Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 66
Alternative 2b Wetlands in Pennsylvania

Source: ESRI Streetmap 2006, Penn State 2010, ESRI ArcGISonline Map Service 2010, PennDOT 2011, USGS 2006, NJ DEP 2008, NWI 1977

Projection: NAD 83 UTM Zone 18N
Date: July 2012





Legend

- Substation
- Crane Pad for Proposed Tower*
- Crane Pad for Existing Tower Removal
- Outside Study Area
- Alternative 2b Corridor
- Appalachian National Scenic Trail
- Delaware River
- Proposed Access Road
- Road
- Delaware Water Gap National Recreation Area
- Wetlands in Alternative 2b Corridor
- Wetlands
- County Line

** Crane pads for proposed towers will also be used for the removal of existing towers, where applicable*

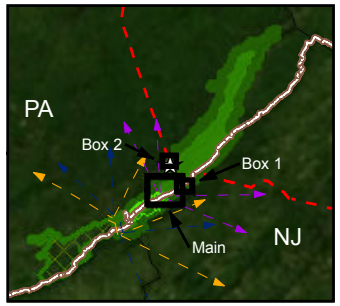
0 1,250 2,500
Feet

Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 67
Alternative 2b Wetlands in New Jersey

Source: ESRI Streetmap 2006, Penn State 2010, ESRI ArcGISonline Map Service 2010, PennDOT 2011, USGS 2006, NJ DEP 2008, NWI 1977

Projection: NAD 83 UTM Zone 18N
Date: July 2012



Legend

- Substation
- Outside Study Area
- Existing ROW in Study Area
- 350 ft Corridor
- Appalachian National Scenic Trail
- Delaware River
- Proposed Access Road
- Road
- Delaware Water Gap National Recreation Area
- Worthington State Forest
- Wetlands within 350ft buffer
- Wetlands
- County Line

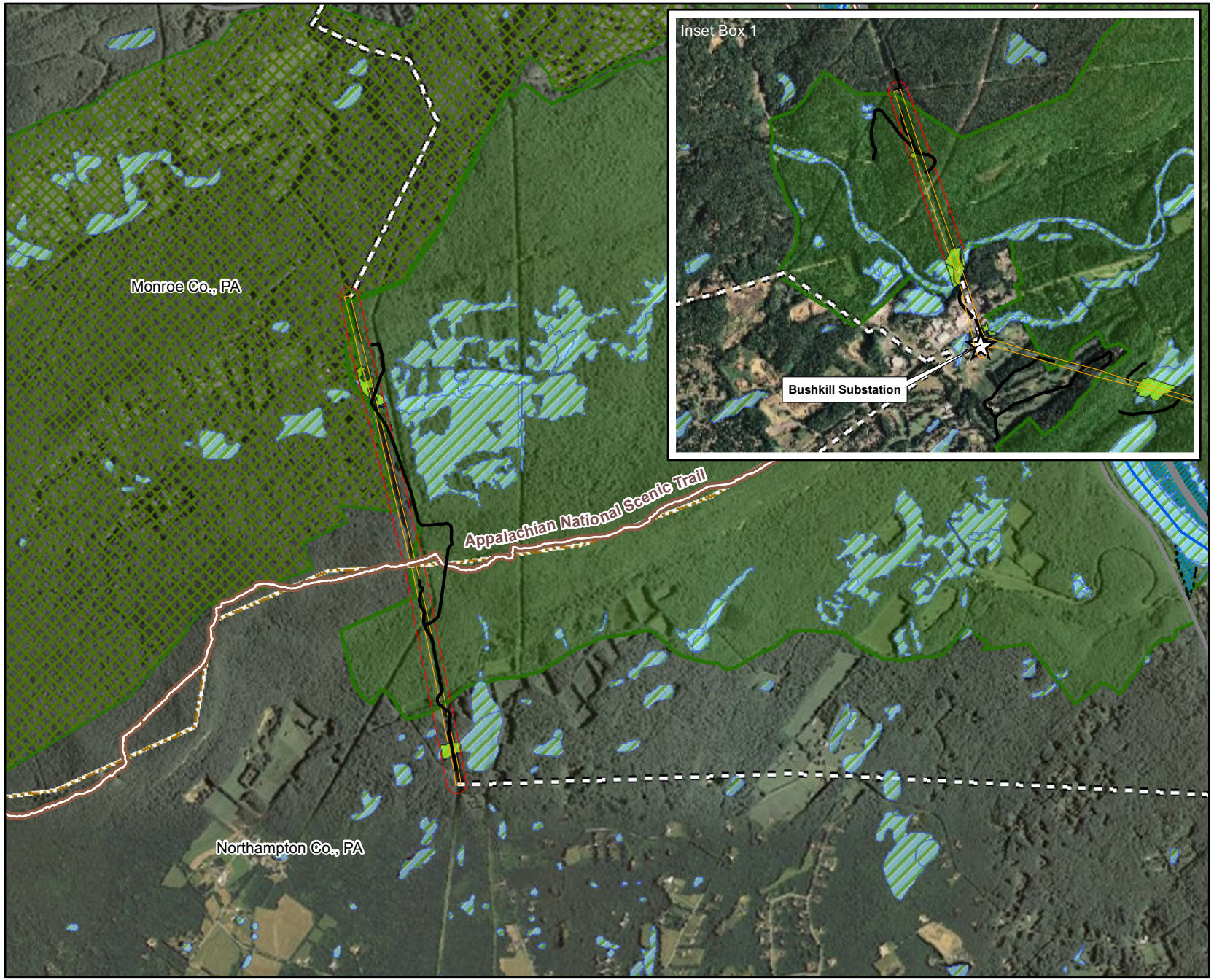
0 1,250 2,500
Feet
Scale applies to main frame and inset maps

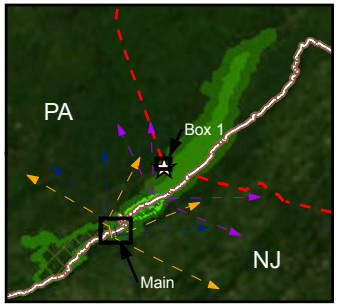
Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 68
Alternative 3 Wetlands

Source: ESRI Streetmap 2006, Penn State 2010, ESRI ArcGISonline Map Service 2010, PennDOT 2011, USGS 2006, NJ DEP 2008, NWI 1977

Projection: NAD 83 UTM Zone 18N
Date: July, 2012





Legend

- Substation
- Outside Study Area
- Existing ROW in Study Area
- 350 ft Corridor
- Appalachian National Scenic Trail
- Proposed Access Road
- Delaware Water Gap National Recreation Area
- CVNWR Boundary
- Wetlands within 350ft buffer
- Wetlands
- County Line

Note: Designated boundary of CVNWR is depicted, not all property is owned within the boundary

0 1,250 2,500
Feet
Scale applies to main frame and inset maps

Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 69
Alternative 4/5 Wetlands

Source: ESRI Streetmap 2006, Penn State 2010, ESRI ArcGISonline Map Service 2010, PennDOT 2011, USGS 2006, NJ DEP 2008, NWI 1977

Projection: NAD 83 UTM Zone 18N
Date: July, 2012

Resource-specific context for assessing impacts to wetlands includes the following:

- Executive Order 11990 directs the NPS to avoid to the extent possible the long- and short-term adverse impacts associated with the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative.
- NPS Director's Order 77-1 adopts a goal of "no net loss of wetlands;" in addition, the NPS will strive to achieve a longer-term goal of net gain of wetlands.
- Wetlands have unique functions and values (groundwater recharge, stormwater storage and discharge, unique habitats, etc.) that are intrinsic to wetlands and cannot be easily duplicated or replaced.
- The quality of the particular wetland being impacted related to the functions and values performed by that wetland.

Consistent with Executive Order 11990 and Director's Order 77-1: *Wetland Protection* (NPS 2011a), the NPS has adopted a goal of "no net loss of wetlands." Director's Order 77-1 states that for new actions where impacts on wetlands cannot be avoided, proposals must include plans for compensatory mitigation that restores wetlands on NPS lands, at a minimum acreage ratio of 1:1. Therefore, any adverse impacts on wetlands described in this section require mitigation that would assure no net loss of wetlands. The exact ratio for compensation is determined on a project-specific basis in consultation with the NPS Water Resources Division. The U.S. Army Corps of Engineers (USACE) may require higher mitigation ratios, which would be determined at a later date following consultation and coordination as part of the permitting process. Whenever possible, every effort is made to assure that the same wetland restoration proposal meets the compensation requirements of both the NPS and the USACE processes to avoid any duplication of effort.

STUDY AREA

The study area for wetlands includes the ROW for each alternative and any area outside the ROWs where necessary pulling and splicing sites, staging areas, and access road development are proposed or would be expected. Because the location of the S-R Line outside the study area cannot be determined at this time, the indirect impacts on wetlands cannot be evaluated per alternative. The potential impacts outside the study area are generally addressed; however, further surveys would be required prior to construction of the S-R Line.

CUMULATIVE IMPACTS COMMON TO ALL ALTERNATIVES

Actions inside and outside the parks can affect wetlands. Wetland ecosystems are threatened by alterations and permanent loss from development and other habitat pressures. Wetlands provide crucial habitat for many plant and wildlife species and other key ecosystem functions. The establishment of nonnative invasive species that compete with or prey on native species is also a concern in wetland ecosystems. These pressures can alter species diversity and abundance as well type of wetland communities, sometimes resulting in the loss of wetland functions or values. Past, present, and reasonably foreseeable activities that would have beneficial or adverse impacts on wetland communities inside and outside the study area are included below. These projects were taken from a list of projects that could contribute to cumulative impacts developed for the S-R Line (appendix H). An overall cumulative impacts analysis was performed by combining the impacts from the projects below with the potential impacts of each alternative.

In DEWA, there are approximately 1,000 individually mapped wetlands (NPS 2008a). Cumulative impacts on wetlands, specifically forested wetlands, are a concern due to the historically high rate of forested wetland losses and the long period necessary to restore forested wetlands and their functions. Although the annual rate of forested wetland loss has declined since the 1970s, due in part to federal agriculture programs, the loss of forested wetland acreage continues; almost 300,000 acres of forested wetland were lost between 1998 and 2004 (Dahl 2006, 70). Freshwater forested wetlands have recently been affected by two processes: the conversion of forested wetland to and from other wetland types through cutting or maturation of trees, and the loss of forested wetlands where wetland hydrology has been destroyed (Dahl 2006, 70). Because forested wetlands function at different levels, functional losses in individual areas may not be great when viewed as separate and single events. However, the cumulative loss of functions on a regional basis and the continued loss of forested wetland acreage in the United States could have greater overall impacts even as a result of the loss or conversion of small individual areas.

Projects Inside the Study Area

Inside the study area, the following road and utility projects would result in adverse cumulative impacts on wetlands: the PADOT SR 2001 road project (road reconstruction), the Tennessee Gas Line Proposal (addition to an existing gas pipeline), the Columbia Gas Transmission Company pipeline (replacement of an existing gas pipeline), and the Northeast Supply Link Expansion (Palmerton Loop gas pipeline). These projects would result in adverse impacts on wetlands from vegetation clearing and trimming activities as well as disturbance of wetland areas. The parkwide invasive species control program for DEWA would have a beneficial impact on wetlands. This project would aid in the protection of threatened open-canopy wetlands that support rare plant communities along with marsh birds, small mammals, and special-status species. Additionally, there are several land protection programs that could protect wetlands functions and values. The beneficial effects of many of these programs are dependent on the availability of funding for specific projects, which is uncertain and could vary throughout the period of analysis: therefore, the level of benefit resulting from the implementation of any project is also variable. Although these programs would protect wetland functions and values, the beneficial impacts would not outweigh the adverse impacts from the above-mentioned projects. Cumulative impacts on wetlands inside the study area from these projects would be adverse.

Projects Outside the Study Area

Outside the study area, the following road and utility projects would result in cumulative adverse impacts on wetlands: Marcellus shale natural gas drilling, the Columbia Gas Transmission Company pipeline (new gas pipeline), the PPL proposal for a 138/12-kV substation (which opens up additional areas to electric transmission), and transportation improvement and replacement projects in Pennsylvania and New Jersey. Proposed residential and commercial developments in New Jersey and Pennsylvania would also cause adverse impacts on wetlands. Adverse impacts on wetlands would result from vegetation clearing and trimming activities as well as the disturbance of wetland hydrology through impacts on groundwater quality and supply (specifically from gas drilling). Several land protection programs could provide beneficial impacts on wetlands functions and values. As stated above, these programs are dependent on the funding, which is uncertain and could vary throughout the period of analysis: therefore, the level of benefit resulting from the implementation of any project is also variable. Although these programs would protect wetland functions and values, the beneficial impacts would not outweigh the adverse impacts from the above-mentioned projects. Cumulative impacts on wetlands outside the study area from these projects would be adverse.

IMPACTS OF THE ALTERNATIVES ON WETLANDS

Common to All Alternatives

Vegetation Maintenance: Vegetation would be cleared and managed in wetland areas for all alternatives. PPL and PSE&G have separate vegetation management plans because they are distinct utility companies working in different states. In general, all compatible plant species as well as all native grasses, ferns, and herbaceous plants would be preserved to the greatest extent possible (PPL 2010a, 8). Emergent wetlands (PEM) consist of low, herbaceous vegetation that does not require management, and are not likely to be affected by vegetation maintenance. However, incompatible trees and shrubs, trees that violate the wire zone, or trees that are considered danger trees would be removed from wetland areas. Wetlands characterized as scrub shrub wetlands (PSS) that support plant species not compatible with vegetation maintenance programs described in chapter 2 would be affected by vegetation management. Wetlands characterized as forested wetlands (PFO) would be affected by tree removal during vegetation management. Trees and small shrubs in wetland areas would not be removed by heavy equipment, but would be cleared using low-impact tree-clearing methods and would be felled by hand, which would require a chainsaw and operator on foot (PPL and PSE&G 2008, 7–8). Trees would be cut close to the ground and stumps and root systems would be left in the ground to naturally decompose over time, which would provide soil stability (PPL and PSE&G 2008, 7–8). Shrubs and trees felled by hand would be removed in wetland areas and all associated organic materials (with the exception of stumps) from tree cutting would be removed from the wetlands, wetland buffers, or water-body buffer areas and stored in upland areas. Herbicides would not be used in wetland areas in the parks. The only exception to herbicide use would be for stem-treating nonnative invasive plants. Appropriate herbicides would be approved for specific treatment use. The details of the vegetation management plans and techniques for clearing vegetation are explained in chapter 2. The NPS considers the applicant's current vegetation management plans to be insufficient, and the NPS would require a NPS-specific, NPS-approved vegetation management plan.

Mitigation Measures: Mitigation measures would be required to minimize impacts on wetlands both inside and outside the study area. To minimize adverse impacts, a park-specific plan would be developed by the applicant for review and approval by the NPS in consultation with the U.S. Fish and Wildlife Service (USFWS) to protect listed species and sensitive habitats at the park (wetlands, rare and unique communities). Numerous wetland mitigation practices have already been considered for the S-R Line and have been incorporated into the alternatives. None of these mitigation measures would eliminate impacts on wetlands; however, they would reduce the impacts on wetlands by decreasing the total loss of vegetation and diversity, controlling the spread of invasive species, and protecting native and sensitive wetland communities. In order to implement the "no net loss of wetlands" policy and the goal of net gain for wetlands, Director's Order 77-1 states that for new actions where impacts on wetlands cannot be avoided, proposals must include plans for compensatory mitigation that restores wetlands on NPS lands at a minimum acreage ratio of 1 to 1 for the preferred alternative. NPS Procedural Manual 77-1: *Wetland Protection* (NPS 2012d) requires a description of mitigation in a Statement of Findings for Wetlands (appendix I). Wetland mitigation measures for this project also include avoidance and minimization measures for bog turtles and their wetland habitat and/or in upland areas adjacent to bog turtle habitat as suggested in the *Bog Turtle (*Clemmys muhlenbergii*) Northern Population Recovery Plan* (USFWS 2001, 51). Specifically, the recommended conservation zones (Zones 1, 2, and 3) as described in chapter 3 and USFWS (2001, appendix A of the recovery plan) are based on the best scientific information available and are used as a template throughout the northern range of the bog turtle to ensure consistent and vigorous protection of extant bog turtle sites. More details concerning wetland mitigation measure are discussed in chapter 2 and appendix F as well as the biological assessment (BA) for the bog turtle.

Outside the Study Area: Regardless of which alternative is selected, the line could pass through Carbon, Luzerne, Monroe, Northampton, Pike, and Wayne counties in Pennsylvania and Morris, Sussex, and Warren counties in New Jersey. These counties are largely undeveloped and contain a variety of plant communities as well as developed areas, and could include wetland areas such as forested wetlands, riparian wetlands, bogs/fens, freshwater scrub shrub wetlands, and freshwater herbaceous wetlands. Impacts on wetlands as a result of clearing, construction, and vegetation maintenance activities outside the study area would be consistent with those described for inside the study area; however, because the NPS cannot dictate where the line would actually go, the exact nature of direct impacts from the construction and maintenance of the transmission line outside the study area cannot be determined. Additionally, the specific wetland resources that would be affected by the transmission line outside the study area cannot be identified until the route is chosen by the applicant. Upon this decision, wetland delineation surveys would be required to determine the wetland type and acreage that would be affected along the selected route. Wherever possible, staging areas would be placed outside wetland areas. Impacts on wetland areas outside the study area would generally be adverse because the majority of these impacts would be associated with periodic maintenance, including tree removal, similar to the impacts discussed for inside the study area. However, if wetland impacts are unavoidable, such as impacts from constructing access roads in wetland areas, adverse impacts could arise from a permanent loss in wetland functions or values. In particular, if rare or unique communities that support wetlands and/or *Exceptional Value Wetlands* are affected outside the study area, indirect impacts could result due to the sensitivity of these wetland resources. When the adverse impacts on wetlands outside the study area are combined with the adverse impacts from other past, present, and reasonably foreseeable projects outside the study area, overall adverse cumulative impacts would be expected.

Alternative 1: No Action

All adverse impacts on wetlands under alternative 1 are associated with vegetation management activities in existing wetland areas, which result in wetland habitat conversion as discussed in more detail in the paragraphs that follow and in table 46. Emergent wetlands (PEM) would not be affected under alternative 1 because they consist of low, herbaceous vegetation that does not require management or maintenance. Wetlands characterized as scrub shrub wetlands (PSS) with plant species not compatible with vegetation maintenance programs described in chapter 2 would be affected by vegetation management. Wetlands characterized as forested wetlands (PFO) would be affected by tree removal in the ROW under alternative 1. Herbicides would not be used in wetland areas in the parks. The only exception to herbicide use would be for stem-treating nonnative invasive plants. Appropriate herbicides would be approved for specific treatment use.

In Pennsylvania, a total of three wetlands are located along the current ROW and would be affected under alternative 1. Two of these wetlands include the Hogback Ridge wetlands and Arnott Fen, both characterized as rare or unique communities as well as *Exceptional Value Wetlands*. In New Jersey seven wetland areas are located along the current ROW and would be affected under alternative 1, including the Van Campen wetland complex, characterized as a rare and unique community as well as an *Exceptional Value Wetland*. The paragraphs below describe impacts to individual wetland areas under alternative 1.

TABLE 46: WETLAND IMPACTS BY TYPE AND ALTERNATIVE

Wetland Name	Type of Impact				
	Vegetation Removal — Shrubs/Trees (Acreage)	Permanent Road Impacts (Acreage)	Crane Pad Impacts[a] (Acreage)	Wetland Buffer Impacts (Acreage)[c]	Temporary Road Impacts (Acreage)
Alternative 1					
Wetland CC (PEM/PSS)	0.21	N/A			
Arnott Fen (PEM/PSS) EV	0.99[b]				
Hogback Ridge (PEM/PSS) EV	0.02[b]				
Van Campen (PEM/PSS) EV	4.45[b]				
Wetland 42 (PEM/PSS)	0.69[b]				
Wetland 45 (PEM/PSS)	0.86[b]				
Wetland 46 (PEM/PSS)	0.24[b]				
Wetland 47 (PEM/PSS)	0.05[b]				
Wetland 49 (PEM/PSS)	0.9[b]				
NWI-1 (PEM/PSS)	0.23[b]				
Alternative 1 Total	**8.64**	**N/A**	**N/A**	**N/A**	**N/A**
Alternative 2					
Wetland AA (PFO)	0.52	—	—	0.06	—
Wetland BB (PFO) EV	1.05	—	—	—	—
Wetland CC (PEM/PSS)	0.22	—	—	0.03	—
Arnott Fen (PEM/PSS) EV	4.1	—	—	—	—
Hogback Ridge (PEM/PSS) EV	0.47	—	—	—	—
Van Campen (PEM/PSS) EV	9.6	0.56	0.23	—	—
Wetland 42 (PFO)	0.04	—	—	—	—
Wetland 42 (PEM/PSS)	0.74	0.09	—	—	—
Wetland 45 (PEM/PSS)	1.09	—	0.12	—	—
Wetland 46 (PEM/PSS)	0.24	—	—	0.08	—
Wetland 47 (PEM/PSS)	0.08	0.02	—	—	—
Wetland 49 (PEM/PSS)	1.34	—	—	—	—
NWI-1 (PEM/PSS)	0.79	—	—	—	—
Alternative 2 Total	**20.28**	**0.67**	**0.35**	**0.17**	**—**
Alternative 2b					
Wetland AA (PFO)	—	—	—	—	—
Wetland BB (PFO) EV	0.21	—	—	—	—
Wetland CC (PEM/PSS)	0.21	—	—	0.03	—
Arnott Fen (PEM/PSS) EV	1.30	—	—	—	—
Hogback Ridge (PEM/PSS) EV	0.02	—	0.01	0.01	—

Wetland Name	Type of Impact				
	Vegetation Removal — Shrubs/Trees (Acreage)	Permanent Road Impacts (Acreage)	Crane Pad Impacts[a] (Acreage)	Wetland Buffer Impacts (Acreage)[c]	Temporary Road Impacts (Acreage)
Van Campen (PEM/PSS) [EV]	4.82	0.56	0.23	—	—
Wetland 42 (PFO)	0.04	—	—	—	—
Wetland 42 (PEM/PSS)	0.52	0.09	—	—	—
Wetland 45 (PEM/PSS)	0.75	—	0.10	0.01	—
Wetland 46 (PEM/PSS)	0.20	—	—	—	—
Wetland 47 (PEM/PSS)	0.08	0.02	—	—	—
Wetland 49 (PEM/PSS)	1.34	—	—	—	—
NWI-1 (PEM/PSS)	0.79	—	—	—	—
Alternative 2b Total	**10.28**	**0.67**	**0.34**	**0.05**	—
Alternative 3					
Wetland 8 (PEM)	—	0.02	—	—	—
Wetland 10 (PSS)	0.29	—	—	—	—
NWI-3 (PFO)	1.43	—	—	—	—
Wetland AA (B-K Line)	—	—	—	0.06	—
Wetland CC (B-K Line)	0.21			0.03	
Arnott Fen, Van Campen, 42, 47 (B-K Line removal)	—	—	—	—	0.67
Alternative 3 Total	**1.93**	**0.02**	**—**	**0.09**	**0.67**
Alternative 4					
Wetland 1 (PFO)	1.77	—	—	—	—
Wetland 2(PFO)	0.71	0.01	—	—	—
NWI-4 (PFO/PSS)	1.83	0.08	—	—	—
Wetland AA (B-K Line)	—	—	—	0.06	—
Wetland CC (B-K Line)	0.21	—	—	0.03	—
Arnott Fen, Van Campen, 42, 47 (B-K Line removal)	—	—	—	—	0.67
Alternative 4 Total	**4.52**	**0.09**	**—**	**0.09**	**0.67**
Alternative 5					
Wetland 1 (PFO)	1.77	—	—	—	—
Wetland 2(PFO)	0.71	0.01	—	—	—
NWI-4 (PFO/PSS)	1.83	0.08	—	—	—
Arnott Fen, Van Campen, 42, 47 (B-K Line removal)	—	—	—	—	0.67
Alternative 5 Total	**4.31**	**0.09**	**—**	**—**	**0.67**

a. Unknown for alternatives 3, 4, and 5.

b. These wetland areas total 8.43 acres and would be allowed to recover under alternatives 3, 4, and 5.

c. Buffer impacts are a result of permanent road impacts to the 50-foot wetland buffer only.

EV = Exceptional value wetland

Approximately 0.99 acre of the Arnott Fen wetland complex (characterized as a PEM/PSS wetland) is within the B-K Line ROW under alternative 1. In the existing ROW, Arnott Fen contains a diverse emergent vegetation community, including numerous special-status wetland plant species that are not found anywhere else in the study area (impacts are discussed in the "Special-status Species" section of this chapter) and is therefore considered an *Exceptional Value Wetland*. Vegetation control measures such as mowing and herbicide use are not currently employed in Arnott Fen and would not be necessary for maintenance under alternative 1. Many of the plant species in the fen in the ROW are herbaceous and compatible with the vegetation maintenance programs described in chapter 2, although incompatible shrubs / small trees such as red maple are also present in the fen and would be hand cleared as part of vegetation management.

Approximately 0.02 acre of the Hogback Ridge wetland (characterized as a PEM/PSS wetland) is in the B-K Line ROW under alternative 1. The wetland contains deciduous scrub shrub wetland vegetation and is considered an *Exceptional Value Wetland*. Some of the plant species in the wetland are compatible with the applicant's specifications for vegetation clearing and control; however, incompatible shrub and small tree species such as red maple would be removed by hand clearing.

Approximately 4.45 acres of the Van Campen wetland complex (characterized as a PEM/PSS wetland) is in the B-K Line ROW under alternative 1. The wetland contains emergent and scrub shrub wetland vegetation and is considered an *Exceptional Value Wetland*. Some of the plant species in the wetland are compatible with the applicant's specifications for vegetation clearing and control; however, incompatible shrub and any small tree species would be removed by hand clearing.

In addition to the three wetland areas described above, a total of approximately 3.18 acres of scrub shrub wetlands (wetlands CC, 42, 45, 46, 47, 49, and NWI-1) are located within the B-K Line ROW and would be affected by vegetation maintenance activities. It is possible that New Jersey Department of Environmental Protection (NJDEP) may identify existing wetlands along and within the ROW as *Exceptional Value Wetlands*, based on the recent discovery of wood turtle and timber rattlesnake habitat (these snakes can forage in wetland areas) in surveys conducted along alternative 2 (EcolSciences 2009b; 2011). Incompatible shrubs and small trees would be removed from these scrub shrub wetlands under alternative 1. The removal of vegetation would increase the amount of open areas of the shrub layer in the wetlands. Open areas facilitate the growth and spread of nonnative invasive plants and provide more sunlight to the understory, generally comprised of shade-tolerant plant species that cannot persist in full sun. The removal of incompatible shrubs or small trees from scrub shrub wetlands would result in their conversion to emergent wetlands and would cause the emergent understory to be fully exposed. For example, sphagnum moss and cinnamon fern are typical emergent wetland plants beneath the shrub layer that cannot persist in full sun once the shrub layer has been removed.

Although fill would not be placed in wetland areas during vegetation maintenance activities, habitat conversion is considered a wetland impact because some of the wetland functions and values would change (including fish and wildlife productivity and habitat, threatened and endangered species habitat, vegetation habitat, water purification, and streamflow). Shrub removal in the B-K Line corridor would change functions and values by reducing the vegetation canopy over these wetlands, which would reduce the biomass and change the species composition of the wetland. The reduction in biomass would potentially alter the vegetation and wildlife species that use that wetland. This shift in the vegetation type could lessen available resources for wildlife species that depend on the conditions currently found in the wetland. Therefore, measurable changes to the abundance and diversity of wetland vegetation would occur. These areas would continue to function as wetlands, but there would be changes in the abundance and diversity of wetland vegetation, which could directly affect the use of the area by wildlife and listed species and could allow invasive plant species to colonize wetland areas. Managed ROW corridors do not return to the original species composition or structure and succeed to different wetland types (Jordan et al.

n.d., 154). Because shrubs and small trees in the ROW under alternative 1 would continue to be maintained/removed, wetland areas within the ROW would not recover during the period of analysis to become fully functioning scrub shrub wetlands.

The regular maintenance and vegetation management in the ROW would cause disturbance to wetlands, including *Exceptional Value Wetlands* under alternative 1 throughout the period of analysis. Wetland functions and values that would change as a result of vegetation management include fish and wildlife productivity and habitat, threatened and endangered species habitat, vegetation habitat, water quality, and streamflow. Other wetland functions and values are unlikely to change as a result of alternative 1. The no-action alternative would result in impacts on a total of 8.64 acres of wetlands as a result of conversion to either emergent wetlands. Although vegetation removal and maintenance efforts would continue in rare and unique wetland communities, no new development or construction would be allowed under alternative 1. Overall, alternative 1 would result in adverse impacts on wetlands.

Cumulative Impacts

Cumulative impacts on wetlands inside the study area from other past, present, and reasonably foreseeable projects would be adverse, as described previously in the "Cumulative Impacts Common to All Alternatives" section. When the adverse impacts on wetlands as a result of alternative 1 are combined with the other projects in the study area, overall adverse cumulative impacts would be expected. Alternative 1 would not alter the level of impact.

Conclusion

The no-action alternative would impact a total of 8.64 acres of wetlands (including 5.46 acres of rare and unique wetland communities) as a result of conversion to either emergent or scrub shrub wetlands. Although vegetation removal and maintenance efforts would continue in rare and unique wetland communities, no new development, construction, or drilling would be allowed under alternative 1. Overall, alternative 1 would result in adverse impacts on wetlands. When the adverse impacts on wetlands as a result of alternative 1 are combined with other past, present, and reasonably foreseeable projects in the study area, overall adverse cumulative impacts would be expected.

Alternative 1 crosses several unique wetland communities which, in turn, support rare, threatened, and endangered plants and animals and act as groundwater repositories. Alternative 1 would have adverse impacts to wetlands, including the unique wetland communities, associated with ongoing vegetation management activities that are changing from their historic pattern. The most severe adverse impact would be the conversion of forested wetlands to emergent or scrub shrub wetlands, which would substantially change the way the wetlands function as fish and wildlife habitat and to a lesser degree, some of the hydrological functions such as streamflow. The adverse impacts of alternative 1 would be confined to the limits of the present ROW and would not likely result in a noticeable reduction in wetlands functions and values. Adverse impacts to wetlands would be avoided and minimized through required consultation and permitting processes; thus, the impacts would be consistent with the laws and policies that govern these resources. In conclusion, the actions under alternative 1 would be in keeping with the parks' enabling legislations, NPS *Management Policies 2006*, and all other applicable federal and state laws. Any cumulative impacts to wetlands would remain adverse primarily from other actions taken outside the study area. Although there are adverse impacts associated with the continued operation and maintenance of the existing B-K Line, the intensity of the adverse impacts in the context of wetlands would not likely result in significant impacts.

Common to All Action Alternatives

Removal of Existing Structures: All action alternatives (2, 2b, 3, 4, and 5) would involve the removal of all or a portion of the B-K Line, as discussed in chapter 2. For all action alternatives, the B-K Line structures would be removed but the foundations for these structures would remain in place. For alternatives 2 and 2b, the S-R Line would be constructed along the same alignment. The removal of the structures would require constructing access roads (either permanent or temporary, depending on the alternative). Under alternatives 2 and 2b, the removal of the B-K Line would require constructing access roads, wire pull sites, and the removal of the line as described in chapter 2; wire pull sites would not be located in wetland areas. Because access roads would also be required for the construction and long-term maintenance of the new line, adverse impacts from removing the line would be the same as (or less than) the impacts discussed for construction of the S-R Line.

Vegetation Clearing: The ROWs would be cleared of vegetation for the construction of the new double 500-kV transmission line for alternatives 2 through 5, which would affect wetlands. For the analysis of impacts on wetlands, it was assumed that a 350-foot corridor would be cleared of vegetation for the construction of the new double 500-kV transmission line for alternatives 2, 3, 4, and 5. For alternatives 2, 3, 4, and 5, the corridor would be cleared 175 feet from the centerline of the existing ROW to either side. Under alternative 2b, the applicant proposes to operate the S-R Line within the existing ROW. The NPS anticipates that the applicant would require additional area for construction; therefore, it is estimated that under alternative 2b, the applicant would expand the ROW to the extent of their deeded property rights, which ranges from 100 feet to 380 feet. For alternative 2b, the ROW would be cleared on either side of the centerline to an appropriate width based on the deeded property rights. Clearing would be complete for all action alternatives, with the exception of the 50-foot buffer near intermittent streams/wetlands and the 100-foot buffer near perennial waterways such as the Delaware River (PPL and PSE&G 2008, 7).

Construction Components: Construction activities are described in detail in chapter 2; the activities that would affect wetlands if these areas cannot be avoided include site preparation and construction of access roads, tower foundations, crane pads, wire pull locations, and pulling and splicing sites, as well as the use of heavy equipment and staging areas. These activities would disturb wetland functions and values. Specifically, the construction of access roads would cause increased sedimentation in adjacent wetland areas, thus affecting water clarity and water quality; wetlands can also be affected by siltation and alteration of drainage patterns resulting from access road construction, particularly if access roads are in or next to sensitive wetland areas. Also, the use of heavy construction equipment such as forwarders, feller bunchers, and skidders during the removal of vegetation, as well as bulldozers and trucks during the construction and use of access roads, would contribute to the compaction of soil in and near wetland areas. Compaction can cause damage to soil structure, which determines the ability of a soil to hold and conduct water, nutrients, and air necessary for plant root activity and growth (UM 2001, 1). Soil compaction would also increase runoff, thus increasing soil erosion. Soil compaction can also cause changes to hydrology, which would affect wetland function and possibly wildlife use (including bog turtle, a special-status species) of the wetland. In addition to direct effects from construction component, indirect effects to wetlands resulting from activities in the adjacent uplands as stated in the *Bog Turtle* (Clemmys muhlenbergii*) Northern Population Recovery Plan* (USFWS 2001, appendix A) include:

- changes in hydrology (from roads, detention basins, irrigation, increases in impervious surfaces, sand and gravel mining);
- degradation of water quality (due to herbicides, pesticides, oil and salt from various sources including roads, agricultural fields, parking lots and residential developments);

- acceleration of succession (from fertilizer runoff); and
- introduction of exotic plants (due to soil disturbance and roads).

Specified BMPs to protect wetlands from increased sedimentation and compaction would be used to minimize and mitigate these impacts, as described in appendix F. All action alternatives would require drilling as part of the construction process, but because drilling is unlikely to affect groundwater (see discussion in "Geologic Resources") it would not affect wetlands in the vicinity and is not discussed further.

Alternative 2

In Pennsylvania, a total of five wetlands would be affected under alternative 2. Two of these five wetlands include the Hogback Ridge wetlands and Arnott Fen, both characterized as rare or unique communities as well as *Exceptional Value Wetlands*. In New Jersey seven wetland areas would be affected under alternative 2, including the Van Campen wetland complex, characterized as a rare and unique community as well as an *Exceptional Value Wetland*. It is possible that NJDEP may identify additional wetlands along and within the ROW as *Exceptional Value Wetlands*, based on the recent discovery of wood turtle and timber rattlesnake habitat (these snakes can forage in wetland areas) in surveys conducted along alternative 2 (EcolSciences 2009b; 2011). The paragraphs below describe impacts to individual wetland areas under alternative 2.

Approximately 4.1 acres of the Arnott Fen wetland complex (characterized as a PEM/PSS wetland) is in the 350-foot construction corridor of the proposed ROW under alternative 2. As described in the vegetation maintenance programs in chapter 2, the majority of the existing herbaceous vegetation in the fen and a 50-foot buffer surrounding the fen includes compatible plant species, which would not be cleared to prepare for construction activities (PPL and PSE&G 2008, 7). Although the fen is dominated by emergent plant species, a very small portion of the outer edges of the fen does include some incompatible shrubs / small trees such as red maple exist in the fen and would be hand cleared for construction and as part of the vegetation maintenance programs.

Approximately 0.47 acre of the Hogback Ridge wetland (characterized as a PEM/PSS wetland) is located within the 350-foot construction corridor of the proposed ROW under alternative 2. The wetland contains some incompatible shrub / small tree species such as red maple that would be hand cleared as part of construction and vegetation maintenance activities. Access roads would not be constructed through the Hogback Ridge wetland. However, indirect adverse impacts could occur as a result of access road construction, tower construction, and vegetation clearing adjacent to the wetland. These adverse impacts include the potential for impeding the natural flow of water into or out of the wetland area and changes to the movement of wetland wildlife (such as turtles and salamanders) and the distribution of wetland plant seeds.

Approximately 9.6 acres of the Van Campen wetland complex (characterized as a PEM/PSS wetland) is located in the 350-foot construction corridor of the proposed ROW under alternative 2. Some of the plant species in the wetland are incompatible shrub / small tree species that would be removed by hand clearing for construction and maintenance activities. However, approximately 10,000 square feet (0.23 acre) of the wetland vegetation in the ROW is proposed for clearing under alternative 2 because the applicant's proposal includes a tower in the wetland area that would require a crane pad. Additionally, approximately 0.56 acre of PEM/PSS wetlands that are part of the Van Campen wetland complex would be directly and adversely affected by access roads. As stated under "Common to All Action Alternatives," site preparation and construction of the access roads as well as the use of heavy equipment would disturb wetland functions and values.

In addition to the *Exceptional Value Wetlands* discussed above, nine other wetlands would be adversely affected under alternative 2:

- Wetland AA is a PFO wetland near the Bushkill Substation and located outside of the NPS boundary. Impacts from clearing trees in the forested wetland would occur on 0.52 acre of wetland. Direct impacts from access roads would avoid wetland AA, but a very small portion (0.06 acre) of the proposed access road would be constructed in the 50-foot wetland buffer.
- Wetland BB has both PEM and PFO wetland portions that support incompatible plant species (red maple). This wetland is considered an *Exceptional Value Wetland* because it supports special-status species. Impacts from clearing trees in the forested wetland would occur on 1.05 acres of wetland; no direct impacts from access roads would be expected and impacts to the emergent (PEM) portion of the wetland are not expected.
- Wetland CC is a PEM/PSS wetland near the northern portion of the alignment. Generally, the wetland vegetation is considered compatible plant species, but clearing may result in impacts on 0.22 acres of the wetland. Direct impacts from access roads would avoid wetland CC, but a very small portion (0.03 acre) of the proposed access road would be constructed in the 50-foot wetland buffer.
- Wetland 42 has both PEM/PSS and PFO wetland areas partially located in the proposed ROW. Impacts from clearing trees would result on 0.04 acres of the forested (PFO) wetland in the proposed ROW and impacts from clearing shrubs would result on 0.74 acre of the PEM/PSS wetland in the proposed ROW. Access roads would directly and permanently affect approximately 0.09 acre of the PEM/PSS wetland.
- Wetland 45 is a PEM/PSS wetland in the ROW. Impacts from clearing of shrubs / small trees in the proposed ROW would occur on 1.09 acres of this wetland. The construction of the crane pads would affect 0.12 acre of this wetland.
- Wetland 46 is a PEM/PSS wetland that surrounds a pond in the ROW; impacts from clearing shrubs / small trees would occur on 0.24 acre of this wetland in the proposed ROW. Direct impacts from access roads would avoid wetland 46, but a very small portion (0.08 acre) of the proposed access road would be constructed in the 50-foot wetland buffer.
- Wetland 47 is a PEM/PSS wetland in the ROW; impacts from clearing shrubs / small trees in the wetland would occur on 0.08 acre of this wetland in the proposed ROW. Access roads would directly and permanently affect approximately 0.02 acre of this wetland.
- Wetland 49 is a PEM/PSS wetland in the ROW located outside the NPS boundary. Impacts from clearing shrubs / small trees in the proposed ROW would occur on 1.34 acres of this wetland.
- Wetland NWI-1 is a PEM/PSS wetland partially located in the ROW located outside the NPS boundary. Impacts from clearing shrubs / small trees in the proposed ROW would occur on 0.79 acres of this wetland.

The removal or felling of trees in forested wetland areas or shrubs in scrub shrub wetlands would increase the amount of open canopy in wetland areas. Open canopy facilitates the growth and spread of nonnative invasive plants, which spread into forested or scrub shrub wetland areas. Open canopy provides more sunlight to the understory and shade-tolerant plant species cannot persist in full sun. In addition to creating more open canopy, the increased potential for blowdowns or windthrow in forested wetlands also exists when trees are removed from forested wetlands. In forested wetlands, shallow-rooted species protect each other from potential wind damage; whenever trees are removed from a forested wetland, the possibility of blowdowns or windthrow (trees uprooted or broken by wind) increases (MIDNR 1992, LC-

3). Edge trees protect shallow-rooted species by shielding them from the prevailing wind; it is suggested that as many edge trees as possible be left on the prevailing wind side of the cleared area (MIDNR 1992, LC-3). Therefore, the removal of trees in the wetland and along the forested wetland edge would increase the open canopy and could cause an increased potential for blowdowns to occur, which could further adversely affect the wetlands where trees have been removed.

Tree removal in forested wetlands would result in the conversion of wetland habitat type from a forested wetland to an emergent or scrub shrub wetland. In addition, the removal of incompatible shrubs or small trees from scrub shrub wetlands would result in their conversion to emergent wetlands. The removal of the shrub layer from these PEM/PSS wetlands would result in fully exposing the emergent understory. For example, sphagnum moss and cinnamon fern are typical emergent wetland plants beneath the shrub layer of wetlands along alternative 2 that cannot persist in full sun once the shrub layer has been removed.

Although fill would not be placed in wetland areas during vegetation removal and maintenance activities, habitat conversion is considered a wetland impact because some of the wetland functions and values would change (including fish and wildlife productivity and habitat, threatened and endangered species habitat, vegetation habitat, water purification, and streamflow). It has been demonstrated that removing trees from a forested wetland does not interrupt the prevailing hydrology of the site (Cutlip 1986). However, tree removal in the B-K Line corridor and in forested wetlands would change functions and values by reducing the vegetation canopy over these wetlands, which would reduce the biomass and change the species composition of the wetland (Cutlip 1986). The reduction in biomass would potentially alter the vegetation and wildlife species that use that wetland. This shift in the vegetation type could lessen available resources for wildlife species that depend on the conditions currently found in the wetland. Therefore, there would be measurable changes to the abundance and diversity of wetland vegetation. These areas would continue to function as wetlands, but there would be changes in the abundance and diversity of wetland vegetation, which could directly affect the use of the area by wildlife and listed species and could allow invasive plant species to colonize wetland areas. Managed ROW corridors do not return to the original species composition or structure and succeed to different wetland types (Jordan et al. n.d., 154). Because northern forested wetlands may take 50 years to reach maturity (Kusler 2006, iii) and because trees and shrubs would be maintained/removed, those wetland areas allowed to revegetate after construction would not recover during the period of analysis to become fully functioning forested or scrub shrub wetlands.

Construction impacts described under alternative 2 would cause both permanent and temporary changes to wetland functions and values, including *Exceptional Value Wetlands*. Site preparation and construction of the access roads as well as the use of heavy equipment would degrade wetland functions and values. Heavy equipment operation in the ROW during the construction of access roads across a ROW in a forested wetland has been shown to interrupt the natural hydrologic regime of the forested wetland and cause the impoundment of water (Cutlip 1986). The use of heavy equipment in wetland areas can also result in the compaction of wetland soils, as discussed above under “Construction Components.”

The construction of access roads both adjacent to and through wetlands would fragment the wetlands, resulting in changes to hydrology and impeding water movement, ground-level wildlife movement, and the seed distribution of wetland plants. Access roads would also reduce the ability of wetlands to perform functions such as groundwater discharge/recharge, sediment/toxicant retention, nutrient removal, flood flow alteration and/or storage, and production export may be temporarily decreased due to temporary disturbance adjacent to the wetland. Access roads would also cause the wetlands’ stormwater/nutrient assimilative capacity to be lost and construction vehicles along the roads could introduce toxic substances (oil and grease). During construction activities, siltation/runoff into wetland areas could occur but would be contained with approved BMPs as discussed under “Common to All Action Alternatives.”

Overall, alternative 2 would require construction and vegetation clearing and maintenance activities that would affect 20.28 acres of wetlands through conversion to scrub shrub and/or emergent wetlands, including *Exceptional Value Wetlands*. Access roads and crane pads would affect 1.02 acres of wetlands. Approximately 0.17 acre of wetlands would be indirectly affected by vegetation clearing in the 50-foot wetland buffer. Overall, alternative 2 would result in adverse impacts on wetlands as a result of vegetation removal and maintenance, construction of access roads, tower foundations, and crane pads, portions of which would affect rare and unique wetland communities as well as *Exceptional Value Wetlands*.

Because alternative 2 is the preferred alternative, mitigation under NPS Procedural Manual 77-1: *Wetland Protection* (NPS 2012d) is discussed in detail in the Statement of Findings for Wetlands (appendix I). The exact ratio for compensation is determined on a project-specific basis.

Cumulative Impacts

Cumulative impacts on wetlands inside the study area from other past, present, and reasonably foreseeable projects would be adverse, as described previously in the "Cumulative Impacts Common to All Alternatives" section. When the adverse impacts on wetlands as a result of alternative 2 are combined with the other projects in the study area, an overall adverse cumulative impact would be expected. Alternative 2 would contribute an appreciable increment to the overall cumulative impact.

Conclusion

In the study area under alternative 2, adverse impacts on wetlands would result in impacts on wetlands because construction activities and vegetation clearing would result in converting 20.28 acres of forested wetlands to scrub shrub and/or emergent wetlands during ROW clearing. Access road, tower foundation, and crane pad construction would permanently impact 1.02 acres of wetlands, including wetlands that support rare and unique communities. Approximately 0.17 acres of wetlands would be indirectly affected by vegetation clearing in the 50-foot wetland buffer for access roads. For wetlands with limestone geology (Arnott Fen) in the study area of alternative 2, required drilling could create impacts on unique geologic formations and could lead to a decrease in groundwater availability and quality that could indirectly and adversely affect wetland functions and values. It is not entirely known how drilling would affect wetland areas along alternative 2 but drilling is unlikely to affect groundwater (see discussion in the "Geologic Resources" section). A drilling plan and postconstruction monitoring would be required to identify and monitor the potential impacts of drilling on wetlands. Access road construction adjacent to wetlands could have both direct and indirect adverse impacts on wetlands. Although the construction activities would be short term, the regular maintenance of the ROW and access roads would cause disturbance throughout the period of analysis. Cleared trees in wetland areas under alternative 2 would never be allowed to mature in the ROW and cleared wetland areas would not recover during the period of analysis to become a fully functioning forested wetland. When the adverse impacts on wetlands as a result of alternative 2 are combined with other past, present, and reasonably foreseeable projects in the study area, an overall adverse cumulative impact would be expected.

Alternative 2 would be located in a particularly sensitive area of DEWA containing high concentrations of many important and unique natural features including rare limestone formations that support unique calcareous wetlands such as Arnott Fen, the Delaware River riparian corridor, the Hogback Ridge wetlands and the Van Campen Brook riparian area. Arnott Fen, Hogback Ridge wetlands, and the Van Campen wetlands are characterized as rare and unique communities and classified as *Exceptional Value Wetlands* by Pennsylvania and New Jersey, meaning these wetlands are significant resources in park and regional contexts, making any impacts in these locations even more acute. Alternative 2 would impact the largest acreage of wetlands of any of the action alternatives; nearly twice as much as alternative 2b and up to 10 times the acreage of alternatives 3, 4, or 5. The adverse impacts of alternative 2, such as clearing,

ground disturbance and compaction, and changes in surface runoff from placement of fill material, pose a serious risk of harm to these wetlands due to the potential to introduce invasive species or alter wetland hydrology in unexpected ways that would disrupt and degrade the wetland values and functions. The long-term effects of construction activities on rare and unique communities are often difficult to predict accurately because of the nature of these communities. Cumulatively, wetlands are under threat by other actions and outside pressure, which in the context of the function of the parks as an "oasis" or refuge within the highly developed east coast, elevates the need to preserve and protect these scarce, sensitive resources. Considering the intensity of these adverse impacts in the context of wetlands laws and policies as well as the purpose and significance for which DEWA, APPA, and MDSR were established, alternative 2 would likely result in significant adverse impacts on wetlands.

Permitting the project would adversely affect multiple protected resources inside the parks, in some instances irreversibly. Allowing such adverse effects in order to facilitate private infrastructure expansion would be contrary to NPS practice and principle of protecting and improving these resources, and of removing incompatible infrastructure to do so. This could establish precedent that may invite similar proposals by other applicants in the future, and create an expectation of like treatment for those proposals; it may make it difficult to deny such proposals. DEWA and APPA both contain numerous other utility crossings, which makes the risk of such precedent particularly concerning for these parks. Furthermore, as units of the national park system, wherein all parks are entitled to equal protection, creating such a precedent could have ramifications for parks nationwide. The location of this particular crossing through the center of DEWA could make such a precedent even more potent. Installing the S-R Line on this alignment may invite future utilities proposing to follow the same route.

Overall, the significance of the impact of alternative 2 is a result of two considerations: the particularly resource-rich area through which the alternative crosses and the potential to inflict harm to those resources because of the magnitude and duration of the adverse impacts. Although it is true that not all impacts can be predicted with great certainty, in the context of the purpose and significance for which DEWA, APPA, and MDSR were established and NPS mandates to specifically preserve the natural, cultural, and scenic resources within them, additional precautions are warranted when considering risks to these resources, many of which are of national importance. Similarly, certain resources are non-renewable, which makes any impacts to them all the more serious because they cannot be replaced if lost. And some resources are under threat by other actions and outside pressure, which in the context of the function of the parks as an "oasis" or refuge within the highly developed east coast, elevates the need to preserve and protect these scarce, sensitive resources. For these reasons, the environmental consequences of alternative 2 would be significant.

Alternative 2b

In Pennsylvania, a total of four wetlands would be affected under alternative 2b. Two of these four wetlands include the Hogback Ridge wetlands and Arnott Fen, both characterized as rare or unique communities as well as *Exceptional Value Wetlands*. In New Jersey seven wetland areas would be affected under alternative 2b, including the Van Campen wetland complex, characterized as a rare and unique community as well as an *Exceptional Value Wetland*. The paragraphs below describe impacts to individual wetland areas under alternative 2b.

Approximately 1.30 acres of the Arnott Fen wetland complex (characterized as a PEM/PSS wetland) is located in the corridor of the proposed ROW under alternative 2b. Some incompatible shrubs / small trees such as red maple exist in the fen and would be hand cleared for construction and as part of the vegetation maintenance programs. No new access roads or tower foundations would be placed in the Arnott Fen wetland complex.

Approximately 0.02 acre of the Hogback Ridge wetland (characterized as a PEM/PSS wetland) is located in the corridor of the proposed ROW under alternative 2b. Because the wetland contains deciduous scrub shrub wetland vegetation, most of the plant species in the wetland would not be disturbed. Incompatible shrub / small tree species such as red maple exist in the wetland area and would be hand cleared as part of construction and vegetation maintenance activities. Access roads would not be constructed through Hogback Ridge wetland, but would be constructed in the wetland buffer, affecting approximately 0.01 acre. A crane pad would also be partially located in the wetland, affecting approximately 0.01 acre of the wetland. Indirect adverse impacts could result from access road construction and vegetation clearing adjacent to the wetland. These activities would adversely affect the wetland in the same manner as described in detail above for alternative 2.

Approximately 4.82 acres of the Van Campen wetland complex (characterized as a PEM/PSS wetland) is located in the corridor of the proposed ROW under alternative 2b. Some of the plant species in the wetland are incompatible shrub / small tree species that would be removed by hand clearing for construction and maintenance activities. Additionally, approximately 10,000 square feet (0.23 acre) of the wetland vegetation in the ROW is proposed for clearing under alternative 2b because the applicant's proposed plan includes a tower in the wetland area that would require a crane pad. Also, approximately 0.56 acre of PEM/PSS wetlands that are part of the Van Campen wetland complex would be directly and adversely affected by access roads. These activities would adversely affect the wetland in the same manner as described in detail above for alternative 2.

In addition to the rare or unique communities that support wetlands discussed above, nine other wetlands would be adversely affected under alternative 2b.

- Wetland BB is a PFO wetland in the proposed ROW under alternative 2b and is considered an *Exceptional Value Wetland*. Impacts from clearing trees in the forested wetland would occur on 0.21 acres of the wetland; no direct impacts from access roads would be expected.
- Wetland CC is a PEM/PSS wetland near the northern portion of the alignment. Generally, the wetland vegetation is comprised of compatible plants species, but clearing may result in impacts on 0.21 acres of the wetland. Direct impacts from access roads would avoid wetland CC, but a very small portion (0.03 acre) of the proposed access road would be constructed in the 50-foot wetland buffer.
- Wetland 42 has both PEM/PSS and PFO wetland areas partially located in the proposed ROW. Impacts from clearing trees would occur on 0.04 acres of the forested (PFO) wetland in the proposed ROW and impacts from clearing shrubs would occur on 0.52 acres of the PEM/PSS wetland in the proposed ROW. Access roads would directly and permanently affect approximately 0.09 acre of the PEM/PSS wetland.
- Wetland 45 is a PEM/PSS wetland in the ROW. Impacts from clearing shrubs / small trees would occur on 0.75 acre of this wetland. A crane pad would affect 0.10 acre of this wetland and a very small portion (0.01 acre) of the proposed access road would be constructed in the 50-foot wetland buffer.
- Wetland 46 is a PEM/PSS wetland that surrounds a pond in the corridor. Impacts from clearing shrubs / small trees would occur on 0.20 acre of this wetland.
- Wetland 47 is a PEM/PSS wetland in the ROW. Impacts from clearing shrubs / small trees would occur on 0.08 acre of this wetland; access roads would directly and permanently affect approximately 0.02 acre of this wetland.

- Wetland 49 is a PEM/PSS wetland in the ROW. Impacts from clearing shrubs / small trees would occur on 1.34 acre of this wetland.
- Wetland NWI-1 is a PEM/PSS partially located in the corridor. Impacts from clearing shrubs / small trees would occur on 0.79 acres of this wetland.

Overall, alternative 2b impacts on wetlands due to construction and associated activities and vegetation clearing would result in the loss of 10.28 acres of wetlands through conversion to scrub shrub and/or emergent wetlands, and impacts due to access roads and crane pads would permanently affect 1.01 acres of wetlands. Approximately 0.05 acre of wetlands would be indirectly affected by vegetation clearing in the 50-foot wetland buffer from access roads. The total impacts (acreage) of alternative 2b are less than the impacts for alternative 2 because the cleared corridor is narrower under this alternative. Rare or unique wetland communities as well as *Exceptional Value Wetlands* would be permanently altered by crane pad construction. Overall, adverse impacts on wetlands would occur under alternative 2b.

Cumulative Impacts

Cumulative impacts on wetlands inside the study area from other past, present, and reasonably foreseeable projects would be adverse, as described previously in the "Cumulative Impacts Common to All Alternatives" section. When the adverse impacts on wetlands as a result of alternative 2b are combined with the other projects in the study area, an overall adverse cumulative impact would be expected. Alternative 2b would not alter the level of impact.

Conclusion

In the study area under alternative 2b, adverse impacts on wetlands would occur because construction activities and vegetation clearing would result in converting 10.28 acres of forested wetlands to scrub shrub and/or emergent wetlands during clearing activities in the proposed corridor; access roads and crane pads would permanently affect 1.01 acres of wetlands. Approximately 0.05 acre of wetlands would be indirectly affected by vegetation clearing in the 50-foot wetland buffer from access roads. Under alternative 2b, rare or unique wetland communities and *Exceptional Value Wetlands* would be adversely affected. The required drilling could affect unique geologic formations (Arnott Fen) and could lead to a decrease in groundwater availability and quality, which could indirectly and adversely affect wetland functions and values. It is not entirely known how drilling would affect wetland areas along the alternative 2b alignment but drilling is unlikely to affect groundwater (see discussion in the "Geologic Resources" section). A drilling plan and postconstruction monitoring would be required to identify and monitor the potential impacts of drilling on wetlands in the study area. Access road construction in and adjacent to wetlands could have both direct and indirect adverse impacts on wetlands. Although the construction activities would be short term, the regular maintenance of the ROW and the access roads would cause disturbance throughout the period of analysis. Cleared trees in wetland areas under alternative 2b would never be allowed to mature in the ROW; therefore, cleared wetland areas would not recover within the period of analysis to become a fully functioning forested wetland. Alternative 2b would have fewer impacts on forested wetlands as a result of tree removal compared to alternative 2; however, rare and unique communities and *Exceptional Value Wetlands* would be both directly and indirectly adversely affected under alternative 2b. When the adverse impacts on wetlands as a result of alternative 2b are combined with other past, present, and reasonably foreseeable projects in the study area, an overall adverse cumulative impact would be expected.

Alternative 2b would cross the same wetlands as alternative 2, including the same rare, high-quality wetlands, and would have the same types of adverse impacts on wetlands (i.e., clearing, ground disturbance and compaction, and changes in surface runoff from placement of fill material, all of which

could harm the wetlands by introducing invasive species or altering wetland hydrology). Alternative 2b would pose less risk of serious harm to wetlands than alternative 2 because it would affect less than half of the acreage of rare and unique wetland communities and *Exceptional Value Wetlands* and nearly half of the total acreage in wetlands. Alternative 2b would disturb much less acreage in Arnott Fen and the Hogback wetlands than would alternative 2, although any disturbance carries the risk of introducing invasive species which would be particularly serious given the rare nature of these wetlands. Alternative 2b would adversely impact the same acreage in the Van Campen wetlands which presents a high risk of degrading the functions and values of these rare, high-quality wetlands. As noted under alternative 2, cumulatively, wetlands are under threat by other actions and outside pressure, which in the context of the function of the parks as an "oasis" or refuge within the highly developed east coast, elevates the need to preserve and protect these scarce, sensitive resources. Considering the intensity of these adverse impacts in the context of wetlands laws and policies as well as the purpose and significance for which DEWA, APPA, and MDSR were established, alternative 2b would likely have significant adverse impacts on wetlands because although alternative 2b would affect less total acreage of wetlands, the adverse impacts would still have the potential to result in serious harm to rare and unique wetlands and *Exceptional Value Wetlands*.

Permitting the project would adversely affect multiple protected resources inside the parks, in some instances irreversibly. Allowing such adverse effects in order to facilitate private infrastructure expansion would be contrary to NPS practice and principle of protecting and improving these resources, and of removing incompatible infrastructure to do so. This could establish precedent that may invite similar proposals by other applicants in the future, and create an expectation of like treatment for those proposals; it may make it difficult to deny such proposals. DEWA and APPA both contain numerous other utility crossings, which makes the risk of such precedent particularly concerning for these parks. Furthermore, as units of the national park system, wherein all parks are entitled to equal protection, creating such a precedent could have ramifications for parks nationwide. The location of this particular crossing through the center of DEWA could make such a precedent even more potent. Installing the S-R Line on this alignment may invite future utilities proposing to follow the same route.

Overall, the significance of the impact of alternative 2b is a result of two considerations: the particularly resource-rich area through which the alternative crosses and the potential to inflict harm to those resources because of the magnitude and duration of the adverse impacts. Although it is true that not all impacts can be predicted with great certainty, in the context of the purpose and significance for which DEWA, APPA, and MDSR were established and NPS mandates to specifically preserve the natural, cultural, and scenic resources within them, additional precautions are warranted when considering risks to these resources, many of which are of national importance. Similarly, certain resources are non-renewable, which makes any impacts to them all the more serious because they cannot be replaced if lost. And some resources are under threat by other actions and outside pressure, which in the context of the function of the parks as an "oasis" or refuge within the highly developed east coast, elevates the need to preserve and protect these scarce, sensitive resources. For these reasons, the environmental consequences of alternative 2b would be significant.

Common to Action Alternatives 3 through 5

Restoration of the B-K Line: For alternatives 3, 4, and 5, the portion of the B-K Line between the Bushkill Substation and the eastern boundary of DEWA would be permanently removed and the ROW would be restored, as described in chapter 2. The ROW would be allowed to ultimately return to forested habitat over the long term, including wetlands that are currently maintained through vegetation clearing and tree removal. Approximately 8.4 acres of wetlands would be allowed to recover under these alternatives (includes wetland acreage in the existing B-K Line ROW at Arnott Fen, Hogback Ridge, Van Campen, and wetlands 42, 45, 46, 47, 49, and NWI-1) as shown in table 46. Spur roads would be required

on a temporary basis to remove the line and would affect between a maximum of 0.67 acre of wetlands (table 46). After the line is removed, the spur roads would be removed and returned to preconstruction conditions; there would be no permanent impacts on wetlands. No periodic maintenance would be required; after construction, wetland areas would no longer be impacted by tree removal from vegetation. Therefore, approximately 8.4 acres of wetlands in the B-K Line ROW would be expected to recover under alternatives 3, 4, and 5. Although the B-K Line from the Bushkill Substation to the eastern boundary of DEWA would be removed and revegetated, and all construction activities would be short term, the prior maintenance of the B-K Line ROW and the spur roads would cause disturbance to persist for the period of analysis. While the forested wetlands would not become a fully functioning in the period of analysis of this EIS, the process would begin and would be a beneficial impact.

Alternative 3

Numerous small emergent wetland areas exist in the existing transmission line ROW under alternative 3 but would generally not be affected by construction activities or vegetation maintenance because they are herbaceous plant species that are compatible with the applicant's specifications for vegetation clearing and control. Three wetland areas in the alternative 3 corridor would be adversely affected under this alternative:

- Wetland 8 is a small PEM wetland in the corridor that is vegetated predominantly with sphagnum moss. Adverse impacts would occur on 0.02 acre of wetland 8 because an access road would be constructed through the wetland. The hydrology of this wetland arises from a seep, so impacts on this wetland as a result of an alteration of hydrology from access roads and other construction activities in the wetland are possible due to ponding and/or impoundment of water. As stated under "Common to All Action Alternatives," site preparation and construction of the access roads as well as the use of heavy equipment would disturb the wetland functions and values.
- Wetland 10 is a PSS wetland in the corridor of alternative 3. Some of the plant species in the wetland are incompatible shrub / small tree species (red maple) that would be removed by hand clearing for construction and maintenance activities. Impacts from clearing shrubs / small trees would occur on 0.29 acre of the wetland.
- NWI-3 is a PFO wetland in the corridor of alternative 3 that supports evergreen and deciduous species. Approximately 1.43 acres of NWI-3 would be adversely affected as a result of vegetation clearing and tree removal. Removing trees in this wetland would convert it from a forested wetland to a scrub shrub and/or emergent wetland. Because this wetland is seasonally flooded, habitat conversion of this forested wetland could impact the hydrology of the wetland because fewer trees (biomass) would exist in this wetland.

In addition to wetland impacts in the alternative 3 corridor, wetland vegetation along the B-K Line corridor would be affected along the portion of alternative 3 from the Bushkill Substation to the western boundary of DEWA. Vegetation would be cleared and maintained, and access roads would be required to upgrade the line for alternative 3. Therefore, vegetation would be removed from wetland CC from an area in the ROW totaling approximately 0.21 acre. A very small portion (0.06 acre) of the proposed access road would be constructed in the 50-foot wetland AA buffer, and a very small portion (0.03 acre) would be constructed in the wetland CC buffer. There would be no direct impacts on wetland AA, but there would be indirect impacts to the wetland buffer as a result of construction of access roads adjacent to the wetland.

Under alternative 3, general impacts on wetland functions and values as a result of construction and removing shrubs/trees would be similar to those discussed in detail under alternative 2, although total impacts (acreage) would be far less. Overall, alternative 3 would adversely affect wetlands due to

vegetation clearing that would result in the loss of 1.93 acres of wetlands and due to the construction of access roads that would result in the loss of 0.02 acre of wetlands. Wetlands in rare or unique communities would not be affected under alternative 3. Indirect impacts on the 50-foot wetland buffer (0.09 acre) and temporary wetland impacts from spur roads (approximately 0.53 to 0.67 acre) would also occur under alternative 3. Approximately 8.4 acres of wetlands would be allowed to recover through the revegetation of the B-K Line. Although the B-K Line from the Bushkill Substation to the eastern boundary of DEWA would be removed and revegetated and all construction activities would be short term, the regular maintenance of the alternative 3 ROW and the access roads would cause disturbance to occur throughout the period of analysis. Therefore, the trees cleared under alternative 3 would never be allowed to mature in the ROW and would not recover during the period of analysis to return to a fully functioning forested wetland. Overall, alternative 3 would result in adverse impacts on wetlands.

Cumulative Impacts

Cumulative impacts on wetlands inside the study area from other past, present, and reasonably foreseeable projects would be adverse, as described previously in the "Cumulative Impacts Common to All Alternatives" section. When the adverse impacts on wetlands as a result of alternative 3 are combined with the other projects in the study area, an overall adverse cumulative impact would be expected. Alternative 3 would not alter the level of impact.

Conclusion

In the study area, alternative 3 would result in direct adverse impacts on forested wetlands through conversion to scrub shrub and/or emergent wetlands during ROW clearing and as a result of the construction of access roads in wetland areas. Overall, alternative 3 would cause adverse impacts on wetlands due to construction activities and vegetation clearing that would result in the loss of 1.93 acres of forested wetlands through conversion to scrub shrub and/or emergent wetlands during ROW clearing and due to the construction of access roads that would permanently impact 0.02 acre of wetlands. Wetlands in rare or unique communities or *Exceptional Value Wetlands* would not be permanently affected under alternative 3. When the adverse impacts on wetlands as a result of alternative 3 are combined with other past, present, and reasonably foreseeable projects in the study area, an overall adverse cumulative impact would be expected.

Alternative 3 would impact the least acreage of any of the action alternatives and would not permanently affect any rare and unique communities or *Exceptional Value Wetlands.* Alternative 3 would have adverse impacts to other wetlands such as loss of habitat functions due to removal of forest cover and possible changes in hydrology, and potential introduction of invasive species. However, the adverse impacts of alternative 3 would not likely be significant because of the relatively small area affected and because this alternative completely avoids rare, high-quality wetlands. Removal of the existing B-K Line under alternative 3 would have beneficial impacts by restoring rare and unique communities and *Exceptional Value Wetlands* to natural conditions, offsetting some of the adverse impacts to wetlands that would result from construction of the line along the alternative 3 route.

Permitting the project would adversely affect multiple protected resources inside the parks, in some instances irreversibly. Allowing such adverse effects in order to facilitate private infrastructure expansion would be contrary to NPS practice and principle of protecting and improving these resources, and of removing incompatible infrastructure to do so. This could establish precedent that may invite similar proposals by other applicants in the future, and create an expectation of like treatment for those proposals; it may make it difficult to deny such proposals. DEWA and APPA both contain numerous other utility crossings, which makes the risk of such precedent particularly concerning for these parks. Furthermore, as units of the national park system, wherein all parks are entitled to equal protection, creating such a

precedent could have ramifications for parks nationwide. However, it would also set a precedent for routing utilities around MDSR and to the edges of DEWA.

Alternative 4

Three wetland areas (wetland 1, wetland 2, and NWI-4) were identified in the study area for alternative 4 within the boundaries of DEWA and APPA.

Wetlands 1 and 2 are contiguous PFO wetlands in the proposed ROW. Approximately 1.77 acres of wetland 1 and 0.71 acre of wetland 2 would be adversely affected as a result of vegetation clearing and tree removal under alternative 4. Both wetlands support red maple, which is an incompatible shrub/tree species that would be cleared/removed. In addition, approximately 1.83 acres of wetland NWI-4 (a PFO/PSS wetland) would also be adversely affected by vegetation clearing and tree removal in the proposed ROW. Alternative 4 would adversely affect approximately 4.31 acres of forested wetlands (wetland 1, wetland 2, and NWI-4), not including wetlands affected by removal of the B-K Line from the Bushkill Substation to the western boundary of DEWA, as described below. In addition to vegetation clearing and tree removal, adverse impacts would occur on 0.01 acre of wetland 2 and 0.08 acre of wetland NWI-4 from access road construction activities in the wetlands. Other impacts from construction activities under alternative 4 would be similar to those discussed under "Common to All Action Alternatives," including specified BMPs to minimize impacts.

Additionally, the impacts to wetlands in the proposed ROW from the Bushkill Station to the western boundary of DEWA (along the B-K Line), would be the same as those described for alternative 3. Ultimately, 0.21 acre of wetland CC would be adversely affected by vegetation removal, and the construction of proposed access roads would affect 0.06 acre of the 50-foot wetland AA buffer and 0.03 acre of the wetland CC buffer.

General impacts on wetland functions and values as a result of construction and removing shrubs/trees for alternative 4 would be similar to those discussed in detail under alternative 2, although total impacts (acreage) would be less. Overall, alternative 4 would affect wetlands due to construction activities and vegetation clearing that would result in the total loss of 4.52 acres of wetlands through conversion to scrub shrub and/or emergent wetlands and due to access roads that would permanently affect 0.09 acre of wetlands. Wetlands in rare or unique communities would not be affected under alternative 4. Indirect impacts on the 50-foot wetland buffer (0.09 acre) and temporary wetland impacts from spur roads (approximately 0.53 to 0.67 acre) would also occur under alternative 4. Approximately 8.4 acres of wetlands would be allowed to recover through the revegetation of the B-K Line, which would move large infrastructure to the margins of DEWA. Although the B-K Line from the Bushkill Substation to the eastern boundary of DEWA would be removed and revegetated and all construction activities would be short term, the regular maintenance of the alternative 4 ROW and the access roads would cause disturbance to occur throughout the period of analysis. Therefore, the trees cleared under alternative 4 would never be allowed to mature in the ROW and would not recover during the period of analysis to become a fully functioning forested wetland. Overall, alternative 4 would result in adverse impacts on wetlands.

Cumulative Impacts

Cumulative impacts on wetlands inside the study area from other past, present, and reasonably foreseeable projects would be adverse, as described previously in the "Cumulative Impacts Common to All Alternatives" section. When the adverse impacts on wetlands as a result of alternative 4 are combined with the other projects in the study area, an overall adverse cumulative impact would be expected. Alternative 4 would not alter the level of impact.

Conclusion

Inside the study area, alternative 4 would result in adverse impacts on wetlands due to conversion of forested wetlands to scrub shrub and/or emergent wetlands during ROW clearing and as a result of the construction of access roads in wetland areas. Overall, alternative 4 would affect wetlands due to construction activities and vegetation clearing that would result in the total loss of 4.52 acres of wetlands from conversion and due to access roads that would result in the loss of 0.09 acre of wetlands. Wetlands in rare or unique communities or *Exceptional Value Wetlands* would not be permanently affected under alternative 4. When the adverse impacts on wetlands as a result of alternative 4 are combined with other past, present, and reasonably foreseeable projects in the study area, an overall adverse cumulative impact would be expected.

Alternative 4 would result in changes in wetland functions and values by altering habitat types and may degrade some wetland functions by altering hydrology through construction activities. Alternative 4 would not permanently affect rare and unique wetland communities but would impact one *Exceptional Value Wetland* by converting existing vegetation to a different cover type, resulting in a change in functions and values that may affect the exceptional quality of the wetland. Thus, although alternative 4 would have considerably fewer adverse impacts than alternatives 2 or 2b, the adverse impacts of alternative 4 may also be significant because of the intensity of the impacts to an *Exceptional Value Wetland* when considered in the context of wetland protection laws and policies.

Permitting the project would adversely affect multiple protected resources inside the parks, in some instances irreversibly. Allowing such adverse effects in order to facilitate private infrastructure expansion would be contrary to NPS practice and principle of protecting and improving these resources, and of removing incompatible infrastructure to do so. This could establish precedent that may invite similar proposals by other applicants in the future, and create an expectation of like treatment for those proposals; it may make it difficult to deny such proposals. DEWA and APPA both contain numerous other utility crossings, which makes the risk of such precedent particularly concerning for these parks. Furthermore, as units of the national park system, wherein all parks are entitled to equal protection, creating such a precedent could have ramifications for parks nationwide. However, it would also set a precedent for routing utilities around MDSR and to the edges of DEWA.

Alternative 5

Inside the study area, alternative 5 would follow the same route through DEWA and APPA as alternative 4, with the exception of the portion of the B-K Line from the Bushkill Station to the western boundary of DEWA. Alternative 5 would adversely affect approximately 4.31 acres of forested wetlands (wetland 1, wetland 2, and NWI-4). Additionally, the construction of access roads would adversely affect 0.09 acre of wetlands under alternative 5 (wetland 2 and NWI-4).

Overall, alternative 5 would affect wetlands due to construction activities and vegetation clearing that would result in the loss of a total of 4.31 acres of wetlands through conversion to scrub shrub and/or emergent wetlands and due to access roads that would permanently affect 0.09 acre of wetlands. Wetlands in rare or unique communities would not be affected under alternative 5. Although the B-K Line from the Bushkill Station to the eastern boundary of DEWA would be removed, all construction activities would be short term and 8.4 acres of wetlands would be allowed to recover. The regular maintenance of the alternative 5 ROW and the access roads would cause disturbance to occur throughout the period of analysis. Therefore, the trees cleared under alternative 5 would never be allowed to mature in the ROW, which would prevent these wetland areas from becoming a fully functioning forested wetland. Overall, alternative 5 would result in adverse impacts on wetlands.

Cumulative Impacts

Cumulative impacts on wetlands inside the study area from other past, present, and reasonably foreseeable projects would be adverse, as described previously in the "Cumulative Impacts Common to All Alternatives" section. When the adverse impacts on wetlands as a result of alternative 5 are combined with the other projects in the study area, an adverse cumulative impact would be expected. Alternative 5 would not alter the level of impact.

Conclusion

Overall, alternative 5 would result in adverse impacts on wetlands due to construction activities and vegetation clearing that would result in the total loss of 4.31 acres of wetlands through conversion to scrub shrub and/or emergent wetlands and due to access roads that would permanently affect 0.09 acre of wetlands. Wetlands in rare or unique communities or *Exceptional Value Wetlands* would not be affected under alternative 5. When the adverse impacts on wetlands as a result of alternative 5 are combined with other past, present, and reasonably foreseeable projects in the study area, an overall adverse cumulative impact would be expected.

Alternative 5 would affect slightly fewer acres of wetlands than alternative 4 but would result in similar changes in wetland functions and values by altering habitat types and may degrade some wetland functions by altering hydrology through construction activities. Alternative 5 would not affect any rare or unique wetland communities but, like alternative 4, would impact one *Exceptional Value Wetland* by converting existing vegetation to a different cover type, resulting in a change in functions and values that may affect the exceptional quality of the wetland. Thus, although alternative 5 would have slightly fewer adverse impacts than alternative 4 and considerably less adverse impacts than alternatives 2 or 2b, the adverse impacts of alternative 5 may also be significant because of the intensity of the impacts to an *Exceptional Value Wetland* when considered in the context of wetland protection laws and policies.

Permitting the project would adversely affect multiple protected resources inside the parks, in some instances irreversibly. Allowing such adverse effects in order to facilitate private infrastructure expansion would be contrary to NPS practice and principle of protecting and improving these resources, and of removing incompatible infrastructure to do so. This could establish precedent that may invite similar proposals by other applicants in the future, and create an expectation of like treatment for those proposals; it may make it difficult to deny such proposals. DEWA and APPA both contain numerous other utility crossings, which makes the risk of such precedent particularly concerning for these parks. Furthermore, as units of the national park system, wherein all parks are entitled to equal protection, creating such a precedent could have ramifications for parks nationwide. However, it would also set a precedent for routing utilities around MDSR and to the edges of DEWA.

VEGETATION

In this section, impacts on vegetation communities are evaluated. The overall analysis includes an evaluation of the potential for reduction of community diversity and vitality, as well as the potential for the spread of invasive species.

METHODOLOGIES

Maps showing vegetation cover in DEWA (PNHP 2006) were consulted, and vegetation studies (NPS 2011b) were conducted to identify baseline conditions and composition in the study area. The analysis of vegetation considered that changes in plant community size, integrity, or continuity could occur as a result of the implementation of various proposed activities. This analysis included an evaluation of the

potential for proposed actions to favor the establishment and/or expansion of invasive species. All proposed actions are described in detail in chapter 2, including initial vegetation clearing; construction, operation, and maintenance of the transmission line; and vegetation maintenance along the ROW.

Aerial images (ESRI 2008) were used to determine the following inside the study area: the acreages of maintained utility ROWs; the amount of forested habitat that would initially be removed to prepare for construction for the expanded ROWs; the amount of vegetation that would be permanently lost due to features of the transmission line; and the amount of mature forest that would be permanently replaced by maintained scrub shrub. Although mitigation measures would decrease the severity of impacts from construction, operation, and maintenance activities, plant communities would be subject to direct impacts, disturbance, and effects from invasive species.

Resource-specific context for assessing impacts to vegetation includes the following:

- Vegetation is part of the larger, continuous, diverse ecosystem within the Delaware River valley.
- Vegetation is the basis of the ecological community, meaning that other important resources depend on vegetation.

STUDY AREA

The study area for vegetation includes the ROW proposed for each alternative and any areas outside the corridors where necessary pulling and splicing sites, staging areas, and access road development are proposed or would be expected. Because the location of the S-R Line outside the study area cannot be determined at this time, the indirect impacts on vegetation cannot be evaluated per alternative. The potential impacts outside the study area are generally addressed; however, further surveys may be needed prior to construction of the S-R Line.

CUMULATIVE IMPACTS COMMON TO ALL ALTERNATIVES

Actions inside and outside the parks can affect native vegetation communities. Alterations to and permanent loss of vegetation communities can occur as a result of removal for construction, fire suppression, and the establishment or spread of nonnative, invasive species that compete with native plant species. These actions can alter the diversity and abundance of native vegetation communities and lead to loss of habitat continuity. Past, present, and reasonably foreseeable activities that have beneficial or adverse impacts on plants and vegetation communities inside and outside the study area are listed below and discussed under each alternative as applicable. A complete list of projects that may contribute to cumulative impacts both inside and outside the study area can be found in appendix H.

Projects Inside the Study Area

Inside the study area, projects that would result in adverse cumulative impacts on vegetation include the following visitor access, road, and utility projects: the New Jersey Swim Beach construction (construction of new facilities), the PADOT SR 2001 road project (road reconstruction), the US Route 209 rehabilitation and replacement of Toms Creek Bridge (road and bridge repair), the Appalachian Trail relocation near the Columbia Gas Pipeline Crossing (pipeline upgrade), the Metropolitan Edison enhanced vegetation management program (for transmission lines), the Tennessee Gas Line Proposal (addition to an existing gas pipeline), the Columbia Gas Transmission Company pipeline (replacement of an existing gas pipeline), Central Jersey Power and Light vegetation maintenance (for transmission lines), and the Northeast Supply Link Expansion (Palmerton Loop gas pipeline). Illegal activities such as off-road vehicle (ORV) use, flora collection, and woodcutting also adversely affect vegetation. These projects

and actions would result in adverse impacts on vegetation communities through ground disturbance, soil compaction, vegetation loss, alteration of habitat, fragmentation of habitat, alteration of the natural process of succession, potential colonization by invasive plant species, and the potential spread of invasive insect species. The full impact on vegetation and habitat from the Marcellus shale natural gas drilling is still unknown, but the project would likely cause the removal or disturbance of vegetation in some locations, depending on the area under development.

Projects inside the study area that could result in beneficial cumulative impacts on vegetation include construction projects, restoration projects, fire management, and agricultural leases. Construction projects (sustainable comfort stations, hazardous structure demolition/deconstruction, and Metropolitan Edison removal of unused power poles and transformers) would restore previously disturbed areas to natural conditions. Restoration projects inside the study area (the rehabilitation of Childs Park, the restoration of flood-damaged river campsites, the realignment of McDade Trail, parkwide invasive species control programs, the Wildlife Habitat Incentive Program, and important bird area / important mammal area [IBA/IMA] programs) would collectively work to restore areas to natural conditions, prevent further impacts on vegetation from human activity, preserve and improve critical habitat, and reduce the spread of invasive species. Agricultural permits could preserve open space and habitat. Prescribed burns could perpetuate native plant species, control invasive species, and maintain natural habitat. Additionally, several land protection programs could protect vegetation communities. The beneficial effects of many of the listed programs are dependent on the availability of funding for specific projects, which is uncertain and could vary throughout the period of analysis: therefore, the level of benefit resulting from the implementation of any project is also variable.

Overall cumulative impacts on vegetation inside the study area from these projects/actions would be adverse.

Projects Outside the Study Area

Outside the study area, projects that would result in adverse cumulative impacts on vegetation include the following road and utility projects: the Marshalls Creek traffic relief project (new bypass route), the US Route 209 rehabilitation and replacement of Toms Creek Bridge (road and bridge repair), the Tennessee Gas Line Proposal (addition to an existing gas pipeline), Marcellus shale natural gas drilling, the Columbia Gas Transmission Company pipeline (replacement of an existing gas pipeline), and the PFBC natural gas leasing and water access programs. Proposed residential and commercial developments in New Jersey and Pennsylvania would also cause adverse impacts on vegetation. The impacts on vegetation and habitat from the Marcellus shale natural gas drilling and the PFBC natural gas leasing and water access programs are still unknown.

Beneficial impacts on vegetation would result from the following projects: the DEWA prescribed-burn program, the Pennsylvania weed eradication program, the Wildlife Habitat Incentive Program, and IBA/IMA programs. Several land protection programs could provide beneficial impacts on vegetation. The implementation of these programs may be dependent on funding availability, which is uncertain and may vary from year to year throughout the period of analysis. As a result, the beneficial impacts expected from the implementation of these programs could also vary.

The impacts on vegetation from these projects would be the same as those described for projects inside the study area. Therefore, cumulative impacts on vegetation outside the study area would be adverse.

IMPACTS OF THE ALTERNATIVES ON VEGETATION

The construction and operation of the S-R Line could produce impacts on vegetation communities including the removal of vegetation, the maintenance of vegetation along the proposed ROW, and the facilitation of the establishment and spread of invasive species. Forest fragmentation is also a potential impact, and it is discussed in the "Landscape Connectivity, Wildlife Habitat, and Wildlife" section.

Common to All Alternatives

Vegetation Maintenance: PPL and PSE&G, as separate utilities operating in different states, have separate vegetation management plans; however, vegetation management for both utilities would occur annually, at minimum. Vegetation maintenance sustains habitat in the existing ROW as scrub shrub using selective clearing. Additionally, vegetation maintenance would include removal of danger trees that could interfere with the transmission lines. The details of the vegetation management plans and techniques for clearing vegetation are explained in chapter 2. The NPS considers the applicant's current vegetation management plans to be insufficient, and the NPS would require a NPS-specific, NPS-approved vegetation management plan. The impacts of vegetation maintenance are discussed under each alternative.

Invasive Species: Under all alternatives, invasive plant and wildlife species have the potential to spread as a result of vegetation removal and disturbance. Additionally, new invasive species may colonize an area where they were previously absent. Across all 50 states, invasive plants spread at an estimated annual rate of 14 million acres (NWRA 2002, 4). In western federal lands, conservative estimates of aggregate invasive plant spread range from 10% to 15% per year (Asher and Dewey 2005.). The colonization and spread of invasive plant species causes considerable problems, including competing with native species, contributing to species extinctions, altering the structure of natural plant communities, and disrupting ecosystem functions.

Before the initiation of construction, the applicant would design management guidelines for invasive plant species to be included in their vegetation management plans (explained in detail in appendix F). These guidelines, which would include regular monitoring and treatment of key invasive plant species, would also require approval by the NPS prior to implementation. The invasive species management guidelines included in the applicant's vegetation management plans would be the primary mechanism for preventing and managing the spread of invasive plant species in and adjacent to the ROW.

In addition to the applicant's vegetation management plans, the Eastern Rivers and Mountains Network has an early detection monitoring program to provide early identification and treatment of invasive species before they become widespread in a park, as described in the "Invasive Plant Species" section of chapter 3.

Invasive plant species are currently present in the existing ROWs and surrounding habitats of each alternative alignment. The invasive species present and the abundance of those species vary depending on the conditions in the vegetation communities along the ROW of each alternative route. Revegetating cleared and disturbed areas with native plant seeds, continued monitoring through the applicant's vegetation management plans, and to a lesser degree, the Eastern Rivers and Mountains Network early detection program would help manage the spread of invasive species in cleared and disturbed areas; however, the vegetation communities would be adversely affected by the proposed actions.

Three invasive, nonnative terrestrial insect species have the potential to affect vegetation communities in the study area: hemlock woolly adelgid, European gypsy moth, and emerald ash borer. The hemlock wooly adelgid and the European gypsy moth are present within the study area; therefore, it is not likely that these species would be spread by maintenance activities. All life stages of the emerald ash borer, but

especially egg and larval stages, could be inadvertently spread during construction and maintenance activities, resulting in opportunities for new infestations throughout the study area. Mechanisms that could contribute to the spread of invasive insects include ground disturbance, mulching, the transport of mulch for use in other areas, and the transport of equipment used during vegetation removal. Trees that remain in place but are injured during construction activity could become more susceptible to new infestations of nonnative, invasive insect species. Management programs in place to minimize damage from infestations, such as the Eastern Rivers and Mountains Network early detection monitoring program, would reduce the adverse effects of nonnative, invasive insects; however, vegetation communities would be indirectly affected because of the periodicity and varying intensity of infestations.

Mitigation Measures: Mitigation measures would reduce impacts from construction, operation, and maintenance activities and are described in chapter 2 and appendix F. None of the mitigation measures would eliminate impacts on vegetation; however, they would reduce the impacts on vegetation communities by decreasing the loss of native vegetation, controlling the spread of invasive species, protecting native vegetation and sensitive communities, and restoring disturbed areas after construction.

Outside the Study Area: Outside the study area, regardless of which alternative is selected, the transmission line could pass through Carbon, Lackawanna, Luzerne, Monroe, Northampton, Pike, and Wayne counties in Pennsylvania and Morris, Sussex, and Warren counties in New Jersey. These counties are largely undeveloped and contain a variety of habitats. Habitat types that could be encountered in these counties include forest and woodland vegetation communities, riparian and wetland systems, and land altered by human activities such as development or agriculture. These habitat types are described in detail according to dominant vegetation characteristics in the "Vegetation" section of chapter 3.

The clearing, construction, and vegetation maintenance activities outside the study area would be consistent with those described for inside the study area; however, the direct impacts outside the study area cannot be determined, as described in the introduction of this chapter. In addition, specific resource impacts outside the study area cannot be identified until the route is chosen by the applicant. Once this decision is reached, additional surveys would be required to determine the type of vegetation that would be affected along the selected route.

Vegetation communities outside the study area would be adversely affected by vegetation clearing, construction, the operation and maintenance of the transmission line, vegetation maintenance, and the potential spread of invasive species. Indirect impacts may vary in intensity depending on the location, the habitat type, the condition of the existing vegetation, and the extent of activity.

Cumulative impacts on vegetation outside the study area would be adverse, as described previously in the "Cumulative Impacts Common to All Alternatives" section. When the adverse impacts on vegetation as a result of activities outside the study area are combined with other past, present, and reasonably foreseeable projects in the study area, an overall adverse cumulative impact would be expected.

Alternative 1: No Action

All impacts on vegetation under alternative 1 would be associated with vegetation maintenance activities along the existing B-K Line ROW. Selective clearing to maintain vegetation would continue under alternative 1. Based on aerial photographs (ESRI 2008), the existing ROW ranges from approximately 80 to 100 feet wide and includes 84 acres in the study area, with 63 acres inside NPS boundaries; this area would continue to undergo selective clearing under alternative 1. The full impact of danger tree removal is uncertain because the number and location of danger trees cannot be estimated. Maintenance activities, including the removal of danger trees, would disturb vegetation, including vegetation in rare and unique communities. Vegetation maintenance by selective clearing would retain compatible species and remove

only those that would pose a risk to the security of the transmission lines; therefore, maintenance would not have an overall effect at the population level or on the viability of the plant communities.

Ground disturbance from maintenance activities, especially tree removal, could facilitate the spread of invasive plant species. Currently, the invasive species in the ROW are uncontrolled and spreading. The applicant would monitor invasive plant species through the NPS-approved vegetation management plan (described in appendix F). Overall, the impacts on vegetation under alternative 1 from vegetation maintenance, including tree removal, and the spread of invasive species would be adverse.

Cumulative Impacts

Cumulative impacts on vegetation from past, present, and reasonably foreseeable projects inside the study area would be adverse, as described previously in the "Cumulative Impacts Common to All Alternatives" section. When the adverse impacts on vegetation as a result of alternative 1 are combined with the other projects inside the study area, an overall adverse cumulative impact would be expected. Alternative 1 would not alter the level of impact.

Conclusion

Under alternative 1 inside the study area, vegetation maintenance activities would have localized effects on vegetation but the functionality of the plant communities would not be affected. Additionally, indirect impacts would result from artificially maintaining scrub shrub habitat in the parks, which is inconsistent with NPS protection of natural, scenic, and recreational resources. Adverse impacts would result from the continued operation of the existing transmission line due to vegetation maintenance and from the spread of invasive plant species. The effects of past, present, and reasonably foreseeable projects, when combined with the adverse impacts on vegetation under alternative 1, would result in adverse cumulative impacts on vegetation inside the study area.

Under alternative 1, the only change would be the result of the applicant's new vegetation management standards, leading to more clearing of vegetation within the ROW than is the case now or has been the case historically. The majority of the adverse impacts of alternative 1 would be confined to the limits of the present ROW. However, under current ROW vegetation management activities the applicant is cutting danger trees. The applicant defines danger trees as those that, in falling, would either strike the conductor or pass within the minimum conductor clearance, which is 6 feet for 230-kV transmission lines and 10 feet for 500-kV transmission lines (PPL 2011, 7). The applicant contends that they can cut danger trees on federal land outside their deeded right. Disagreement over this issue between the NPS and PPL resulted in a court settlement in August 2010. This controversy is not, strictly speaking, a public one over the effects of the applicant's actions, but is an area of disagreement that would remain unresolved under alternative 1. Many of the adverse impacts and possibly the controversy associated with danger tree cutting may be reduced or eliminated with the development of a park-specific, NPS-approved vegetation management plan. Thus, while alternative 1 would result in adverse impacts on vegetation associated with the continued operation and maintenance of the existing B-K Line, the intensity of these impacts considered in the context of vegetation protection and management would likely not be significant.

Common to All Action Alternatives

Removal of Existing Structures: All action alternatives would involve the removal of all or a portion of the B-K Line, as discussed in chapter 2. For all action alternatives, the B-K Line structures would be removed but the foundations for these structures would remain in place. For alternatives 2 and 2b, the S-R Line would be constructed along the same alignment. The removal of the structures would require constructing access roads (either permanent or temporary, depending on the alternative). The removal of

the B-K Line would require constructing access roads, wire pull sites, and the removal of the line as described in chapter 2. Because access roads would also be required for the construction and long-term maintenance of the new line, adverse impacts from removing the line would be the same as (or less than) the impacts discussed for construction of the S-R Line.

Vegetation Clearing: For the analysis of impacts on vegetation, it was assumed that a 350-foot corridor would be cleared of vegetation for the construction of the new double 500-kV transmission line for alternatives 2, 3, 4, and 5. For alternatives 2, 3, 4, and 5, the corridor would be cleared 175 feet from the centerline of the existing ROW to either side. Under alternative 2b, the applicant proposes to operate the S-R Line within the existing ROW. The NPS anticipates that the applicant would require additional area for construction; therefore, it is estimated that under alternative 2b, the applicant would expand the ROW to the extent of their deeded property rights, which ranges from 100 feet to 380 feet. For alternative 2b, the ROW would be cleared on either side of the centerline to an appropriate width based on the deeded property rights.

In addition to vegetation clearing inside the ROW, areas outside of the ROW would also need to be cleared for all action alternatives to construct the access roads, spur roads, and pulling and splicing sites.

Areas cleared for access roads (inside and outside the ROW) and tower foundations (inside the ROW) would be maintained permanently and would result in a permanent loss of vegetation. All other cleared areas would be seeded after construction with an NPS-approved conservation seed mixture appropriate to the local conditions. The area within the ROW maintained for operation is less than that which would be cleared for construction. Areas both inside and outside the ROW that do not need to be maintained for operation of the S-R Line would be allowed to succeed to forested area over time. Because mature forest removed for construction would not be replaced within the 15-year analysis period covered by this EIS, the impacts would be considered permanent for the analysis in this EIS.

The successful restoration of the land temporarily cleared and/or disturbed for construction but not needed for the operation of the S-R Line could be hindered by impacts on soils sustained during the construction of the S-R Line, despite the regrading of the surface soils. The use of heavy construction equipment and the construction and use of access roads would compact the underlying soil. Compaction can cause damage to soil structure, which determines the ability of a soil to hold and conduct water, nutrients, and air necessary for plant root activity and growth (UM 2001, 1). Additionally, the removal of near-surface soils may have unfavorable consequences on productivity, adversely affecting the successful revegetation of disturbed areas. Monitoring and maintenance of revegetated areas under the applicant's vegetation management plans would need to be implemented to ensure that vegetation restoration is successful.

The impacts from vegetation clearing are discussed for each alternative because the amount of clearing for each is different.

Construction Components: Construction activities are described in detail in chapter 2; the activities that would affect vegetation include the construction of access roads, spur roads, tower foundations, crane pads, wire pull locations, pulling and splicing sites, and staging areas. Construction of these components would result in temporary or permanent loss of vegetation, as described above in "Vegetation Clearing."

Alternative 2

Inside the study area, clearing and construction activities along the alternative 2 alignment would result in ground disturbance, soil compaction, and the physical removal of vegetation. Vegetation clearing would be nearly complete in the 350-foot corridor, with exceptions in sensitive areas such as wetlands and the Delaware River riparian corridor, which would be avoided to the extent feasible (PPL and PSE&G

2008, 7). Vegetation clearing would be implemented as described in the "Vegetation Clearing" section of chapter 2. Once the vegetation is cleared, temporary and access roads, tower foundations, crane pads, and pulling and splicing sites would be constructed.

The approximate acreages of vegetation that would be affected by the construction of the S-R Line in the study area for all the action alternatives are presented in table 47. Approximately 240 acres would be cleared initially in the ROW under alternative 2, with approximately 129 acres of this identified as mature forest. Pulling and splicing sites would be constructed outside the 350-foot corridor, resulting in approximately 22 acres of forest cleared for these sites and the associated spur roads; trees surrounding the pulling and splicing sites would be trimmed but not removed (unless unavoidable) to allow for construction activities. Approximately 9.6 acres of vegetation would be permanently lost through the development of access roads under alternative 2. In areas of steep topography in Pennsylvania, access roads would extend outside the proposed ROW into forested areas due to the topography. The placement of the access roads outside of the ROW would also help to reduce impacts to sensitive resources, such as wetlands (e.g., Arnott Fen) and waterways (e.g., Van Campen Brook). Approximately 6.2 acres of access roads would be inside the 350-foot corridor and 3.4 acres would be outside the corridor (see figures 28 and 29 in chapter 3).

Inside the study area, 84 acres of scrub shrub habitat are currently maintained in the existing B-K Line ROW to avoid contact with the transmission lines. Under alternative 2, the expanded ROW would be maintained at an operational width of 200 feet, increasing the acreage of maintained scrub shrub habitat to approximately 129 acres. The area of maintained scrub shrub within NPS boundaries would increase approximately 43% (from 63 acres to 101 acres). Occasionally, trees in the ROW and danger trees outside the ROW would be removed, which would add to the area of maintained habitat. This maintenance program would result in adverse impacts on the 45 acres of previously forested area (38 acres of which is located inside the parks' boundaries) because the maintenance would prevent the vegetation from growing back to its original state. When the loss of forest from the expanded ROW is combined with the loss of forest from construction of access roads outside the ROW, 48 acres of forest would be permanently lost under alternative 2. Vegetation clearing and construction activities in the study area under alternative 2 would result in a net loss of vegetation. The effects from clearing and construction activities would be measurable and perceptible, and some reduction in the abundance, diversity, and quality of native vegetation would occur.

Alternative 2 would result in approximately 5.4 miles of disturbed land in the ROW and an additional 1.9 miles of disturbed area along the access roads outside the ROW. The expansion of the ROW would expose formerly interior trees and plants to edge conditions. This vegetation would be exposed to new conditions such as an increase in sunlight and temperature, especially along an east–west-oriented ROW that would be exposed to hot afternoon sun (Manitoba Hydro 1995, 13). The composition of vegetation along the edge would change to include more sun-tolerant species, which would include invasive species such as multiflora rose, and many invasive species that tolerate a wide range of conditions would be able to spread into shaded areas of forest. Additional edge habitat would be created by the construction of the access roads, and vegetation communities along the roads could be modified in the same manner as the vegetation in the ROW. Invasive species are often strongly associated with access roads (Mortensen et al. 2009). Seeds can be spread long distances during the construction and maintenance of access roads and vegetation maintenance activities. With the implementation of the vegetation management plan for plants and mitigation measures to protect against the spread of invasive insect species as described in chapter 2 and appendix F, the impacts on vegetation from invasive species under alternative 2 would be minimized.

TABLE 47: APPROXIMATE ACREAGES OF VEGETATION AFFECTED BY CONSTRUCTION AND OPERATION OF THE S-R LINE IN THE STUDY AREA

Impacts	Alternatives					
	1	2	2b	3	4	5
Acres of vegetation loss from expanding the ROW for construction (including area currently maintained)[a]	0	240	144	313	113	74
Acres of mature forest cleared in the expanded ROW	0	129	42	204	70	44
Acres of permanent vegetation loss from construction of access roads inside the ROW corridor	0	6.2	4.9	4.7	2.0	1.4
Acres of permanent vegetation loss from construction of access roads outside the ROW corridor	0	3.4	4.7	1.6	0.9	0.3
Acres of impacts from construction of pulling and splicing sites outside the ROW corridor[b]	0	22	22	99	55	55
Acres of forest in the ROW maintained as scrub shrub over the long term in the study area[c]	0	45	23–37	85–159	31–59	25–45
Total acres in the ROW maintained as scrub shrub in the study area over the long term[c]	84	129	107–121[d]	156–230	66–94	44–64
Acres of forest in the expanded ROW maintained as scrub shrub over the long term in NPS lands in the study area[c]	0	38	18–29[d]	66–117	22–41	16–28
Total area in the expanded ROW maintained as scrub shrub in NPS lands in the study area over the long term[c]	63	101	81–92[d]	94–145	42–61	30–42
Total acres maintained as scrub shrub in NPS lands in the study area over the long term with restoration of a portion of the B-K Line[e]	N/A	N/A	N/A	Increase in maintained scrub shrub of 41–92 acres	Decrease of 11 acres to increase of 8 acres in maintained scrub shrub	Decrease in maintained scrub shrub of 11–23 acres

a. The ROWs for alternatives 2, 3, 4, and 5 would be cleared to 350 feet and the alternative 2b ROW would be cleared up to 150 feet (100 feet where constrained by easement rights).

b. This total does not include vegetation removed for spur roads. The length and location of spur roads cannot be determined at this time. The area of vegetation removed from pulling and splicing sites is estimated based on the locations of the alignments where angles occur. Two sites are needed per angle and each site would be 400 feet × 600 feet outside the ROW.

c. The ROWs for alternatives 2b, 3, 4, and 5 would be maintained at 200 to 300 feet (except where the applicant's deeded rights restrain the ROW to a narrower width under alternative 2b), resulting in a range of potential impacts on vegetation. The applicant states that alternative 2 could be constructed within 200 feet; therefore, the impacts on vegetation are limited to 200 feet as the operational width.

d. Alternative 2b would be constructed within the applicant's deeded property rights. A 0.75-mile portion of the alignment is limited to 100 feet wide. Danger trees would be removed outside of the ROW in this area. The amount of tree removal cannot be estimated at this time; however, the amount of maintained scrub shrub is expected to increase.

e. Under alternatives 3 through 5, approximately 53 acres of the existing ROW along the B-K Line within park boundaries would be restored.

Numerous rare and unique communities are present in the alternative 2 alignment and would be subject to vegetation clearing and permanent alteration of habitat, and in several instances, access roads would extend directly into sensitive habitats. Impacts on sensitive resources are discussed in the "Rare and Unique Communities" section of this chapter.

After construction, those areas needed for construction but not for operation, and the rest of the new ROW would be seeded with an NPS-approved conservation seed mixture appropriate to the region unless otherwise specified by the NPS (PPL and PSE&G 2008, 8). The areas outside the operational ROW would be allowed to succeed to natural conditions; however, the full restoration to mature forest would not be complete within the analysis period of this EIS (15 years).

Inside the study area, alternative 2 would result in a net loss of vegetation, would increase the amount of habitat artificially maintained as scrub shrub, would alter habitat types in rare and unique communities, and would facilitate the spread of invasive species. Alternative 2 would result in the permanent loss and alteration of forested habitat. Overall, the actions of alternative 2 would have adverse impacts on vegetation in the study area.

Cumulative Impacts

Cumulative impacts on vegetation from past, present, and reasonably foreseeable projects inside the study area would be adverse, as described previously in the "Cumulative Impacts Common to All Alternatives" section. The adverse impacts on vegetation as a result of alternative 2, when combined with the other projects inside the study area, would be expected to result in an overall adverse cumulative impact. Alternative 2 would not alter the level of impact.

Conclusion

Under alternative 2, adverse impacts on vegetation inside the study area would result from vegetation clearing, the construction of the proposed double 500-kV transmission line, the deconstruction of the existing transmission line, the potential spread of invasive species, and vegetation management for the operation of the S-R Line. Collectively, these impacts would reduce the abundance, diversity, and quality of native vegetation. Additionally, adverse impacts would result from artificially maintaining scrub shrub habitat in the parks, which is not consistent with NPS protection of natural, scenic, and recreational resources. However, the areas maintained by the applicant would be monitored and treated for invasive species. When the adverse impacts from alternative 2 are combined with the adverse impacts from past, present, and reasonably foreseeable projects, the cumulative impacts on vegetation would be adverse.

Alternative 2 would cross in the center part of DEWA, including the MDSR. In general, this area is one of the most undeveloped areas of the park, containing large swaths of contiguous mature forest with few manmade intrusions. This part of the park is a particularly sensitive area because it contains high concentrations of many important and unique natural features including the Arnott Fen, the Delaware River riparian corridor, eastern hemlock forests, the Hogback Ridge, the Kittatinny Ridge, and the Van Campen Brook riparian area. The amount of clearing required under alternative 2 to construct and operate the new line would reduce the abundance, diversity, and quality of native vegetation in and around the alignment. There is a high risk of introducing and spreading invasive species although the risk can be reduced through the implementation of monitoring and controls. When considered in the context of NPS policies for protection and management of vegetation in the parks, the adverse impacts of alternative 2 on vegetation would likely be significant because of the location and quality of the resource and because converting one native habitat type into a different habitat type and artificially maintaining it for purposes that are not related to park purpose and significance is contrary to what the parks strive to achieve in managing vegetation resources.

Permitting the project would adversely affect multiple protected resources inside the parks, in some instances irreversibly. Allowing such adverse effects in order to facilitate private infrastructure expansion would be contrary to NPS practice and principle of protecting and improving these resources, and of removing incompatible infrastructure to do so. This could establish precedent that may invite similar proposals by other applicants in the future, and create an expectation of like treatment for those proposals; it may make it difficult to deny such proposals. DEWA and APPA both contain numerous other utility crossings, which makes the risk of such precedent particularly concerning for these parks. Furthermore, as units of the national park system, wherein all parks are entitled to equal protection, creating such a precedent could have ramifications for parks nationwide. The location of this particular crossing through the center of DEWA could make such a precedent even more potent. Installing the S-R Line on this alignment may invite future utilities proposing to follow the same route.

Overall, the significance of the impact of alternative 2 is a result of two considerations: the particularly resource-rich area through which the alternative crosses and the potential to inflict harm to those resources because of the magnitude and duration of the adverse impacts. Although it is true that not all impacts can be predicted with great certainty, in the context of the purpose and significance for which DEWA, APPA, and MDSR were established and NPS mandates to specifically preserve the natural, cultural, and scenic resources within them, additional precautions are warranted when considering risks to these resources, many of which are of national importance. Similarly, certain resources are non-renewable, which makes any impacts to them all the more serious because they cannot be replaced if lost. And some resources are under threat by other actions and outside pressure, which in the context of the function of the parks as an “oasis” or refuge within the highly developed east coast, elevates the need to preserve and protect these scarce, sensitive resources. For these reasons, the environmental consequences of alternative 2 would be significant.

Alternative 2b

The types of impacts in the study area along the alternative 2b alignment would be the same as those identified for alternative 2: ground disturbance, soil compaction, and the physical removal of vegetation. Vegetation clearing would be nearly complete in the existing ROW, with exceptions in sensitive areas, which would be avoided to the extent feasible (PPL and PSE&G 2008, 7).

Approximately 144 acres of vegetation would be cleared in the existing ROW under alternative 2b in preparation for construction. Included in this total is approximately 42 acres of mature forest. Approximately 22 acres of forest would be cleared for pulling and splicing sites that would be constructed outside the ROW. Additionally, 9.6 acres of vegetation would be permanently removed for the construction of the access roads. Approximately 4.9 acres of access roads would be constructed in the ROW corridor, and 4.7 acres would be outside the corridor (see figures 30 and 31 in chapter 3).

Inside the study area, 84 acres of scrub shrub habitat are currently maintained in the existing B-K Line ROW. Under alternative 2b, the final width of the ROW would be maintained at 200 to 300 feet, except where the applicant’s deeded property rights restrain the ROW to a narrower width. This operational width would maintain approximately 107 to 121 acres of vegetation as scrub shrub habitat with 81 to 92 acres of this inside NPS boundaries. Under alternative 2b, approximately 23 to 37 acres of currently mature forest would be converted into artificially maintained scrub shrub habitat; 18 to 29 acres of which is located within NPS boundaries. Additionally, the removal of danger trees is a part of the applicant’s vegetation maintenance plans. The loss of mature forest through the removal of danger trees is not accounted for because the loss cannot be accurately estimated. Approximately 0.75 mile of the existing ROW in Pennsylvania is 100 feet wide. It is anticipated that danger tree removal would occur in this area, which includes the heavily forested Hogback Ridge. Construction activities and the removal of danger trees in the study area along the alternative 2b alignment would result in a net loss of vegetation,

including rare and unique communities. The widening of the ROW to the deeded width and removal of danger trees along 5.4 miles inside the study area and construction of 2.6 miles of access roads outside of the ROW would expose formerly interior trees and plants to edge conditions, as discussed for alternative 2.

After the double 500-kV transmission line is constructed, the crane pads, pulling and splicing sites, and access roads would be removed and access roads would be reduced to 15 feet wide; these areas and the rest of the new ROW would be seeded with an NPS-approved conservation seed mixture containing native plant species appropriate to the region unless otherwise specified by the NPS (PPL and PSE&G 2008, 8). Due to soil compaction incurred during construction activities as described in the "Common to All Action Alternatives" section, restoration in these disturbed areas could be difficult despite tilling/regrading of the surface soils and would require monitoring as described in the applicant's vegetation management plans to ensure successful growth. As stated for alternative 2, the spread of invasive plant species can increase as a result of changes in vegetation composition after site clearing and access road construction and use. Although mitigation measures would be employed, there is a potential to spread invasive species along the disturbed land in the ROW (approximately 5.4 miles) and along the access roads (approximately 2.6 miles outside the ROW).

Fire hazards would exist from the operation of the double 500-kV transmission line in the existing 100-foot ROW. The 100-foot ROW is insufficient to meet the National Electric Safety Code (NESC) requirements (DEA 2010b), which state that transmission lines must not only be designed to provide adequate vertical clearance, but also to allow for adequate horizontal clearance at the edge of the ROW during high wind conditions for electrical and safety considerations. The safety clearance required around the conductors is determined by normal operating voltages, conductor temperatures, short-term abnormal voltages, windblown swinging conductors, and contamination of the insulators. Conductor displacement as a result of high winds is termed "conductor blowout." The minimum horizontal clearance to the edge of the ROW under high wind conditions to minimize the risks associated with conductor blowout was determined to be greater than 100 feet. Therefore, alternative 2b would not comply with ROW width standards for conductor blowouts. If trees are not removed beyond the 100-foot ROW, the double 500-kV transmission line could create fire hazards, especially if a conductor blowout occurs. Fires can increase the probability of recurring fires and impact biodiversity. After a fire, the dead trees fall and the remaining vegetation is open to direct sunlight, causing it to dry, thus increasing the chance of subsequent fires. Vegetation that is harmed during forest fires is more susceptible to colonization and infestation by insects, which could further disrupt the vegetation community (Nasi et al. 2002, 36).

Inside the study area, alternative 2b would result in a net loss of vegetation including areas of mature forest, would alter habitat types in rare and unique communities, and would facilitate the spread of invasive species. An unknown number of mature trees would be identified as danger trees and would be removed to ensure the reliability of the transmission line. In addition, the final operational width of the ROW is not in compliance with the NESC requirements and could increase the probability of fires. Overall, the actions of alternative 2b would have adverse impacts on vegetation in the study area.

Cumulative Impacts

Cumulative impacts on vegetation from past, present, and reasonably foreseeable projects inside the study area would be adverse, as described previously in the "Cumulative Impacts Common to All Alternatives" section. The adverse impacts on vegetation as a result of alternative 2b, combined with the other projects inside the study area, would be expected to result in an overall adverse cumulative impact. Alternative 2b would not alter the level of impact.

Conclusion

Under alternative 2b, adverse impacts on vegetation would result from vegetation clearing, the construction of the proposed double 500-kV transmission line, the potential spread of invasive species, and vegetation management (including the removal of danger trees) for the operation of the S-R Line. Collectively, these actions would reduce the abundance, diversity, and quality of native vegetation. Impacts would result from artificially maintaining scrub shrub habitat in the parks, which is not consistent with NPS protection of natural, scenic, and recreational resources. Additionally, maintaining a portion of the ROW at a width of 100 feet would increase the risk of fire from the conductors coming in contact with vegetation in high wind situations. When the adverse impacts from alternative 2b are combined with the adverse impacts from past, present, and reasonably foreseeable projects, the cumulative impacts on vegetation would be adverse.

Although alternative 2b would result in fewer acres of permanent vegetation lost than would alternative 2, alternative 2b would cross the same high-quality, sensitive vegetation resources as alternative 2 and would have a high risk of adverse impacts from fire. Therefore, for these reasons and the reasons outlined under alternative 2, alternative 2b would likely result in significant adverse impacts on vegetation.

Permitting the project would adversely affect multiple protected resources inside the parks, in some instances irreversibly. Allowing such adverse effects in order to facilitate private infrastructure expansion would be contrary to NPS practice and principle of protecting and improving these resources, and of removing incompatible infrastructure to do so. This could establish precedent that may invite similar proposals by other applicants in the future, and create an expectation of like treatment for those proposals; it may make it difficult to deny such proposals. DEWA and APPA both contain numerous other utility crossings, which makes the risk of such precedent particularly concerning for these parks. Furthermore, as units of the national park system, wherein all parks are entitled to equal protection, creating such a precedent could have ramifications for parks nationwide. The location of this particular crossing through the center of DEWA could make such a precedent even more potent. Installing the S-R Line on this alignment may invite future utilities proposing to follow the same route.

Overall, the significance of the impact of alternative 2b is a result of two considerations: the particularly resource-rich area through which the alternative crosses and the potential to inflict harm to those resources because of the magnitude and duration of the adverse impacts. Although it is true that not all impacts can be predicted with great certainty, in the context of the purpose and significance for which DEWA, APPA, and MDSR were established and NPS mandates to specifically preserve the natural, cultural, and scenic resources within them, additional precautions are warranted when considering risks to these resources, many of which are of national importance. Similarly, certain resources are non-renewable, which makes any impacts to them all the more serious because they cannot be replaced if lost. And some resources are under threat by other actions and outside pressure, which in the context of the function of the parks as an “oasis” or refuge within the highly developed east coast, elevates the need to preserve and protect these scarce, sensitive resources. For these reasons, the environmental consequences of alternative 2b would be significant.

Common to Alternatives 3, 4, and 5

Restoration of the B-K Line: For alternatives 3, 4, and 5, the portion of the B-K Line between the Bushkill Substation and the eastern boundary of DEWA would be permanently removed and the ROW would be restored, as described in chapter 2. These alternatives would restore the forest along the B-K Line (53 acres total) and create larger patches of contiguous habitat, reducing fragmentation in the core of the park. Vegetation in the existing ROW would be cleared and spur roads would be constructed for the removal process. Inside the existing ROW, approximately 53 acres of land within NPS boundaries would

be cleared of vegetation. An additional 1.1 to 1.5 acres of vegetation within NPS lands but outside the ROW would be cleared to construct the access roads. Removal of the conductors and structures and chipping the foundations below ground surface would cause ground disturbance. The use of heavy machinery during all these activities would cause further ground disturbance and soil compaction.

Following deconstruction of the B-K Line, approximately 53 acres of land disturbed by clearing and construction of the spur roads and the ROW would be restored to original conditions to the greatest extent possible. These areas would be prepared by disking or tilling as needed to mitigate soil compaction. Following soil preparation, the areas would be seeded with an NPS-approved conservation seed mixture for native species appropriate to the region and allowed to succeed naturally into forested habitat over the long term; however, soil compaction could hinder the restoration process and complete restoration of the ROW into mature forest would not occur within the period of analysis of this EIS. Although the vegetation communities would not return to mature conditions in the period of analysis of this EIS, the process would begin over 53 acres of previously disturbed area and would counteract the effects of clearing and construction under alternatives 3, 4, and 5.

Alternative 3

Impacts on vegetation in the study area would result from ground disturbance, soil compaction, the physical removal of vegetation, and the potential spread of invasive species along the alternative 3 alignment. In preparation for construction, approximately 313 acres of vegetation would be removed in the expanded ROW; approximately 204 acres of this would be mature forest (table 47). Approximately 70 of the 313 acres of vegetation removed would be from within the boundaries of Worthington State Forest, and 51 of those acres would be mature forest. An additional 99 acres of mature forest would be cleared for pulling and splicing sites and spur roads outside the 350-foot corridor, and trees surrounding the pulling and splicing sites would be trimmed as necessary to allow for construction activities.

Inside the study area, approximately 65 acres of scrub shrub habitat are currently maintained in the existing ROW for alternative 3, including 31 acres within NPS boundaries. The expanded ROW would be maintained at a width of 200 to 300 feet, increasing the acreage of maintained scrub shrub habitat to approximately 156 to 230 acres, including approximately 66 to 117 acres of currently forested area. The area of maintained scrub shrub within NPS boundaries would be increased from 31 acres to 94 to 145 acres. Access roads created in the New Jersey portion of the alternative 3 route would extend outside the proposed ROW into forested areas (see figure 32 in chapter 3) to accommodate large vehicles on steep terrain. Approximately 4.7 acres of the access roads would be located within the 350-foot corridor and 1.6 acres would be located outside the corridor. Approximately 85 to 159 acres of mature forest would be permanently altered and maintained as scrub shrub habitat after construction of the transmission line under the applicant's vegetation maintenance plans. With the loss of mature forest from the construction of the access roads outside the ROW, the total acreage of forest permanently altered to scrub shrub would increase by about 2 acres to 87 to 161 acres.

After construction, the crane pads, pulling and splicing sites, and spur roads would be removed and access roads would be reduced to 15 feet wide. These areas, those needed for construction but not for operation, and the rest of the new ROW would be seeded with an NPS-approved conservation seed mixture appropriate to the region unless otherwise specified by the NPS (PPL and PSE&G 2008, 8). The restoration of areas used only for construction would allow 50 to 150 feet of the cleared ROW to return to natural conditions. Under alternative 3, the B-K Line from the Bushkill Substation to the eastern boundary of DEWA would be decommissioned and removed, allowing the original corridor to succeed naturally into mature forest in the long term. Approximately 53 acres along the B-K Line within park boundaries would be restored. The restoration of these areas would result in a net increase in maintained scrub shrub of 41 to 92 acres under alternative 3. The full restoration to mature forest though the

restoration could be hindered by soil compaction and loss of near-surface soils, as described for alternative 2. Ultimately, the restoration of the B-K Line ROW and of areas temporarily disturbed during construction would not be complete within the analysis period of this EIS; however, the restoration process would begin, which would be valuable for the vegetation communities.

As stated for alternative 2, the spread of invasive species can increase from changes in vegetation composition after site clearing and access road construction and use. Although mitigation measures would be employed, alternative 3 would create a corridor approximately 6.9 miles long and approximately 200 to 300 feet wide that would contain newly disturbed land, which may provide favorable conditions for invasive species to spread. Additionally, new edge habitat would be created along the ROW and the 0.9 mile of access roads outside the ROW; edge effects would be the same as those described for alternative 2.

Inside the study area, alternative 3 would result in a net loss of vegetation, would increase the amount of habitat artificially maintained as scrub shrub, would alter habitat types in rare and unique communities, and would potentially facilitate the spread of invasive species over 6.9 miles. The alternative 3 alignment contains sensitive habitats that would be affected by the construction and operation activities of alternative 3; however, the variety and abundance of these habitats is less than those in the alignment for alternatives 1, 2, and 2b. Overall, the actions of alternative 3 would have adverse impacts on vegetation in the study area.

Cumulative Impacts

Cumulative impacts on vegetation from past, present, and reasonably foreseeable projects inside the study area would be adverse, as described previously in the “Cumulative Impacts Common to All Alternatives” section. When the adverse impacts on vegetation as a result of alternative 3 are combined with other projects inside the study area, an overall adverse cumulative impact would be expected. Alternative 3 would not alter the level of impact.

Conclusion

Under alternative 3, adverse impacts on vegetation inside the study area would result from vegetation clearing, the construction of the proposed double 500-kV transmission line, the potential spread of invasive species, and vegetation management for the operation of the S-R Line. These changes would result in a decline in the functionality of the plant communities by reducing biodiversity and possibly altering species composition. Adverse impacts would also result from artificially maintaining scrub shrub habitat in the parks, which is not consistent with NPS protection of natural, scenic, and recreational resources. The removal of the existing B-K Line would reduce the net area of vegetation lost and maintained as scrub shrub; however, the full restoration of the area would not be complete in the period of analysis. When the adverse impacts from alternative 3 are combined with the adverse impacts from past, present, and reasonably foreseeable projects, the cumulative impacts on vegetation would be adverse.

Alternative 3 would result in the greatest amount of permanent vegetation loss of any of the action alternatives, including the greatest loss of mature forest and conversion to scrub shrub cover. The clearing of vegetation and transition from mature forests to artificially maintained shrub scrub lands increases the potential for the spread of invasive species within the ROW and surrounding area and the parks. Mitigation measures would be implemented to help control the introduction and spread of invasive species but the extent of the clearing required for alternative 3 would greatly increase the risk that mitigation would be unsuccessful and invasive species would be spread into new areas, further impacting the vegetation communities within and surrounding the cleared areas. The restoration of the existing B-K Line would, in the long-term, have a beneficial impact on the region by restoring a large forested block

through a natural and wild area of the Middle Delaware River Valley; however, this beneficial impact does not outweigh the adverse impacts. Considered in the context of NPS policies for protection and management of vegetation in the parks, alternative 3 would likely have significant adverse impacts on vegetation.

Permitting the project would adversely affect multiple protected resources inside the parks, in some instances irreversibly. Allowing such adverse effects in order to facilitate private infrastructure expansion would be contrary to NPS practice and principle of protecting and improving these resources, and of removing incompatible infrastructure to do so. This could establish precedent that may invite similar proposals by other applicants in the future, and create an expectation of like treatment for those proposals; it may make it difficult to deny such proposals. DEWA and APPA both contain numerous other utility crossings, which makes the risk of such precedent particularly concerning for these parks. Furthermore, as units of the national park system, wherein all parks are entitled to equal protection, creating such a precedent could have ramifications for parks nationwide. However, it would also set a precedent for routing utilities around MDSR and to the edges of DEWA.

Alternative 4

Vegetation clearing inside the study area in preparation for the construction of the S-R Line under alternative 4 would remove approximately 113 acres of vegetation initially in the expanded ROW; approximately 70 acres of this would be mature forest (table 47). An additional 55 acres of forest would be cleared for pulling and splicing sites and spur roads outside the 350-foot corridor, and trees surrounding the pulling and splicing sites would be trimmed to allow for construction activities as necessary.

Because alternative 4 is located along the edge of DEWA, the forests are more fragmented than those along other alternatives. Forested areas are bordered by developed areas, paralleled by another existing ROW, and bisected by existing paved roads. Overall, the existing habitat is lower quality and contains less value than the habitat along the alignments for alternatives 1, 2, 2b, and 3.

Vegetation removal and the expansion of successional habitat in the proposed ROW would occur and would permanently alter habitat along the route. Approximately 31 to 59 acres of former mature forest would be maintained as scrub shrub habitat following construction of the S-R Line, and approximately 22 to 41 acres of this would be within DEWA and APPA boundaries. Permanent vegetation loss would occur in the ROW where tower foundations and access roads are constructed. Approximately 2.9 acres of vegetation would be permanently eliminated by the access roads under alternative 4. In some areas inside the study area, access roads would extend outside the proposed ROW into forested areas (see figure 33 in chapter 3). Approximately 2.0 acres of the new access roads would be within the 350-foot corridor and 0.9 acre would be outside the corridor. With the clearing required for permanent access roads outside the ROW, the total amount of mature forest lost would increase to 32 to 60 acres.

Inside the study area, 35 acres of scrub shrub habitat are currently maintained within the existing ROW. Vegetation maintenance would result in adverse impacts on the 31 to 59 acres of previously forested area, because the maintenance would not allow trees to grow to maturity. Impacts would also result from the occasional removal of trees in the proposed ROW and danger trees outside the ROW. Under alternative 4, the expanded ROW would be maintained at a width of 200 to 300 feet, increasing the acreage of maintained scrub shrub habitat to approximately 66 to 94 acres, with 42 to 61 acres within NPS boundaries.

Inside the study area, alternative 4 would traverse 2.3 miles. Widening of the ROW would create new edge habitat, potentially resulting in a change in vegetation composition and the spread of invasive species. The same effects would be seen along the 0.9 mile of access roads outside of the ROW.

After construction, crane pads, pulling and splicing sites, and spur roads would be removed and permanent access roads would be reduced to 15 feet wide. These areas would be restored by tilling or regrading the soils and seeding with an NPS-approved conservation seed mix, as previously described. Additionally, the B-K Line from the Bushkill Substation to the eastern boundary of DEWA would be decommissioned and removed and this area would also be restored, allowing the corridor to succeed naturally into mature forest in the long term. Approximately 53 acres within NPS boundaries would be restored, resulting in a potential range in conditions from a net increase in maintained scrub shrub of 8 acres to a net decrease in maintained scrub shrub of 11 acres, based on a ROW width of 200 to 300 feet. All areas of restoration would be subject to impacts from soil compaction and the loss of surface soils, and the restoration would not be complete within the analysis period of this EIS.

Clearing, construction, and vegetation maintenance activities that would remove existing vegetation and disturb ground and soil surfaces could spread invasive species. As stated for alternative 2, the spread of invasive species can increase from disturbance from site clearing and access road construction and use. Although mitigation measures would be implemented, alternative 4 would result in approximately 2.3 linear miles of newly disturbed land within the ROW and an additional 0.5 linear mile along access roads outside the ROW that could facilitate the spread of invasive species.

Inside the study area, alternative 4 would result in a potential range in conditions from a net increase in maintained scrub shrub of 8 acres to a net decrease in maintained scrub shrub of 11 acres, could increase the amount of habitat artificially maintained as scrub shrub, would alter habitat types in rare and unique communities, and would facilitate the spread of invasive species. Overall, the actions of alternative 4 would have adverse impacts on vegetation in the study area.

Cumulative Impacts

Cumulative impacts on vegetation from past, present, and reasonably foreseeable projects inside the study area would be adverse, as described previously in the “Cumulative Impacts Common to All Alternatives” section. The adverse impacts on vegetation as a result of alternative 4, combined with the other projects inside the study area, would be expected to result in an overall adverse cumulative impact. Alternative 4 would not alter the level of impact.

Conclusion

Under alternative 4, adverse impacts on vegetation would result from vegetation clearing, the construction of the proposed double 500-kV transmission line, the potential spread of invasive species, and vegetation management for the operation of the S-R Line. These adverse impacts would reduce the abundance, diversity, and quality of native vegetation. Additionally, impacts would result from artificially maintaining scrub shrub habitat in the parks, which is inconsistent with NPS protection of natural resources. The deconstruction of a portion of the B-K Line would allow a portion of the B-K Line ROW to revegetate. When the adverse impacts from alternative 4 are combined with the adverse impacts from past, present, and reasonably foreseeable projects, the cumulative impacts on vegetation would be adverse.

Alternative 4 would result in a relatively large amount of permanent vegetation loss but the quality of the vegetation resources lost would be much lower than those found along alternatives 2, 2b, and 3. Alternative 4 would have the same risk of introducing and spreading invasive species as the other action

alternatives although the adverse impacts may be less severe under alternative 4 because the length of the corridor is relatively short compared to the other action alternatives, meaning that mitigation measures may be more successful when applied over a relatively smaller area. Although alternative 4 would result in permanent loss of mature forest and conversion to scrub shrub habitat, the acreages affected would be substantially less than those affected by alternatives 2, 2b and 3. Given the lower quality resources and fewer acres of vegetation loss and conversion, the adverse impacts of alternative 4 could be substantially offset by the beneficial impacts of removing the existing B-K Line and restoring high-quality forest in a relatively undeveloped area of the parks, creating larger patches of contiguous habitat and reducing fragmentation in the core of the park. The permanent loss and conversion of native vegetation is contrary to NPS policies for protection and management of vegetation resources in the parks; however, the adverse impacts of alternative 4 on vegetation may not rise to the level of significant, considering the lower quality of the resources impacted and the potential to restore a large, contiguous block of high-quality habitat.

Permitting the project would adversely affect multiple protected resources inside the parks, in some instances irreversibly. Allowing such adverse effects in order to facilitate private infrastructure expansion would be contrary to NPS practice and principle of protecting and improving these resources, and of removing incompatible infrastructure to do so. This could establish precedent that may invite similar proposals by other applicants in the future, and create an expectation of like treatment for those proposals; it may make it difficult to deny such proposals. DEWA and APPA both contain numerous other utility crossings, which makes the risk of such precedent particularly concerning for these parks. Furthermore, as units of the national park system, wherein all parks are entitled to equal protection, creating such a precedent could have ramifications for parks nationwide. However, it would also set a precedent for routing utilities around MDSR and to the edges of DEWA.

Alternative 5

The alignments for alternatives 4 and 5 follow the same route through DEWA and APPA; however, the acreage affected by alternative 5 would be less than that for alternative 4 (table 47) because alternative 5 would take a different course outside the study area and would not reenter DEWA west of the Bushkill Substation.

Under alternative 5, approximately 74 acres of vegetation would be cleared initially to prepare for construction; approximately 44 acres of this is characterized as mature forest. The pulling and splicing sites would require the removal of an additional 55 acres of forest. After construction, access roads would encompass 1.7 acres, including 0.3 acres outside the ROW, resulting in a permanent loss of 1.4 acres of mature forest inside the ROW within the road footprint.

Inside the study area, 19 acres of scrub shrub habitat are currently maintained within the existing ROW. Under alternative 5, the expanded ROW would be maintained at a width of 200 to 300 feet, increasing the acreage of maintained scrub shrub habitat to approximately 44 to 64 acres. Approximately 30 to 42 acres of this land is within NPS boundaries, an increase from the current 19 acres of maintained scrub shrub.

Under alternative 5, areas used only during construction would be restored following the construction period. Additionally, the B-K Line from the Bushkill Substation to the eastern boundary of DEWA would be decommissioned and removed, allowing the corridor to succeed naturally into mature forest in the long term. Approximately 53 acres within NPS boundaries would be restored, resulting in a net decrease in maintained scrub shrub area along the alternative 5 alignment over the long term of 11 to 23 acres. As stated previously, restoration to mature forest could be hindered by soil compaction and loss of near-surface soils, and the restoration of the B-K Line and of areas temporarily disturbed during construction would not be complete within the analysis period of this EIS.

As stated for alternative 2, the spread of invasive species can increase from creating new edge habitat, which changes vegetation composition after site clearing and through the construction and use of permanent roads. Mitigation measures to manage the spread of invasive species would be employed; however, alternative 5 would result in approximately 1.7 linear miles of disturbed land within the ROW and an additional 0.2 mile along the access roads outside the ROW, which could facilitate the spread of invasive species.

Inside the study area, alternative 5 would result in a net gain of vegetation, would decrease the amount of habitat artificially maintained as scrub shrub, would alter habitat types in rare and unique communities, and would facilitate the spread of invasive species. Overall, the actions of alternative 5 would have adverse impacts on vegetation in the study area.

Cumulative Impacts

Cumulative impacts on vegetation from past, present, and reasonably foreseeable projects inside the study area would be adverse, as described previously in the "Cumulative Impacts Common to All Alternatives" section. When the adverse impacts on vegetation as a result of alternative 5 are combined with the other projects in the study area, an overall adverse cumulative impact would be expected. Alternative 5 would not alter the level of impact.

Conclusion

Under alternative 5, adverse impacts on vegetation inside the study area would result from vegetation clearing, the construction of the proposed double 500-kV transmission line, the deconstruction of the existing transmission line, the potential spread of invasive species, and vegetation management for the operation of the S-R Line, which would reduce the abundance, diversity, and quality of native vegetation. Additionally, adverse impacts would occur from artificially maintaining scrub shrub habitat in the parks, which is not consistent with NPS protection of natural, scenic, and recreational resources. The removal of the existing B-K Line would result in a decrease in maintained scrub shrub habitat; however, the full restoration of the area would not be complete in the period of analysis. When the adverse impacts from alternative 5 are combined with the adverse impacts from past, present, and reasonably foreseeable projects, the cumulative impacts on vegetation would be adverse.

Alternative 5 would have the same types of adverse impacts as the other action alternatives but alternative 5 would result in the least amount of permanent vegetation loss and conversation to other habitat types; therefore, the severity of the adverse impacts would be correspondingly less than the other action alternatives. Alternative 5 would also offer the potential for offsetting the adverse impacts with the substantial benefits of removing the existing B-K Line and restoring a large, contiguous block of high-quality habitat at the core of the parks. Thus, the adverse impacts of alternative 5 would not likely rise to the level of significant because of the lower quality of the resources affected; the relatively small acreage of permanent vegetation lost or converted to scrub shrub habitat; and the substantial benefit of restoring high-quality contiguous habitat through removal of the existing B-K Line.

Permitting the project would adversely affect multiple protected resources inside the parks, in some instances irreversibly. Allowing such adverse effects in order to facilitate private infrastructure expansion would be contrary to NPS practice and principle of protecting and improving these resources, and of removing incompatible infrastructure to do so. This could establish precedent that may invite similar proposals by other applicants in the future, and create an expectation of like treatment for those proposals; it may make it difficult to deny such proposals. DEWA and APPA both contain numerous other utility crossings, which makes the risk of such precedent particularly concerning for these parks. Furthermore, as units of the national park system, wherein all parks are entitled to equal protection, creating such a

precedent could have ramifications for parks nationwide. However, it would also set a precedent for routing utilities around MDSR and to the edges of DEWA.

LANDSCAPE CONNECTIVITY, WILDLIFE HABITAT, AND WILDLIFE

Landscape connectivity is an important ecological component when evaluating the quality of a habitat. High quality habitat is critical for the health and viability of wildlife populations, which ultimately contribute to the overall health and functionality of these natural systems. The amount of connectivity among patches of habitat increases the quality of habitat because wildlife are able to freely move between the patches and maintain genetic diversity, leading to healthy populations; ease of travel varies depending on the species' mobility or ability to disperse (Wilderness Society 2004, 1–5). Many wildlife species currently have the ability to travel freely from Pennsylvania state lands across NPS lands and the Delaware River, and across New Jersey state lands in an uninterrupted complex of nearly half a million acres. Fragmentation of the habitat can create barriers for individuals of a species traveling between populations and can lead to isolation of a species (D'Eon et al. 2002). In some cases the large scale connectivity that presently exists is dependent upon undeveloped private property that has no long term protection status. The present condition is subject to fragmentation through potential development. As a result, every significant action that diminishes this aspect of the environment has increased importance.

DEWA, APPA, and MDSR form the backbone of the natural landscape in this region and as such provide the most important element in an ecosystem that crosses several states. Across the country similar connectivity projects have been focusing on these same issues and goals of protecting the ecological benefits of a landscape, such as Mojave Complex in the California desert, the Yellowstone to Yukon Project, and the Everglades Complex in Florida. Research programs such as NASA's Park Analysis and Monitoring Support program, which looks at land use change surrounding NPS lands on more of a landscape scale, have become more prevalent throughout the country. A national effort is underway through the Natural Resource Advisory Group (Advisory Group) to bring landscape-scale connectivity actions to the forefront of NPS programs. The Advisory Group has developed recommended action items, program elements, and products to meet NPS needs regarding landscape-scale connectivity.

The NPS has been working with state and local agencies and other nongovernmental conservation organizations in both Pennsylvania and New Jersey to identify priority areas and lands that connect state and federal lands. The focus of the private/public partnership on conservation is landscape connectivity at a regional scale.

METHODOLOGIES

The evaluation of wildlife, wildlife habitat, and landscape connectivity was based on a qualitative assessment of the expected alterations to habitats inside and outside the study area resulting from the implementation of each alternative. The assessment of landscape connectivity in its traditional sense of continuity of habitat on a regional scale cannot be accomplished in this analysis. Because the location of the S-R Line outside the study area cannot be determined at this time, a direct analysis of the impacts on landscape connectivity at the regional scale is not possible. Therefore, connectivity at the regional scale is discussed as a cumulative impact.

Inside the study area, the analysis focuses on contiguous habitat patches and the impact of the alternatives on these patches. The proposed project alignment for each alternative is based on an existing ROW; therefore, baseline conditions include some amount of existing fragmentation along the alignment for each alternative. Determination of habitat loss, alteration, or restoration was based on an analysis of likely vegetation changes resulting from each alternative.

A terrestrial study area, as described in the following section, was created to determine impacts on landscape connectivity within its perimeter. The amount of habitat fragmentation — and therefore the impacts on contiguous habitat patches — that would result was analyzed using NPScape, a landscape dynamics monitoring project (NPS 2010ad). NPScape uses GIS-based modeling and land cover data for NPS lands and the surrounding area to produce a suite of landscape-scale data sets, maps, reports, and other products to inform resource management and planning at local, regional, and national scales (NPS 2010ad). For the analysis in this EIS, contiguous habitat patches were determined for the existing conditions of the terrestrial study area using major and minor roads, trails, and existing ROWs as fragmenting features. The specifications of each alternative were used to create contiguous habitat patches for the proposed conditions. The modeled information was used to determine the impacts from the alternatives on contiguous habitat patches and therefore wildlife habitat. These analyses were then used to evaluate the impacts on wildlife and migratory birds that use the land in the terrestrial study area. It should be noted that because of the relatively narrow terrestrial study area, patches along the edges of the terrestrial study area boundary appear small, but the actual size of these patches is unknown. The terrestrial study area was designed to end at the VSL points.

The parks' wildlife species are directly affected by the natural abundance, biodiversity, and ecological integrity of their habitat. Wildlife groups analyzed in this section include aquatic species, terrestrial invertebrates, birds, reptiles and amphibians, and mammals. All rare, threatened, and endangered species are discussed in the "Special-status Species" section. The impact analysis for terrestrial wildlife species included an assessment of impacts on species associated with habitat types that would be altered with the implementation of each alternative.

Resource-specific context for assessing impacts to landscape connectivity, wildlife habitat and wildlife includes:

- Connectivity is essential for healthy wildlife populations, especially those species that are highly mobile and have large home-range requirements.
- DEWA and APPA together provide a mosaic of different habitat types that includes roads and utility rights of way with minimal fragmentation of the contiguous ecosystem which is rare in the Northeast.
- The connections between the parks and other public and undeveloped lands create a larger area for wildlife that provides a refuge amidst increasing development; important populations of animals already use these contiguous blocks of habitat (e.g., the Kittatinny Ridge flyway is an important raptor migration corridor).
- DEWA and APPA serve as regional green space, providing a contiguous connected green space between the parks and other public lands within the larger East Coast.
- Connectivity is a recreational asset (i.e., visitors have an opportunity for a "backcountry" experience away from the interruptions of daily life).
- DEWA, in particular, is positioned within the region to take advantage of connectivity opportunities that do not exist elsewhere.

TERRESTRIAL STUDY AREA

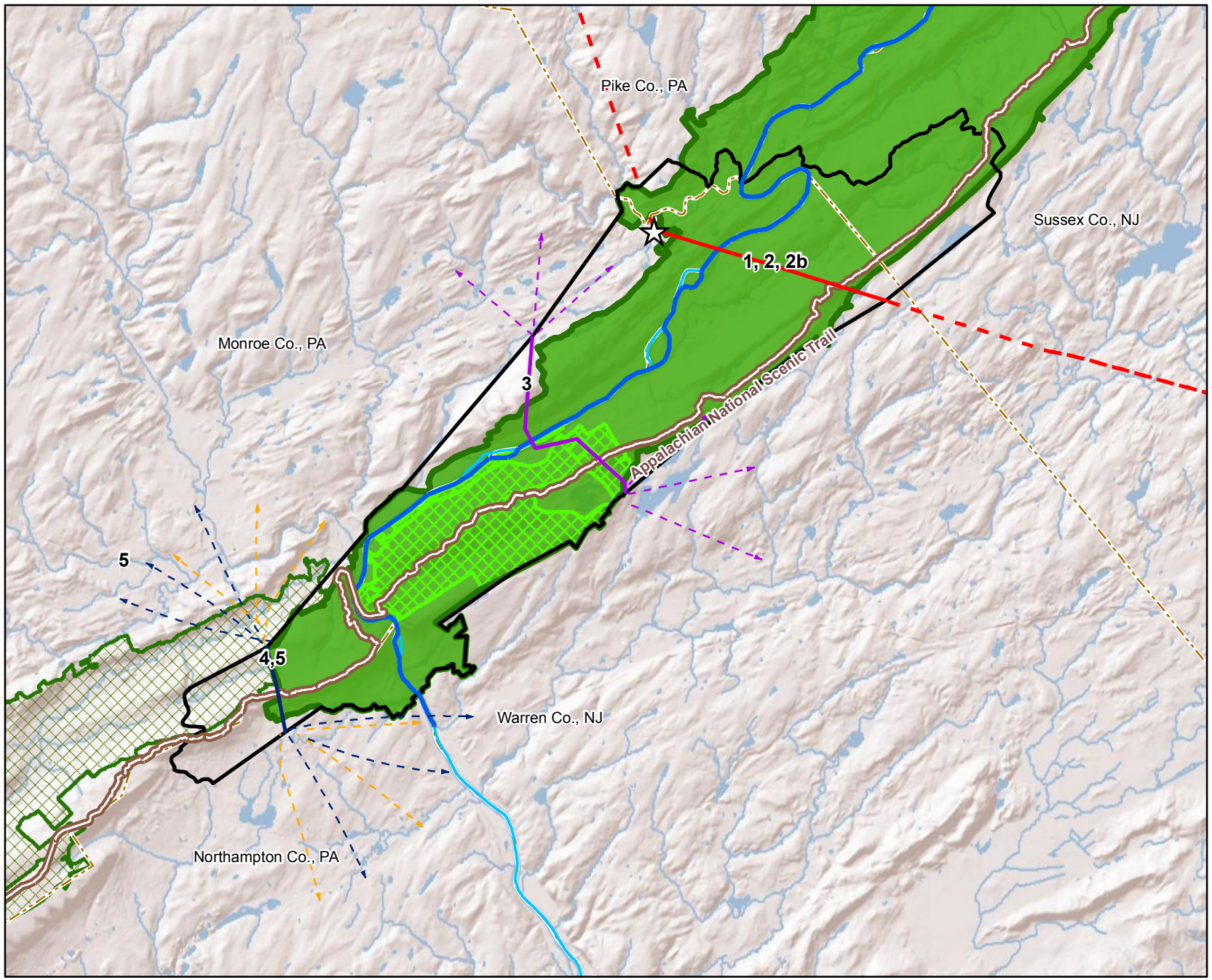
The terrestrial study area for landscape connectivity, wildlife habitat, and wildlife includes all portions of the parks between the VSLs for each alternative and is bounded in the north by the DEWA boundary and in the south by major roads south of DEWA (figure 70). This terrestrial study area was created because impacts from construction, operation, and maintenance activities would affect terrestrial resources beyond the corridors of the alternatives. Because the location of the S-R Line outside the terrestrial study area cannot be determined at this time, the indirect impacts on landscape connectivity, wildlife habitat, and wildlife cannot be evaluated per alternative. The potential impacts outside the study area are generally addressed; however, further surveys may be needed prior to construction of the S-R Line.

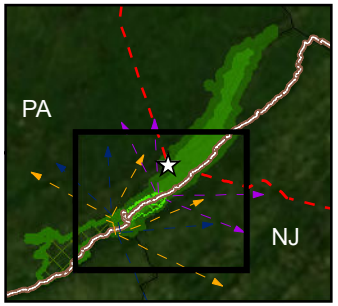
CUMULATIVE IMPACTS COMMON TO ALL ALTERNATIVES

Actions inside and outside the parks affect vegetation communities that provide habitat for wildlife. Alterations to and permanent loss of natural vegetation communities have occurred, are occurring, and will occur as a result of natural and unnatural successional changes and the establishment of invasive species. Forests in DEWA have been altered and are still regenerating from timber harvesting that has occurred more than a half century ago. The original forest has proceeded through a number of successional changes and is also subjected to the invasion of nonnative species. Other alterations and the loss of natural vegetation communities can result from many types of development, including agriculture, residential, commercial, industrial, and infrastructure; fire suppression; natural successional changes; and the establishment of nonnative invasive species resulting from actions and projects other than timber cutting.

Landscape Connectivity: Species response and migration as a result of climate change make the preservation of landscape connectivity in a large-region perspective key to the survival of many species in the future. Trends in the United States, and particularly the immediate project region, show an increase in low-density rural housing development and a resulting increase in impervious surface cover (Jantz 2009). This type of land use change leads to changes in the patterns of the natural landscape, isolating the pockets of natural areas and ultimately causing a decline in landscape connectivity. The pressures from residential development and the infrastructure to support the expanding communities and populated areas and the resulting fragmentation make the efforts to protect the connectivity between shrinking and more isolated natural areas increasingly difficult. As a result, the importance of the Appalachian Mountain chain as it runs through the densely populated northeast is critical in maintaining the connectivity between the isolated pockets of protected natural landscapes.

Studies conducted using remote sensing technologies have shown that DEWA and the surrounding undeveloped natural lands have areas of existing high density of connectivity based on the connections between protected lands and the proximity of the large protected lands to DEWA. Analysis of the biological integrity of the region show that the park lands have more natural landscape than the surrounding private lands (Goetz et al. 2011). Therefore, these public lands, such as DEWA and surrounding state land pockets, and natural corridors such as the one APPA follows along the ridges of the Appalachian Mountain chain, provide critical short- and long-distance paths that wildlife may follow to avoid the more densely human-developed areas (Goetz et al. 2011). These corridors connecting natural areas create critical migration pathways between the large intact habitat patches in the upper northeast and the Southern Appalachian Mountains. The increased isolation of the protected habitats decreases the chances for wildlife migration and could result in extinctions (Goetz et al. 2009) The resulting decline in landscape connectivity has both ecological and social consequences.





Legend

- Substation
- Alternative 1, 2, 2b
- Alternative 3
- Alternative 4
- Alternative 5
- Appalachian National Scenic Trail
- Delaware River
- Middle Delaware National Scenic & Recreational River
- Delaware Water Gap National Recreation Area
- Worthington State Forest
- CVNWR Boundary
- Terrestrial Study Area
- County Line

Note: Designated boundary of CVNWR is depicted, not all property is owned within the boundary

0 1.5 3
Miles

Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 70
Terrestrial Study Area

Source: ESRI Streetmap 2006, Penn State 2010, ESRI ArcGISonline Map Service 2010, PennDOT 2011, USGS 2006, NJ DEP 2008,

Projection: NAD 83 UTM Zone 18N
Date: July, 2012

The pressures of population growth and the resulting growth in infrastructure increase the fragmentation of the natural areas, affecting both the local habitat continuity and the greater landscape connectivity (Goetz et al. 2009). For example, increases in impervious surface area can lead to greater runoff, affecting water quality and increasing the risk of flooding events (Goetz et al. 2011). Maintaining the ecological integrity of public lands such as DEWA and APPA and their linkages to other natural protected lands in the immediate and greater region helps slow the loss of connectivity and maintain these critical habitat corridors. Maintaining landscape connectivity in the heavily populated northeast is becoming more difficult and more important to the survival of many species. Figure 53 shows federal, state, and other conservation lands in Pennsylvania and New Jersey between the Susquehanna and Roseland substations. Each severed link isolates the protected natural areas and breaks the pathways, losing the critical regional landscape connectivity. The central position of the proposed S-R Line geographically could create two separate and distinct park land management areas.

Habitat Alteration and Development: Historically, in the northeastern United States woodlands were cleared in unregulated harvesting of timber to support agricultural activities, which resulted in the creation of large expanses of early successional habitat maintained by agricultural practices. However, in the past century, agricultural activities have decreased and forested areas have regrown, reducing the acreage of early successional habitat. Species that use early successional habitat, such as brown thrasher and golden-winged warbler, have exhibited population declines. Currently forested areas are second-growth forests, which contain mature hardwoods that are generally over 100 years old and produce valuable mast crops for a variety of wildlife. Mast crops are those which provide food for wildlife, such as oak trees that provide acorns. These forests represent a stable forest that will remain as such for another 100 years or more if left undisturbed. It is rare and valuable to have such a large contiguous block of undisturbed mature forest on the East Coast. Despite the alterations to the original eastern forests over the past 300 years, the large tracts of intact deciduous woodlands currently found in the eastern United States are known to support high densities of breeding songbirds, most of which migrate to the tropics for the winter. These eastern forests are also important for other migratory species that pass through on their way to and from their breeding grounds (Lebbin et al. 2010, 174). Inside and outside the terrestrial study area, development from residential and second-home construction, utility and infrastructure projects, and communications towers contributes to the incremental loss of forested lands or results in the alteration of habitats into maintained clearings and early successional habitat, which can also alter the abundance and composition of wildlife populations. Ultimately, the maintained and early successional habitat resulting from development benefits those species that can adapt to human-altered habitats (e.g., house sparrows, European starlings, raccoons, opossums, and gray squirrels) or those that prefer scrub shrub habitats (such as golden-winged warbler and brown thrasher), while species that are considered interior forest-dwelling species (e.g., wood thrush, scarlet tanager, and a variety of warblers and vireos) decline in abundance. As a result, large areas of protected intact woodlands inside and outside the terrestrial study area that provide habitat for many wildlife species, as described in chapter 3, are becoming increasingly important as a result of development and habitat fragmentation in the surrounding area. Lands protected by the NPS in the parks, New Jersey and Pennsylvania protected state-owned lands, and lands protected by other organizations such as land trusts, the National Audubon Society, and The Nature Conservancy (TNC) provide islands of natural habitat for wildlife, including insects and other invertebrates, migratory bird species, salamanders and frogs, small mammals, and black bear (see figure 53).

Communications Towers, Wind Turbines, and Transmission Lines: In addition to habitat alteration and development, the siting of communications towers, wind turbines, and transmission lines, especially on hilltops and ridgelines, can adversely affect wildlife through habitat fragmentation, loss, or alteration due to construction as well as through direct mortality of migrating bird and bat species. The USFWS conservatively estimates that between 4 and 5 million birds are killed each year at communications towers and a total of 200 to 500 million birds may die annually when communications tower collisions are combined with collisions with vehicles, buildings, windows, and high-tension lines (Erickson et al. 2001,

7–10). A review of studies on bird collisions with communications towers reported that individuals from 230 species have been killed; many of these species are nocturnal migrants, including Neotropical migrants such as the red-eyed vireo and warblers. Of those 230 species, 52 are of conservation concern and are listed on the USFWS Nongame Species of Management Concern List or Partners in Flight Watch List (Shire et al. 2000, 2). There are presently no cell towers within the boundaries of DEWA or any major transmission lines of the magnitude and intensity proposed here.

Collisions with high-tension lines have been documented since 1876 and can be a significant source of mortality, especially for ducks, geese, swans, herons, and cranes when lines are near open water sources or wetlands. Collisions with bulk transmission lines kill an estimated 130 million birds per year; however, there is a lack of standardized data, and the estimate is rudimentary (Erickson et al. 2005, 1033). When the lines are located in upland areas, raptors and passerines are more susceptible (Erickson et al. 2001, 10). Bird and bat species can be killed as a result of wind turbine developments, which are often sited in linear fashion along ridges and hilltops. Bird fatalities may result from collisions with the turbines and structures. Bird fatalities primarily involve nocturnal migrants, but in areas of large open grasslands, diurnal raptors such as hawks and eagles can also collide with wind energy structures. Current estimates place mortality of birds from wind turbines at approximately 33,000 birds per year; however, wind turbines are less abundant than other structures and newer design technology may reduce bird collisions (Erickson et al. 2001, 19). Bat mortality at wind turbines is associated with the sudden drop in air pressure near the turning blades of the turbines (which causes barotrauma, or internal hemorrhaging caused by a sudden drop in air pressure) and affects migratory bats, primarily during fall migration (Baerwald et al. 2009, 1077).

These actions can alter the distribution and abundance of wildlife and influence reproductive success and survival. Other projects may result in the protection, restoration, or enhancement of wildlife species inside and outside the parks. Past, present, and reasonably foreseeable activities that have beneficial or adverse impacts on wildlife and wildlife habitat in the parks inside and outside the terrestrial study area are summarized below. These projects were taken from the list of cumulative projects for the S-R Line in appendix H. Cumulative impacts were then determined by combining the impacts of the alternative being considered with the impacts from the projects listed below. This cumulative impact analysis was done for each alternative and is presented at the end of the impact analysis discussion for each alternative.

Projects Inside the Study Area

Inside the terrestrial study area, cumulative projects that have resulted or would result in adverse impacts on landscape connectivity, wildlife habitat, and wildlife include the following visitor access, road, and utility projects: the New Jersey Swim Beach construction (construction of new facilities), the PADOT SR 2001 road project (road reconstruction), the rehabilitation of River Road (road repair), the I-80 weigh station (facilities upgrade), the US Route 209 rehabilitation and replacement of Toms Creek Bridge (road and bridge repair), the repair of failing Watergate Dam #10, US Route 209 Raymondskill Creek Bridge rehabilitation, Pocono Environmental Education Center cabin replacement (rehabilitation and replacement of structures), the Appalachian Trail Relocation near the Columbia Gas Pipeline Crossing (pipeline upgrade), the Metropolitan Edison Enhanced Vegetation Management Program (for transmission lines), Central Jersey Power and Light vegetation maintenance (for transmission lines), the Tennessee Gas Line Proposal (addition to an existing gas pipeline), the Columbia Gas Transmission Company pipeline (replacement of an existing gas pipeline), and the Northeast Supply Link Expansion (Palmerton Loop gas pipeline). Nine utility lines cross Kittatinny Ridge in the terrestrial study area in Pennsylvania and New Jersey with aboveground conductors. Eight of the nine utility lines are power lines and one is a telephone line; each of these crossings presents a risk to migratory birds that use Kittatinny Ridge. Illegal activities such as ORV use, flora collection, hunting/poaching, and woodcutting also adversely affect wildlife habitat and wildlife. These projects and actions would result in adverse impacts through habitat loss,

alteration, and fragmentation and wildlife disturbance and mortality. The impacts on landscape connectivity, wildlife habitat, and wildlife from several projects, including the rehabilitation of River Road, the I-80 weigh station, and the repair of Watergate Dam #10, are still unknown.

Cumulative projects inside the terrestrial study area that have resulted or would result in beneficial impacts on landscape connectivity, wildlife habitat, and wildlife include construction projects, restoration projects, fire management, and agricultural permits. The construction projects (sustainable comfort stations, hazardous structure demolition/deconstruction, and Metropolitan Edison removal of unused power poles and transformers) would restore previously disturbed areas to natural conditions. The restoration projects inside the terrestrial study area (the rehabilitation of Childs Park, the restoration of flood-damaged river campsites, the realignment of McDade Trail, parkwide invasive species control programs, the Wildlife Habitat Incentive Program, and IBAs/IMAs) would help preserve sensitive habitat, avoid further impacts on habitat, and restore previously disturbed habitats. Agricultural permits would preserve open space and habitat. Prescribed burns would perpetuate native plant species and maintain natural habitat. Additionally, several land protection programs (as detailed in appendix B) could protect vegetation communities. The beneficial effects of many of these programs are dependent on the availability of funding for specific projects, which is uncertain and could vary throughout the period of analysis; therefore, the level of benefit resulting from the implementation of any project is also variable.

Cumulative projects inside the terrestrial study area would result in adverse cumulative impacts on landscape connectivity, wildlife habitat, and wildlife.

Projects Outside the Study Area

Outside the terrestrial study area, cumulative projects that have resulted or would result in adverse impacts on landscape connectivity, wildlife habitat, and wildlife include the following road and utility projects: the Marshalls Creek traffic relief project (new bypass route), the US Route 209 rehabilitation and replacement of Toms Creek Bridge (road and bridge repair), the Tennessee Gas Line Proposal (addition to an existing gas pipeline), the Marcellus shale natural gas drilling, the Columbia Gas Transmission Company pipeline (replacement of an existing gas pipeline), the PFBC natural gas leasing and water access programs, Martins Creek Power Plant (contaminated water spill), the Federal Energy Regulatory Commission relicensing of Yards Creek Generating Station (relicensing power plant), and wind turbines in northeastern Pennsylvania. Proposed residential and commercial developments in New Jersey and Pennsylvania would also cause adverse impacts on landscape connectivity, wildlife habitat, and wildlife. The impacts from the Marcellus shale natural gas drilling and the PFBC natural gas leasing and water access programs are still unknown. Thirty-seven utility lines cross the Kittatinny Ridge outside the terrestrial study area in Pennsylvania and New Jersey with aboveground conductors; 2 of these are telephone lines and 35 are power lines. Each of these crossings presents a risk to migratory birds that use Kittatinny Ridge. Beneficial impacts on landscape connectivity, wildlife habitat, and wildlife have resulted or would result from the following projects: the DEWA prescribed burn program, Pennsylvania's weed eradication program, the Wildlife Habitat Incentive Program, and IBA/IMA programs. Nongovernmental organizations such as TNC work toward identifying and preserving land that contains rare or unique features or key habitat for plants and wildlife. The beneficial effects of many of the listed programs are dependent on the availability of funding for specific projects, which is uncertain and could vary throughout the period of analysis; therefore, the level of benefit resulting from the implementation of any project is also variable. Despite land protection and conservation outside the terrestrial study area, land in the 10 counties of New Jersey and Pennsylvania that are part of this analysis are subject to continued development that would continue the loss, alteration, and fragmentation of habitat, including rare and unique communities. Projects outside the terrestrial study area would result in adverse cumulative impacts on landscape connectivity, wildlife habitat, and wildlife.

IMPACTS OF THE ALTERNATIVES ON LANDSCAPE CONNECTIVITY, WILDLIFE HABITAT, AND WILDLIFE

Common to All Alternatives

Vegetation Maintenance: PPL and PSE&G have separate vegetation management plans because they are distinct utility companies working in two different states; however, vegetation management for both utilities would occur annually, at minimum. Vegetation maintenance sustains habitat in the existing ROW as scrub shrub using selective clearing. Additionally, vegetation maintenance would include removal of danger trees that could interfere with the transmission lines. The details of the applicant's vegetation management plans and clearing techniques are explained in chapter 2. The NPS considers the applicant's current vegetation management plans to be insufficient, and the NPS would require a NPS-specific, NPS-park approved vegetation management plan. The impacts of vegetation maintenance are discussed under each alternative.

Invasive Wildlife Species: Of the five invasive nonnative terrestrial wildlife species presented in chapter 3, three have the potential to affect vegetation communities that provide wildlife habitat: hemlock woolly adelgid, European gypsy moth, and emerald ash borer. Impacts from these invasive wildlife species are analyzed in the "Vegetation" section of this chapter.

Wintering Golden Eagles: The migration of golden eagles in the eastern United States is strongly tied to the Appalachian ridgelines. Every year golden eagles are observed at the Hawk Watch sites Hawk Mountain and Raccoon Ridge along APPA during fall migration. Golden eagles are also known to overwinter in the Appalachian range in areas with small forest openings along ridgelines (VADGIF 2011). Wintering golden eagles are present inside and outside the terrestrial study area.

Mitigation Measures: Mitigation measures would reduce impacts from operation and maintenance activities under the action alternatives and are described in chapter 2 and appendix F. None of the mitigation measures would eliminate impacts on landscape connectivity, wildlife habitat, or wildlife; however, they would reduce the impacts on these resources by decreasing the loss of habitat and preventing the take of bird nests and direct mortality of wildlife species.

Outside the Study Area: Landscape connectivity, wildlife habitat, and wildlife are currently under pressure from a number of stressors, including development, pollution, toxic chemicals, invasive species, pests, disease outbreaks, habitat fragmentation, and wildfires, making them highly vulnerable to additional impacts such as those from climate change (NABCI 2010, 44). Outside the terrestrial study area, regardless of which alternative is selected, the transmission line could pass through Carbon, Lackawanna, Luzerne, Monroe, Northampton, Pike, and Wayne counties in Pennsylvania and Morris, Sussex, and Warren counties in New Jersey. These counties are largely undeveloped and contain a variety of habitats and developed areas. In general, the transmission lines outside the terrestrial study area could pass through a variety of habitats, including rare and unique communities, state wildlife management areas, and lands designated as IBAs and IMAs.

The clearing, construction, and vegetation maintenance activities outside the terrestrial study area would be consistent with those described for inside the terrestrial study area. However, the impacts outside the terrestrial study area would be indirect because the activities related to constructing and operating the S-R Line would not be caused by activities permitted by the NPS; the specific impacts cannot be determined because of the physical distance from NPS-authorized activities. Additionally, the specific resources that would be affected by the transmission line outside the terrestrial study area cannot be identified until the route is chosen by the applicant. Upon this decision, additional surveys would be required to determine the type of habitat that would be affected along the selected route.

There are more developed, residential, and agricultural lands outside the terrestrial study area than inside. However, large tracts of contiguous forest and wetland habitat outside the terrestrial study area remain because of the largely rural nature of the counties in New Jersey and Pennsylvania; these tracts could be further fragmented depending on the final route of the transmission line. The impacts on landscape connectivity outside the terrestrial study area would be expected to be less severe than those inside the terrestrial study area. The use of existing ROWs, road alignments, and other corridors could minimize the extent of permanent habitat loss, but it is likely that the width of the ROW outside the terrestrial study area would be increased by several hundred percent to accommodate the double 500-kV transmission lines.

The types of impacts on wildlife would be expected to be similar to those inside the terrestrial study area and would result from disturbance and direct mortality from clearing, construction, and maintenance activities and isolation due to fragmentation. The alignments for alternatives 4 and 5 would cross the Delaware River outside the terrestrial study area. Transmission lines transecting the Delaware River could affect raptors that forage along the river. In addition, migratory raptors may forage along newly established ROWs and could collide with transmission lines. Thirty-seven utility lines cross Kittatinny Ridge outside the terrestrial study area in Pennsylvania and New Jersey with aboveground conductors; 2 of these are telephone lines and 35 are power lines. Each of these crossings presents a risk to migratory birds that use Kittatinny Ridge. As stated for inside the terrestrial study area, the height and number of conductors would increase, raising the risk of collisions. A linear expanse of early successional habitat that could benefit some species such as golden-winged warblers, indigo buntings, the black rat snake, and small mammals would be maintained in the ROW. ROWs also function as movement corridors for species such as white-tailed deer and can function as foraging areas for raptors.

Outside the terrestrial study area, indirect adverse impacts on landscape connectivity, wildlife habitat, and wildlife would result from vegetation maintenance under the no-action alternative. Vegetation clearing, the construction of the transmission line, the operation and maintenance of the transmission line, and vegetation maintenance under the action alternatives would result in adverse impacts. Cumulative impacts on landscape connectivity, wildlife habitat, and wildlife outside the terrestrial study area would be adverse, as described previously in the “Cumulative Impacts Common to All Alternatives” section.

Alternative 1: No Action

Landscape Connectivity and Wildlife Habitat: The existing ROW represents a complete east–west fragmentation of the habitats. The habitat patches adjacent to the existing ROW range from approximately 1 acre to 5,301 acres, with the larger patches east of Community Drive. North of the alignment, the parks include roads and trails that do not interfere with wildlife movement to any real extent. However, to the south, existing ROWs also bisect the parks. An existing ROW (the alignment for alternative 3) laterally bisects the habitats of DEWA, MDSR, and APPA 5 miles south of the alternative 1 alignment.

The continued vegetation maintenance under alternative 1 would sustain the current fragmentation and artificially maintained scrub shrub habitat. Occasionally, danger trees would be removed from the edges of the adjacent forested areas, but this maintenance is not expected to notably increase the fragmentation along the alignment. Therefore, additional fragmentation of the habitat would not occur.

Within the ROW, the wire zone / border zone vegetation management employed by the applicant creates varying wildlife habitat, with a herbaceous layer in the wire zone and a shrub layer in the border zone. Vegetation maintenance completed in August 2010 has resulted in varying habitat conditions. In some areas, herbaceous and shrub habitats were retained; however, in other areas, only a herbaceous layer was left in the ROW, bordered by mature forest.

A variety of successional habitat stages provides habitat for a wide range of aquatic species, terrestrial invertebrates, birds, amphibians and reptiles, and mammals. Common wildlife species include white-tailed deer, small mammals (mice, voles, shrews, etc.), eastern cottontail, red and gray fox, raccoon, and songbirds, including Neotropical migrant bird species such as indigo bunting, eastern towhee, field sparrow, and song sparrow. Wetland areas and streams in the ROW provide habitat for a variety of frogs, toads, salamanders, and turtles. If the vegetation is trimmed to the herbaceous layer, the habitat would support fewer species of wildlife because the variety of habitat conditions and vegetation species would be more limited.

Disturbance provides the opportunity for invasive plant species to spread and colonize in new areas. As described in the "Vegetation" section, ground disturbance during vegetation maintenance and removal of danger trees could facilitate the spread of invasive species. Invasive species can alter the structure of natural plant communities and disrupt ecosystem functions, changing the habitat structure. If wildlife species cannot adapt to the changes, the habitat may become inhospitable.

Wildlife: The ROW is an artificially maintained habitat that is not natural to the parks and is not compatible with the surrounding natural habitats. In addition, the presence and periodic maintenance of the ROW is not consistent with NPS conservation of park resources and values, including wildlife and wildlife habitats and the processes that sustain them.

Existing conditions in the alternative 1 alignment contain vegetation in varying stages of succession. While two portions of forest are divided by the ROW, the vegetation in the ROW provides a significant amount of cover and a variety of habitats. Under the no-action alternative, the level and frequency of vegetation maintenance could be increased over historical levels, preventing the natural process of succession and limiting species variation and complexity. The ROW habitat is artificially maintained; however, it provides shelter, food, and nesting areas to species that use early successional habitat and provides a migratory corridor for large mammals, bats, and butterflies. Vegetation maintenance, which has been conducted sporadically in the past, could sustain a relatively open ROW. The largest impact on wildlife from the change in conditions would be the loss of cover as they move across the ROW from one adjacent patch of forest to another. The impacts on specific wildlife groups as a result of regular vegetation maintenance activities and the resulting change in habitat are discussed in the following paragraphs.

Aquatic Species: Maintenance activities would not be conducted in water bodies located along the existing transmission line. In addition, no measurable change to water quality parameters would result from maintenance activities because the increase in soil erosion would be undetectable and surface waters would have no increase in total suspended solids (TSS) levels. There would be no observable or measurable impacts on aquatic species, their habitats, or the natural processes sustaining them.

Terrestrial Invertebrates: Vegetation maintenance activities would have the potential to affect invertebrates through direct mortality. Less mobile invertebrate species, such as crawling insects, as well as invertebrate eggs, may suffer direct mortality as a result of their inability to escape during clearing activities. These impacts would result during maintenance activities but would not be expected to affect the viability of a species. However, the ROW could be used as a migratory corridor by invertebrate species such as butterflies and dragonflies, resulting in beneficial impacts.

Birds: All maintenance activities would have the potential to disturb and temporarily displace bird species in the vicinity. If maintenance were conducted during the breeding/nesting season, direct loss of eggs, nests, and less mobile young could result and adults may abandon eggs, nests, or young due to disturbance. Although impacts would occur within a relatively narrow and linear footprint, bird species that had nested in the ROW prior to the new vegetation maintenance plan and schedule could lose

portions of nesting territories or entire nesting territories and could be forced to relocate territories. Species that could be present in the ROW include ruffed grouse, American woodcock, black-billed and yellow-billed cuckoos, and woodpeckers, as well as many seasonally present Neotropical migrants; flycatchers, vireos, and warblers are known to nest in the parks (PEEC 2008, 1–6). Additionally, migratory waterfowl species use the Delaware River riparian corridor as breeding and foraging habitat. Location and defense of new nesting territories would require time and energy that would otherwise be used for producing young, and it is unlikely that all displaced individuals would be successful in establishing new territories; this could result in lower overall productivity of the population. However, impacts on birds during the breeding season would be minimized by the implementation of seasonal restrictions for maintenance activities, which the applicant has not agreed to observe to date.

The ROW and adjacent habitat would be used by species that prefer more open habitats, such as sparrows (field sparrow, song sparrow), eastern bluebird, eastern kingbird, tree swallow, and predatory raptors. During required maintenance clearing, brush piles should be left to provide cover and nesting habitat and shelter for species such as eastern towhee and gray catbird, as well as wintering white-throated sparrow and dark-eyed junco. Impacts from disturbance would result during maintenance activities; however, the viability of bird populations would not be affected.

The ROW creates edge habitat along the adjacent woodlands that is preferred by brown-headed cowbirds. As nest parasites, brown-headed cowbirds often parasitize Neotropical migrant species such as vireos and warblers. A high abundance of cowbirds in an area can result in multiple cowbird eggs in host nests (Smithsonian 2011). In addition, nest predators such as American crow, opossum, and raccoon may prey on eggs and young birds in nests in and adjacent to the ROW. The continued maintenance and operation of the ROW would maintain edge habitat, resulting in the continued potential for these parasitic and predatory species to find nests and young, which would have adverse impacts on nesting bird species in and adjacent to the ROW. Edge habitat may not remain consistent, because danger trees may be removed from the forested area adjacent to the ROW, increasing disturbance of the habitat and altering it.

Even though it has not been documented in the parks, there may be potential hazards (collisions and electrocutions) to birds from the existing transmission lines, despite adherence to BMPs and mitigation as described in appendix F. Raptors, including resident species, may attempt to perch on the towers, resulting in electrocution. The transmission lines that transect the Delaware River could also affect raptors that forage along the river (osprey and bald eagle). There is also a potential for bird collisions involving waterfowl and large wading birds, such as great blue heron, that are known to nest colonially in DEWA.

A known bald eagle roost and foraging area exists near the alternative 1 alignment. Impacts on bald eagles are discussed in the “Special-status Species” and “Rare and Unique Communities” sections of this chapter.

Amphibians and Reptiles: Vegetation maintenance has the potential to affect reptiles and amphibians through disturbance and direct mortality. Mobile species could be displaced during maintenance activities, but the impacts would be temporary and localized. If the maintenance of the ROW is conducted during the breeding season for amphibians and reptiles, direct mortality of large numbers of individuals of some species could result. Amphibians such as spring peeper, American toad, bullfrog, leopard frog, and spotted and tiger salamanders could be adversely affected. Many amphibian species migrate in large numbers, and some species, such as spotted and Jefferson salamanders, can travel from a few hundred feet to more than a quarter of a mile to their breeding habitats (NYSDEC n.d.). Seasonal restrictions on vegetation maintenance would be enforced if the activities are planned in a known amphibian migration route. Spring peepers, wood frogs, spotted salamanders, red spotted newts, and Jefferson salamanders are known to migrate in large numbers, crossing River Road at various sites, and the parks have enforced road closures to reduce mortality of these migrating amphibians (NPS 2003e). Reptiles such as snapping

turtle, painted turtle, and eastern box turtle could also be affected by direct mortality during their spawning season as they move from aquatic and wetland habitats to upland habitats to lay eggs. Impacts on reptiles and amphibians due to direct mortality during vegetation maintenance would not be expected to affect the viability of a species.

Amphibian species typically find shelter under moist leaves or logs. Continued vegetation maintenance in the ROW would result in an increase in sun exposure and reduced forest canopy; therefore, the availability of preferable habitat would be limited in the ROW. With reduced vegetation cover, predatory animals could hunt more effectively along the ROW, resulting in adverse impacts on prey species such as frogs, salamanders, and snakes because vegetation cover would be reduced immediately after maintenance; however, increased predation would not lead to population-level impacts.

Mammals: Larger mammals using habitats in and adjacent to the ROW would be affected by the periodic and localized disturbance from the activity and noise of vegetation maintenance along the ROW; however, displaced wildlife would be expected to return to the ROW and adjacent habitats when maintenance is completed. During vegetation maintenance activities, less mobile species, including small mammals, and denning or burrowing mammals (striped skunk, ground hog, moles, voles, mice, shrews) may suffer direct mortality as a result of their inability to escape during maintenance activities. Impacts from disturbance and direct mortality under the no-action alternative would not affect the viability of the species.

The existing ROW is surrounded and secluded by forest in most locations allowing it to function effectively as a wildlife corridor. Impacts at the population level would not be expected. The ROW would continue to act as a movement corridor for species such as white-tailed deer, black bear, coyote, and fox and would be used for hunting by fox, bear, and coyote, resulting in beneficial impacts for these species.

Overall Impacts on Landscape Connectivity, Wildlife Habitat, and Wildlife: Adverse impacts on landscape connectivity, wildlife habitat, and wildlife under alternative 1 would result from the continued artificial maintenance of the habitat in the ROW, loss of habitat from removal of danger trees outside the ROW, and disturbance and direct mortality of wildlife.

Cumulative Impacts

Cumulative impacts inside the terrestrial study area from past, present, and reasonably foreseeable projects would result in adverse impacts on landscape connectivity, wildlife habitat, and wildlife as described previously in the “Cumulative Impacts” section. When the adverse impacts as a result of alternative 1 are combined with the impacts of other projects in the terrestrial area, an overall adverse cumulative impact would be expected. Alternative 1 would not increase the levels of impacts.

Conclusion

Although artificial maintenance of scrub shrub habitat in the parks is not consistent with NPS protection and national designations of natural, scenic, and recreational resources, alternative 1, the no-action alternative, would result in the continued maintenance of the ROW. The present situation would remain constant; however, edge habitat may change due to the removal of danger trees. The amount of artificially maintained habitat could increase from the removal of danger trees; however, because of the uncertain definition of danger trees, the impact cannot be measured. The structural stage of the habitat in the ROW may differ from current conditions, because some areas are being trimmed to the herbaceous layer during maintenance, eliminating the shrub layer and limiting the diversity of the habitat. A different regime of vegetation maintenance of alternative 1 could alter the available habitat.

The protection afforded wildlife species in the parks, including those that use the ROW, would continue under the implementation of resource management programs to protect and enhance wildlife habitat; however, the ROW would continue to be maintained as a managed habitat in the parks. The activities of alternative 1 would affect wildlife through disturbance, direct mortality, increased predation, and changes to the functional use of the habitat in the ROW. Impacts on wildlife would continue inside the terrestrial study area during maintenance activities, from continued long-term maintenance of the transmission line, and from potential hazards (electrocution and collision) to birds from the existing transmission lines.

The effects of past, present, and reasonably foreseeable future projects, when combined with the impacts under alternative 1, would result in adverse cumulative impacts on landscape connectivity, wildlife habitat, and wildlife inside the terrestrial study area.

Alternative 1 would continue the existing fragmentation of what are, otherwise, expansive stretches of intact habitat and contiguous forest within the study area which create an important ecological hub upon which natural corridors can be developed to connect other protected lands adjacent or proximate to the parks. The only change would be the result of the applicant's new vegetation management standards, leading to more clearing of vegetation within the ROW than is the case now or has been the case historically, resulting primarily in creation of more edge habitat and more scrub shrub habitat. All of these adverse impacts would be confined to the limits of the present ROW and none of the adverse impacts change existing conditions with regard to the overall functions and values of the affected resources, including the ability to create larger protected corridors. Any cumulative impacts to resources would remain adverse primarily from other actions taken outside the study area. In conclusion, the adverse impacts of alternative 1 would not likely be significant because the impacts would be in keeping with the parks' enabling legislations, NPS *Management Policies 2006*, and all other applicable federal and state laws and would not interfere with management goals for protecting and perpetuating wildlife and wildlife habitat.

Common to All Action Alternatives

Removal of Existing Structures: All action alternatives would involve the removal of all or a portion of the B-K Line, as discussed in chapter 2. For all action alternatives, the B-K Line structures would be removed but the foundations for these structures would remain in place. For alternatives 2 and 2b, the S-R Line would be constructed along the same alignment. The removal of the structures would require constructing access roads (either permanent or temporary, depending on the alternative). The removal of the B-K Line would require constructing access roads, wire pull sites, and the removal of the line as described in chapter 2. Because access roads would also be required for the construction and long-term maintenance of the new line, adverse impacts from removing the line would be the same as (or less than) the impacts discussed for construction of the S-R Line.

Vegetation Clearing: For the analysis of impacts on landscape connectivity, wildlife habitat, and wildlife, it was assumed that a 350-foot corridor would be cleared of vegetation for the construction of the new double 500-kV transmission line for alternatives 2, 3, 4, and 5. For alternatives 2, 3, 4, and 5, the corridor would be cleared 175 feet from the centerline of the existing ROW to either side. Under alternative 2b, the applicant proposes to operate the S-R Line within the existing ROW. The NPS anticipates that the applicant would require additional area for construction; therefore, it is estimated that under alternative 2b, the applicant would expand the ROW to the extent of their deeded property rights, which ranges from 100 feet to 380 feet. For alternative 2b, the ROW would be cleared on either side of the centerline to an appropriate width based on the deeded property rights.

In addition to vegetation clearing inside the ROW, areas outside of the ROW would also need to be cleared for all action alternatives to construct the access roads, spur roads, and pulling and splicing sites.

Areas cleared for access roads (inside and outside the ROW) and tower foundations (inside the ROW) would be maintained permanently and would result in a permanent loss of vegetation. All other cleared areas would be seeded after construction with an NPS-approved conservation seed mixture appropriate to the local conditions. The area within the ROW maintained for operation is less than that which would be cleared for constructions. Areas both inside and outside the ROW that do not need to be maintained for operation of the S-R Line would be allowed to succeed to forested area over time. Because mature forest removed for construction would not be replaced within the 15-year analysis period covered by this EIS the impacts would be considered permanent.

The successful restoration of the land temporarily cleared and/or disturbed for construction but not needed for the operation of the S-R Line could be hindered by impacts on soils sustained during the construction of the S-R Line, despite the regrading of the surface soils. The use of heavy construction equipment and the construction and use of access roads would compact the underlying soil. Compaction can cause damage to soil structure, which determines the ability of a soil to hold and conduct water, nutrients, and air necessary for plant root activity and growth (UM 2001, 1). Additionally, the removal of near-surface soils may have unfavorable consequences on productivity, affecting the successful revegetation of disturbed areas. Monitoring and maintenance of revegetated areas under the applicant's vegetation management plans would need to be implemented to ensure that vegetation restoration is successful.

The impacts from vegetation clearing are discussed for each alternative because the amount of clearing for each is different.

Construction Components: Construction activities are described in detail in chapter 2; the activities that would affect landscape connectivity, wildlife habitat, and wildlife include the construction of access roads (including turnaround areas), tower foundations, crane pads, wire pull locations, pulling and splicing sites, and staging areas. Wire pull locations, pulling and splicing sites, staging areas, and spur roads would create impacts because vegetation would be removed; however, these features are temporary and the disturbed areas would be restored, as described in chapter 2. Construction of these components would result in temporary or permanent loss of vegetation, as described above in "Vegetation Clearing." Restoration would not be complete within the period of analysis of this EIS; however, this section focuses on the activities that would produce permanent impacts (i.e., ROW expansion and the construction of access roads and tower foundations). All action alternatives would require drilling as part of the construction process, but because drilling is unlikely to affect groundwater (see discussion in "Geologic Resources") it would not affect aquatic species in the vicinity and is not discussed further.

Operational Noise and Electromagnetic Fields: Transmission lines produce noise once operational, but the noise is dependent on the size, voltage, and configuration of the lines, as well as the environmental conditions. The S-R Line would be constructed using a conductor configuration that reduces audible noise from the lines (PPL and PSE&G 2008, A10-8); however, the transmission lines would increase the level of noise currently in the parks. There is little conclusive evidence that transmission line noise significantly affects wildlife; however, increases in noise can affect communication, behavior, and ultimately survival. It is anticipated that noise from the operation of the proposed transmission lines would cause disturbance and would be localized.

Global research is ongoing to determine if there are effects on humans and wildlife from electromagnetic field (EMF). While most research is inconclusive as a whole, several studies have determined that EMF exposure has an effect on some bird species, and those effects are usually adverse. Fernie and Reynolds (2005) conducted a literature review and concluded that exposure to EMF can change behavior, physiology, the endocrine system, and immune functions of birds and these changes can lead to a decrease in reproductive success. Effects from EMF exposure appear to be species specific, as evidenced

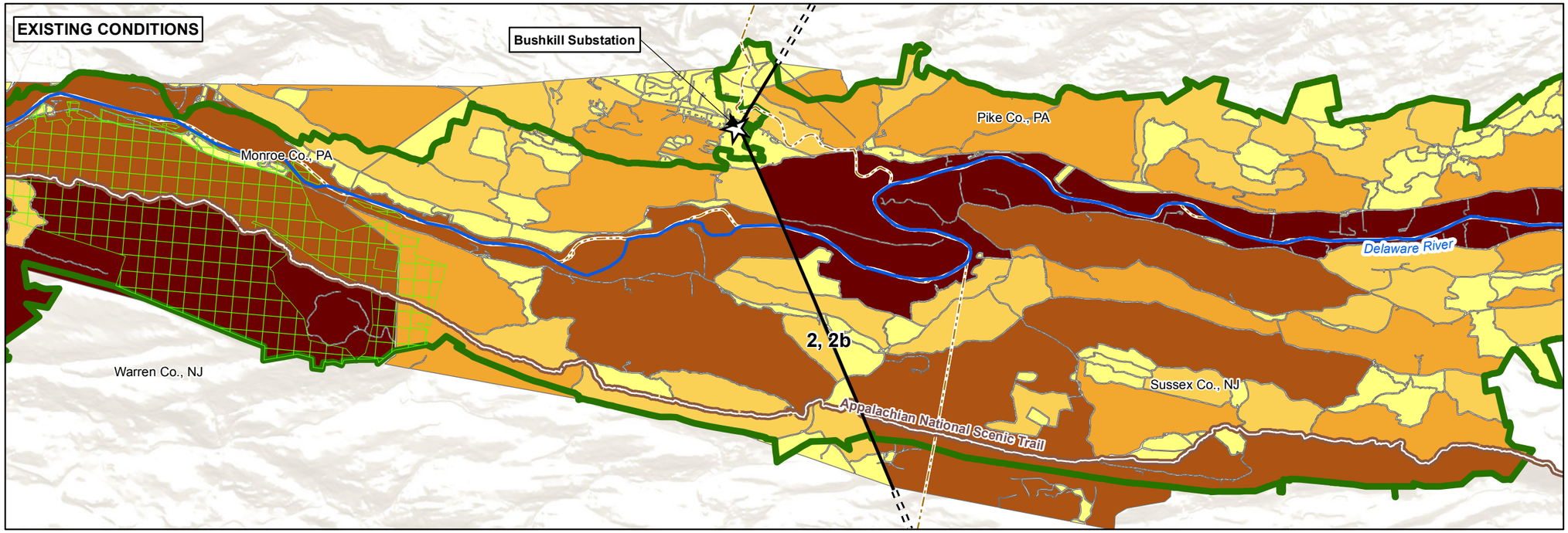
by Doherty and Grubb (1998), where house wrens were essentially unaffected, but tree swallows endured a change in egg size and lower fledgling success.

Alternative 2

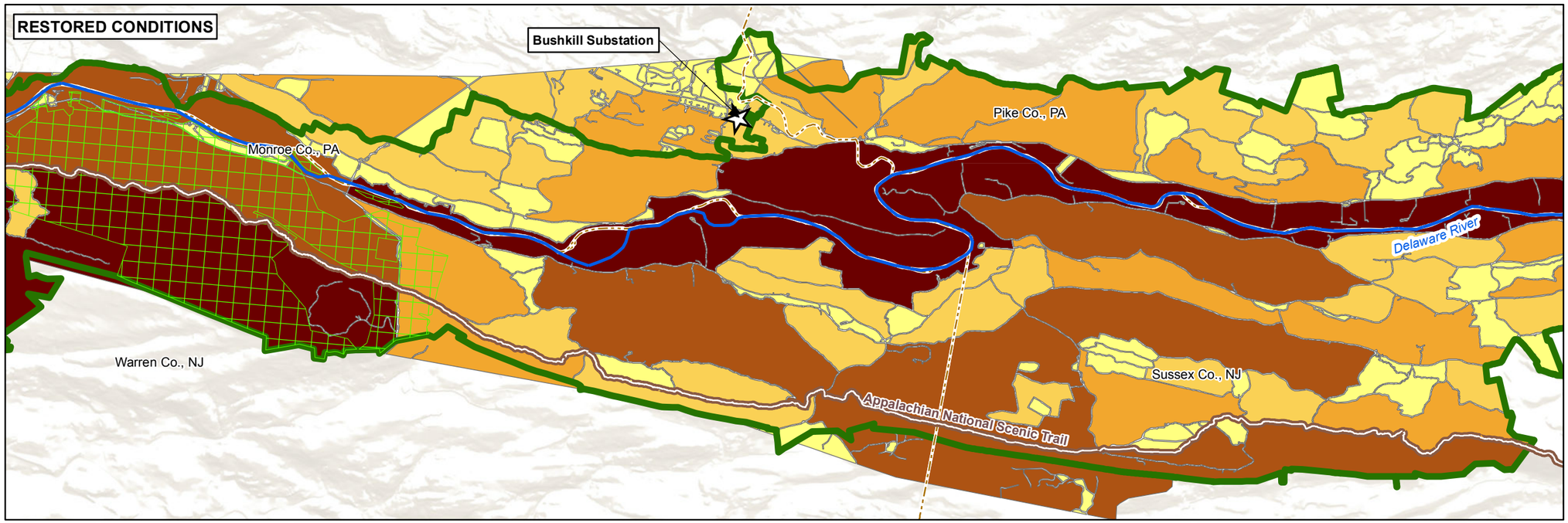
Landscape Connectivity and Wildlife Habitat: Permanent habitat loss under alternative 2 would result from the construction of access roads, the widening of the proposed ROW, and the construction of tower foundations, resulting in a loss of approximately 45 acres (table 47). Approximately 311 acres of utility ROWs currently exist in the terrestrial study area. This total includes all existing alternative alignments, as well as other ROWs not related to the S-R Line. Under alternative 2, the combined area of mechanically and/or chemically maintained corridors would increase to approximately 356 acres, with an additional 3.4 acres of access roads constructed outside the expanded ROW (table 47). The permanent loss of forest from access roads and from the alteration of forest to maintained scrub shrub habitat as a result of alternative 2 actions would represent an increase in artificially maintained area of 14%. The current ROW width ranges from approximately 80 to 150 feet; under alternative 2, this operation or final width would increase to 200 feet, representing a permanent increase in maintained habitat of 33% to 150%. The expansion of the ROW under alternative 2 would fragment the habitats that exist on either side of the corridor. All patches of habitat along the ROW would be reduced in size and some smaller patches would be eliminated completely (figure 71). Access roads would create new fragmentation under alternative 2. For example, three existing patches are each broken into two or three smaller patches by the construction of access roads. At the western boundary of DEWA, a patch of approximately 26.3 acres would be bisected by an access road, creating two patches of 2.5 acres and 18.6 acres. One patch south of the ROW that is currently 95 acres would be fragmented into three patches with acreages of 15, 24, and 48. Similarly, one patch south of the ROW in Pennsylvania is currently 163 acres. With the expansion of the ROW and construction of an access road, this patch would be reduced to 148 acres and a new 4.1 acre patch would be created. The largest contiguous patch in DEWA is currently 5,301 acres. This patch would be reduced to 5,272 acres by the ROW expansion, resulting in a loss of approximately 29 acres. Under alternative 2, the number of smaller patches (from 0 to 150 acres) would increase from 9 to 20. The number of larger patches would decrease from 10 to 9 patches, and patch sizes would be reduced. The largest patches adjacent to the alternative 2 alignment (those over 150 acres) would be reduced in size by 0.2% to 8%.

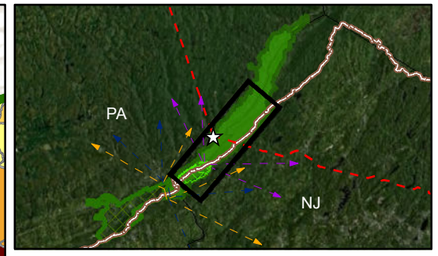
The impacts on wildlife habitat from fragmentation include the loss of habitat, reduced habitat patch size, increased edge, and increased isolation of patches (USDA 1999, 2–4). The alternative 2 alignment would be sited along an existing ROW; therefore, the habitat is already fragmented. The reduction of habitat and patch size from expansion of the ROW and construction of the access roads would have impacts on wildlife habitat. Widening the ROW would reduce the acreage of forest interior and could affect forest interior–dwelling species, such as wood thrush and scarlet tanager. Increased fragmentation from widening the ROW and access roads could become an obstruction to movement for less mobile species such as invertebrates, small mammals, reptiles, and amphibians (Peterken 2002, 5). The alternative 2 alignment would cut through areas of northern hardwood and eastern hemlock forests. Wildlife species that use these habitats likely travel throughout the extent of these forests. The expanded ROW would limit the ability for less mobile species to do so. Within smaller habitats such as the Van Campen Brook wetland, access roads that bisect the habitat could affect the dispersal of reptiles and amphibians. Additionally, the towers and access roads could impede the movement of some smaller wildlife species from one patch to the next. Loss of habitat connections across a landscape is one of the most severe threats to the survival of many wildlife species (Wilderness Society 2004, 1).

EXISTING CONDITIONS



RESTORED CONDITIONS





Legend

- Substation
- Alternative 2,2b Existing Transmission Line
- Outside Study Area
- Appalachian National Scenic Trail
- Middle Delaware National Scenic & Recreational River
- Delaware Water Gap National Recreation Area
- Worthington State Forest
- CVNWR Boundary
- County Line

Habitat Patch Acreages

- 0 - 150 acres
- 150 - 500 acres
- 500 - 1,200 acres
- 1.200 - 3,200 acres
- 3,200 - 8,000 acres

Note: Designated boundary of CVNWR is depicted, not all property is owned within the boundary

0 1 2
Miles

Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 71
Alternative 2,2b
Existing vs. Restored Conditions

Source: ESRI Streetmap 2009;
NPS 2011;
ArcGIS Map Service 2010;

Projection: NAD 83 UTM Zone 18N
Date: July, 2012

The expansion of the ROW would not create more edge habitat; however, it would expose formerly shaded interior trees and plants to edge conditions of increased sunlight and temperature, especially along an east–west-oriented ROW that would be exposed to hot afternoon sun (Manitoba Hydro 1995, 13). The composition of vegetation along the edge would change to include more sun-tolerant species, thus changing the habitat. Additional edge habitat would be created by the construction of access roads, and habitats along the roads would be modified in the same manner.

Vegetation in the 100-foot riparian buffers would not be cleared for construction or during continued vegetation maintenance (PPL and PSE&G 2008, 7). The Delaware River riparian corridor could act as a travel corridor in which wildlife could move from one side of the ROW to the other. Retaining passageways such as these would benefit the wildlife, but would not reduce the level of impact from the widening of the ROW.

Wildlife: Under alternative 2, wildlife would be affected by clearing and construction activities, the operation and maintenance of the proposed transmission line, and vegetation maintenance. Impacts on all animal groups due to vegetation maintenance are described in detail under alternative 1. The impacts from disturbance and direct mortality due to construction activities are the same as those described for vegetation maintenance; however, the impact levels may be different due to the intensity of disturbance or amount of activity. The additional miles of road and increased human access activity may impact wildlife and diminish contiguous habitat.

Aquatic Species: The degradation of water quality and habitat alterations would result in impacts on aquatic species. The increase of sediment loads and TSS due to soil erosion from the construction and use of access roads and crane pads would also contribute to adverse impacts. An increase in sediment loads and turbidity could adversely affect the habitat, reproduction, respiration, and survival of fish and benthic macroinvertebrates and could bury or smother aquatic vegetation. The installation of stream crossing structures associated with the access roads would affect aquatic organisms by potentially blocking access to spawning habitat, feeding areas, and shelter, and restricting the movement of organic material such as leaves and woody debris that provide food and shelter for aquatic organisms. Stream crossing structures would also alter the natural flow dynamics and sediment transport regimes, resulting in streambank erosion, streambed scour, and changes in sediment deposition. These geomorphic changes would alter existing habitat conditions and affect the community structure of fish and benthic macroinvertebrates. Construction along streams could also contribute to the spread of invasive vegetation, which frequently becomes established in construction areas and could have adverse impacts on aquatic species. Impacts on aquatic species and their habitats or on the natural processes sustaining these species could affect the overall amount, integrity, and connectivity of habitat in the terrestrial study area.

Terrestrial Invertebrates: Under alternative 2, invertebrates would be affected through disturbance and direct mortality during clearing and construction activities due to the use of large construction vehicles and the potential use of helicopters.

Birds: Impacts from disturbance during clearing activities would occur on birds in and near the construction corridor for the expanded ROW and roads. During migration, migratory Neotropical bird species would avoid areas adjacent to the ROW during site preparation, tree clearing, and construction activities. Direct loss of nests, eggs, and nestlings due to clearing, construction, and vegetation maintenance activities would be minimized by implementing seasonal restrictions (March 15–July 31) on activity.

Under alternative 2, the expanded ROW would maintain the same amount of edge habitat along the adjacent woodlands; however, edge habitat may change due to the removal of danger trees and would be increased along the access roads where they extend outside the ROW into forested habitat. It is expected

that over the long term, brown-headed cowbird nest parasitism and predation by opportunistic species such as American crow, opossum, and raccoon would increase. Many Neotropical migrant species that breed in the northeastern United States are ground-nesting species that build open nests; these species are therefore more susceptible to nest predation and brood parasitism and as a result are more sensitive to the fragmentation of habitat and creation of forest edges (Faaborg 2002, 8). The continued maintenance of the ROW would maintain or increase edge habitat and would continue the potential for parasitic and predatory species to find nests and young of breeding birds.

Over the long term, the creation and maintenance of early successional habitat in the new ROW footprint could favor species that prefer scrub shrub habitat for nesting, such as field and song sparrows, eastern bluebird, eastern kingbird, tree swallow, golden-winged warbler, and indigo bunting; predatory raptors, as previously mentioned, would be expected to resume using the ROW. Additionally, brush piles created after vegetation maintenance would provide shelter and potential nest sites for species such as eastern towhee and gray catbird, as well as wintering white-throated sparrow and dark-eyed junco.

The terrestrial study area is located along a major north–south fall migration corridor for raptors, and newly constructed transmission lines would create a bird collision hazard where they are oriented in an east–west direction. The configuration of the conductors for the S-R Line would be vastly different than that of the B-K Line. Instead of 6 lines, the S-R Line structures (which would be twice as tall as the B-K Line structures) would carry a total of 20 lines.

Raptors have acute eyesight and are daytime migrants, and would not be expected to collide with transmission lines or structures. However, raptors' flight strategies vary and many raptors forage along the riverbanks of the Delaware River, which would bring these birds to lower altitudes, increasing the potential for collisions. Additionally, hawks are known to use lower altitudes when gliding along ridgelines. Altitudes used by ridge-gliding migrant red-tailed hawks can be as low as 5 to 20 feet or as high as 600 feet above the treetops or ridgetop. When ridge gliding, efficiency is gained by maintaining altitude, especially when the ridge is oriented in the same alignment as the migration path (Kerlinger 1995, 166). Orienting tall structures perpendicular to the flight path of ridge-gliding raptors may result in collisions with wires if conditions are such that raptors are using lower altitudes along a ridge such as Kittatinny Ridge. Because Kittatinny Ridge is oriented north–south and provides ideal conditions for migratory hawks, especially in fall, the potential for collisions would exist. Raptors may also collide with wires when foraging along the ROW. Additionally, large birds of prey attempting to perch on poles can be electrocuted at wire-to-wire or conductor-to-ground connections.

Bird fatalities primarily involve nocturnal migrants because they generally fly at higher altitudes than diurnal migrants; however, the altitude of flight widely varies. Studies have recorded flight patterns from just above the surface of the water to approximately 20,000 feet. Generally, nocturnal migrants take flight after the sun sets. Maximum altitude is gained quickly and is maintained until midnight, after which the birds gradually descend until daylight (USGS 2006). Many migrant passerines use the habitats within the parks for critical food resources and shelter and could collide with the proposed transmission lines during their descent.

Bird collisions may also occur when a transmission line runs perpendicular to a flight path used by a concentration of birds, such as a flock of Canada geese, that move back and forth from feeding and roosting sites on a daily basis or when migrants are traveling at reduced altitudes (usually in inclement weather) and encounter structures. The Delaware River would be traversed by transmission lines under alternative 2, which could affect birds that forage along the river. The proposed transmission line would be routed through several wetland complexes, including the Van Campen Brook wetland complex. The current ROW is located along the same wetlands; however, the birds are generally transient in the area and would move out of and avoid areas of disturbance. Because of the large size of the new transmission

line towers, the height and configuration of the lines may increase the potential for collision with groups of waterfowl that migrate at night and may use the wetlands and open water areas associated with the wetlands.

The presence of higher transmission line structures and lines could adversely affect migratory bird species where the lines transect migratory and habitual flight paths to and from foraging or roosting areas. In a study of wind turbine impacts on migratory birds in Michigan, the majority of migratory birds were observed flying between the tree canopy and 328 feet (100 meters) above the canopy. Many raptors are equipped to use thermals to maximize their energy use during migration and average an altitude of 328 to 1,640 feet (100 to 500 meters) above the tree canopy. However, many other migrating birds are not physically capable of using thermals and often migrate at low altitudes, observed as flights just above the tree canopy (Paterson et al. 2010, 11). Currently, the transmission line conductors are generally at the height or below the top of the tree canopy. The height of the new towers would result in the conductors being considerably higher than the tree canopy. Additionally, the number of conductors would increase to approximately 20 lines under alternative 2. Where agricultural lands are traversed by the ROW, transmission lines and towers could create attractive perching areas from which raptors could discern prey, and towers could create a hazard for raptors foraging along the river, particularly ospreys and bald eagles. The conditions of the proposed alternative 2 transmission line would likely increase collisions. The proposed transmission line would be constructed according to Avian Power Line Interaction Committee (APLIC) standards and would use the best available technology for deterring raptors from using the transmission towers and lines. A sizable number of bird collisions is not expected; however, the effectiveness of the APLIC standards on a 500-kV line crossing DEWA, MDSR, and APPA is unknown.

Two known bald eagle nests, an important bald eagle roost, and a bald eagle foraging area exist near the alternative 2 alignment. Impacts on bald eagles are discussed in the “Special-status Species” and “Rare and Unique Communities” sections of this chapter.

Amphibians and Reptiles: Reptiles and amphibians would be affected through disturbance and direct mortality during clearing and construction activities under alternative 2. With the use of large construction equipment in a concentrated area, direct mortality from strikes by equipment and vehicles are expected. Construction activities could include the use of helicopters, which could result in an intense period of noise and disturbance over a wider area and would coincide with on-the-ground construction activity. Disturbance and displacement of wildlife species could result from the noise and activity surrounding the use of helicopters. Impacts from disturbance would have the potential to be widespread due to noise. As stated for alternative 1, many amphibians and reptiles migrate in large numbers, some over large distances. Direct mortality of individual animals would not affect the viability of the species, if seasonal restrictions on construction and vegetation maintenance during migration were enforced.

Predation could increase in the ROW under alternative 2 because the vegetation would be maintained at an early successional stage, which can expose species to predators because of less vegetation cover. In addition, as previously described, reduced forest canopy and an increase in sun exposure would reduce the amount of habitat available to amphibians.

Mammals: Clearing and construction activities under alternative 2 would disturb and displace large and mobile mammals; less mobile species could suffer direct mortality. As stated for amphibians and reptiles, the impacts from disturbance could be intensified by the use of helicopters during construction.

After construction, the expanded ROW would be maintained regularly, which could increase its use as a movement corridor by larger mammals but could also increase predation on small mammals as a result of less vegetation cover. Maintenance activities would result in disturbance and direct mortality. These impacts are discussed in detail under alternative 1.

Overall Impacts on Landscape Connectivity, Wildlife Habitat, and Wildlife: Adverse impacts on landscape connectivity, wildlife habitat, and wildlife under alternative 2 would result from habitat loss, habitat alteration, the continued artificial maintenance of the habitat within in the ROW, the isolation of habitat patches, increased edge habitat, the disturbance and direct mortality of wildlife, and the isolation of some species.

Cumulative Impacts

Adverse cumulative impacts on landscape connectivity, wildlife habitat, and wildlife would result inside the terrestrial study area from past, present, and reasonably foreseeable projects, as described previously in the "Cumulative Impacts Common to All Alternatives" section. Alternative 2 would impact resources inside the park that are also under pressure in the surrounding region. Multiple types of development outside of DEWA and APPA are quickly diminishing the Kittatinny migratory bird flyway and contiguous wildlife habitats on a broader scale. The reduction of these resources in the region surrounding the parks would increase their scarcity and sensitivity inside the parks, where they are afforded special protections. Alternative 2 would contribute to the cumulative adverse impact on these resources, particularly with regard to fragmentation, loss of landscape connectivity, and hazard to migratory birds. When the adverse impacts as a result of alternative 2 are combined with the impacts from the other projects in the terrestrial study area, an overall adverse cumulative impact would be expected. Alternative 2 would not increase the levels of impacts.

Conclusion

Alternative 2 would result in adverse impacts on landscape connectivity, wildlife habitat, and wildlife. Inside the terrestrial study area, the habitat patches adjacent to the alternative 2 alignment would experience a reduction in size from the expansion of the ROW and further fragmentation from the construction of access roads. The number of patches from 0 to 150 acres would increase from 9 to 20 patches, due to access roads bisecting existing patches and creating several smaller patches. Reductions in the size of larger patches would range from 0.2% to 8%. The increases in habitat fragmentation would result in more isolation between the patches on either side of the ROW and could make some of the smaller patches uninhabitable for certain species. The expansion of the alternative 2 ROW would represent a 14% increase in the amount of maintained scrub shrub habitat in the terrestrial study area.

Although a transmission line ROW currently exists along the alternative 2 alignment, the expansion of the ROW under this alternative could create inhospitable conditions for some species, potentially isolating them on either side of the ROW. Wildlife species would be affected by the actions of alternative 2 throughout the period of analysis. Disturbance and direct mortality would begin with clearing activities and continue through the vegetation maintenance activities. Artificially creating and maintaining successional habitat often increases the number of wildlife species that inhabit the area; however, this local diversity has the potential to lead to the extinction of native species that require large areas of undisturbed habitat (Willyard et al. 2004, 16–17). The adverse impacts from alternative 2, when combined with the adverse impacts from past, present, and reasonably foreseeable projects, would result in adverse cumulative impacts on landscape connectivity, wildlife habitat, and wildlife.

Alternative 2 would cross in the center part of DEWA, including the MDSR. In general, this area is one of the most undeveloped areas of the park, containing a high concentration of many important and unique natural features including large swaths of contiguous mature forest, rare limestone formations, Arnott Fen, the Delaware River riparian corridor, eastern hemlock forests, Hogback Ridge, Kittatinny Ridge, and Van Campen Brook riparian area. Several resources on this alignment are recognized for their biodiversity (e.g., Hogback Ridge and Arnott Fen) and are significant in both park and regional contexts, making any impacts in these locations even more acute.

When considered in the context of NPS policies for protecting and managing wildlife and wildlife habitat, including the importance of landscape-scale habitat connectivity, alternative 2 would have potential to result in significant adverse impacts. The clearing required to construct and operate the new line would reduce the abundance, diversity, and quality of native vegetation in and around the alignment contrary to the conditions the parks strive to maintain. The de facto permanent removal of vegetation from the corridor would create a new element of fragmentation in the landscape, which would inhibit the transit of certain wildlife and reduce opportunities to create future continuous green spaces. The new line would bisect a major migratory bird flyway and is adjacent to an important communal roost for wintering bald eagles that is one of only two known winter roosts in DEWA. The extent of mortality of migratory birds and bald eagles from collisions with the lines is uncertain. Cumulatively, the new transmission line would bisect a key protected land corridor and decrease connectivity on regional scale. It would also decrease future possibilities to connect adjacent lands to create contiguous green space corridors. For these reasons, the adverse impacts of alternative 2 are considered to be potentially significant.

Permitting the project would adversely affect multiple protected resources inside the parks, in some instances irreversibly. Allowing such adverse effects in order to facilitate private infrastructure expansion would be contrary to NPS practice and principle of protecting and improving these resources, and of removing incompatible infrastructure to do so. This could establish precedent that may invite similar proposals by other applicants in the future, and create an expectation of like treatment for those proposals; it may make it difficult to deny such proposals. DEWA and APPA both contain numerous other utility crossings, which makes the risk of such precedent particularly concerning for these parks. Furthermore, as units of the national park system, wherein all parks are entitled to equal protection, creating such a precedent could have ramifications for parks nationwide. The location of this particular crossing through the center of DEWA could make such a precedent even more potent. Installing the S-R Line on this alignment may invite future utilities proposing to follow the same route.

Overall, the significance of the impact of alternative 2 is a result of two considerations: the particularly resource-rich area through which the alternative crosses and the potential to inflict harm to those resources because of the magnitude and duration of the adverse impacts. Although it is true that not all impacts can be predicted with great certainty, in the context of the purpose and significance for which DEWA, APPA, and MDSR were established and NPS mandates to specifically preserve the natural, cultural, and scenic resources within them, additional precautions are warranted when considering risks to these resources, many of which are of national importance. Similarly, certain resources are non-renewable, which makes any impacts to them all the more serious because they cannot be replaced if lost. And some resources are under threat by other actions and outside pressure, which in the context of the function of the parks as an “oasis” or refuge within the highly developed east coast, elevates the need to preserve and protect these scarce, sensitive resources. For these reasons, the environmental consequences of alternative 2 would be significant.

Alternative 2b

Landscape Connectivity and Wildlife Habitat: Alternative 2b would result in a loss of approximately 23-37 acres of habitat loss due to clearing activities and construction of the components of the S-R Line. This alternative would increase the area of maintained utility ROWs in the terrestrial study area from 311 acres to 334 to 348 acres. The current ROW width ranges from approximately 80 to 100 feet; under alternative 2b, this width would increase to 200 to 300 feet where the ROW is not limited by the applicant’s deeded property rights. The widening of the ROW under alternative 2b represents a permanent increase in maintained habitat of 0% to 275%. The permanent loss of forest from access roads and from the alteration of forest to maintained scrub shrub habitat as a result of alternative 2b actions would represent an increase in artificially maintained area of 7% to 12%. Additionally, the removal of danger trees is a part of the applicant’s vegetation maintenance plans. This portion of vegetation maintenance

could involve the removal of individual trees or it could include larger patches of trees, if the trees are deemed to be a threat to the transmission line. A 0.75 mile portion of the existing ROW in Pennsylvania is 100 feet wide. It is anticipated that danger trees would be removed in this area, which includes the heavily forested Hogback Ridge community, and would result in a net loss of mature forest. The amount of danger trees that would be removed is unknown.

Under alternative 2b, the expansion of the ROW and construction of the S-R Line components would fragment the existing habitat in the same manner as described for alternative 2. Patches would be reduced in size and access roads would create new fragmentation. Access roads would be constructed outside the existing ROW and would cause the loss of 4.7 acres of forested land (table 47). The construction of access roads would increase the number of patches from 22 to 30. New patches that would be created by the access roads range from approximately 0.3 acre to 6.6 acres. In two instances, access roads would bisect larger patches, creating two or three smaller patches from each larger patch. For example, one 95-acre patch south of the ROW would be fragmented into three patches with acreages of approximately 17, 26, and 50. The removal of danger trees would also add to fragmentation; however, a definitive amount of deforestation cannot be determined until engineering plans and vegetation surveys are completed.

The wildlife habitat encountered under alternative 2b is the same as that described for alternatives 1 and 2. The construction of access roads would bisect microhabitats and isolate less mobile species on either side of the road. The removal of danger trees could result in a change in conditions along the alternative 2b alignment, depending on the number of trees removed. Newly exposed vegetation that was formerly in shaded areas would be affected by edge conditions such as increased temperature and sun exposure, which could change vegetation composition and habitat conditions.

Wildlife: Under alternative 2b, wildlife would be affected by clearing and construction activities, the operation and maintenance of the proposed transmission line, and vegetation maintenance. Impacts on all wildlife groups are described in detail under alternatives 1 (impacts from vegetation maintenance) and 2 (impacts from construction). The types of impacts from the construction and operation of the proposed transmission line under alternative 2b would be the same. The magnitude of impacts would be approximately the same as alternative 2 because both alternatives would be affecting a linear tract of approximately 5.6 miles within the study area.

Overall Impacts on Landscape Connectivity, Wildlife Habitat, and Wildlife: Adverse impacts on landscape connectivity, wildlife habitat, and wildlife would result from habitat loss, habitat alteration, the continued artificial maintenance of the habitat in the ROW, the isolation of habitat patches, the disturbance and direct mortality of wildlife, and the isolation of some species.

Cumulative Impacts

Adverse cumulative impacts on landscape connectivity, wildlife habitat, and wildlife would result inside the terrestrial study area from past, present, and reasonably foreseeable projects, as described previously in the “Cumulative Impacts Common to All Alternatives” section. Alternative 2b would impact resources inside the park that are also under pressure in the surrounding region. Multiple types of development outside of DEWA and APPA are quickly diminishing the Kittatinny migratory bird flyway and contiguous wildlife habitats on a broader scale. The reduction of these resources in the region surrounding the parks would increase their scarcity and sensitivity inside the parks, where they are afforded special protections. Alternative 2b would contribute to the cumulative adverse impact on these resources, particularly with regard to fragmentation, loss of landscape connectivity, and hazard to migratory birds. When the adverse impacts as a result of alternative 2b are combined with the impacts from the other

projects in the terrestrial study area, an overall adverse cumulative impact would be expected. Alternative 2b would not increase the levels of impacts.

Conclusion

Alternative 2b would result in adverse impacts on landscape connectivity, wildlife habitat, and wildlife from artificially maintaining a ROW that bisects natural landscapes in the parks despite NPS protection and national designations of natural, scenic, and recreational resources. Inside the terrestrial study area, alternative 2b would result in the permanent loss of approximately 4.5 acres of mature forest through the construction of access roads. The access roads would increase the number of patches adjacent to the ROW from 19 to 33. A majority of the new patches created by construction of the access roads be small, from 0.03 to 6.5 acres. The removal of danger trees would cause the additional removal of mature forest, but the amount cannot be determined at this time.

Adverse impacts on wildlife would also result from these changes to landscape connectivity and wildlife habitat. Wildlife species would be affected by the actions of alternative 2b throughout the period of analysis. Disturbance and direct mortality would begin with clearing activities and would continue through vegetation maintenance activities. When the adverse impacts from alternative 2b are combined with the adverse impacts from past, present, and reasonably foreseeable future projects, adverse cumulative impacts on landscape connectivity, wildlife habitat, and wildlife would result.

For the same reasons outlined for alternative 2, alternative 2b would likely result in significant adverse impacts on landscape connectivity, wildlife habitat, and wildlife.

Permitting the project would adversely affect multiple protected resources inside the parks, in some instances irreversibly. Allowing such adverse effects in order to facilitate private infrastructure expansion would be contrary to NPS practice and principle of protecting and improving these resources, and of removing incompatible infrastructure to do so. This could establish precedent that may invite similar proposals by other applicants in the future, and create an expectation of like treatment for those proposals; it may make it difficult to deny such proposals. DEWA and APPA both contain numerous other utility crossings, which makes the risk of such precedent particularly concerning for these parks. Furthermore, as units of the national park system, wherein all parks are entitled to equal protection, creating such a precedent could have ramifications for parks nationwide. The location of this particular crossing through the center of DEWA could make such a precedent even more potent. Installing the S-R Line on this alignment may invite future utilities proposing to follow the same route.

Overall, the significance of the impact of alternative 2b is a result of two considerations: the particularly resource-rich area through which the alternative crosses and the potential to inflict harm to those resources because of the magnitude and duration of the adverse impacts. Although it is true that not all impacts can be predicted with great certainty, in the context of the purpose and significance for which DEWA, APPA, and MDSR were established and NPS mandates to specifically preserve the natural, cultural, and scenic resources within them, additional precautions are warranted when considering risks to these resources, many of which are of national importance. Similarly, certain resources are non-renewable, which makes any impacts to them all the more serious because they cannot be replaced if lost. And some resources are under threat by other actions and outside pressure, which in the context of the function of the parks as an “oasis” or refuge within the highly developed east coast, elevates the need to preserve and protect these scarce, sensitive resources. For these reasons, the environmental consequences of alternative 2b would be significant.

Common to Alternatives 3, 4, and 5

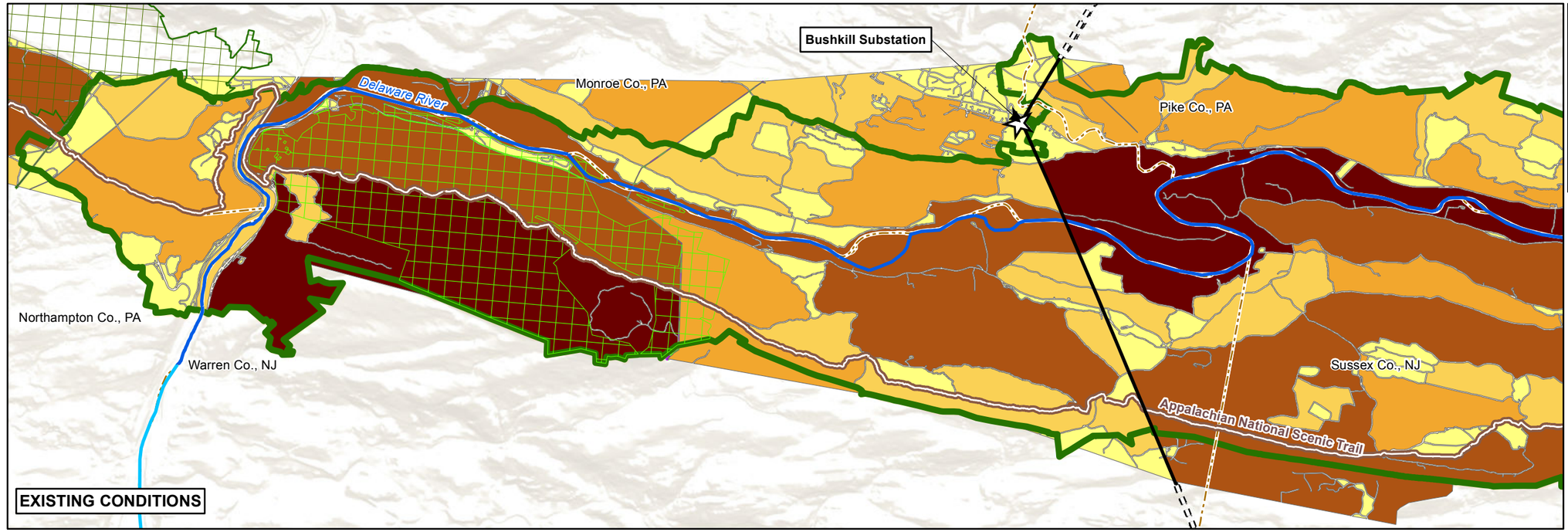
Restoration of the B-K Line: Alternatives 3, 4, and 5 would require the removal of the B-K Line between the Bushkill Substation and the eastern boundary of DEWA. Wetlands, floodplains, and forest would be restored (53 acres total), creating larger patches of contiguous habitat and reducing fragmentation in the core of the park. This would ultimately result in the restoration of wildlife habitat with benefits to wildlife. The details of the removal and disposal of the existing conductors and structures are discussed in chapter 2. Vegetation in the existing ROW would be cleared and spur roads would be constructed for the removal process. In the existing ROW, approximately 53 acres of land within NPS boundaries would be cleared of vegetation. An additional 1.1 to 1.5 acres of vegetation within NPS lands and the terrestrial study area but outside the ROW would be cleared to construct access roads. These clearing and construction activities would remove wildlife habitat and disturb wildlife. Human presence and noise would disturb wildlife in the area and the use of heavy machinery during the deconstruction process would cause direct mortality of less mobile species.

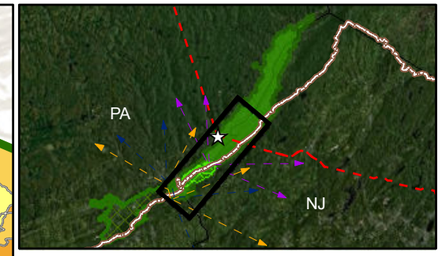
Following the deconstruction of the B-K Line, the access roads and the ROW would be restored to original conditions to the greatest extent possible. These areas would be disked or tilled as needed to mitigate soil compaction. After soil preparation, the areas would be seeded with an NPS-approved conservation seed mixture and allowed to succeed naturally into forested habitat over the long term; however, restoration of the ROW to mature forest would not be complete within the period of analysis of this EIS. Allowing the natural process of succession to reclaim the ROW as natural habitat would result in 53 fewer acres of utility ROW in the terrestrial study area (table 47). In the long term, the restoration would also create connectivity among large patches of habitat that are currently fragmented. The restoration would cause an increase in two patches (originally 4,031 and 1,786 acres) that are currently bisected by the B-K Line, resulting in an increase in size of 3.9% and 307% (for a total of 4,188 and 7,272 acres, respectively). The larger patch, which would generally follow MDSR, contains several rare and unique communities and would stretch approximately 18.3 miles through DEWA. The restoration of the B-K Line would allow two to three patches to join and create larger patches in five instances (figures 72 and 73). In the eastern portion of DEWA in New Jersey, two large habitat patches of 2,338 and 2,763 acres would gain connectivity with patches south of the B-K Line, creating patches of 2,393 acres and 3,053 acres. This area is separated into two patches by the Trail; however, the Trail a 3-foot wide earthen path that is well integrated into the environment.

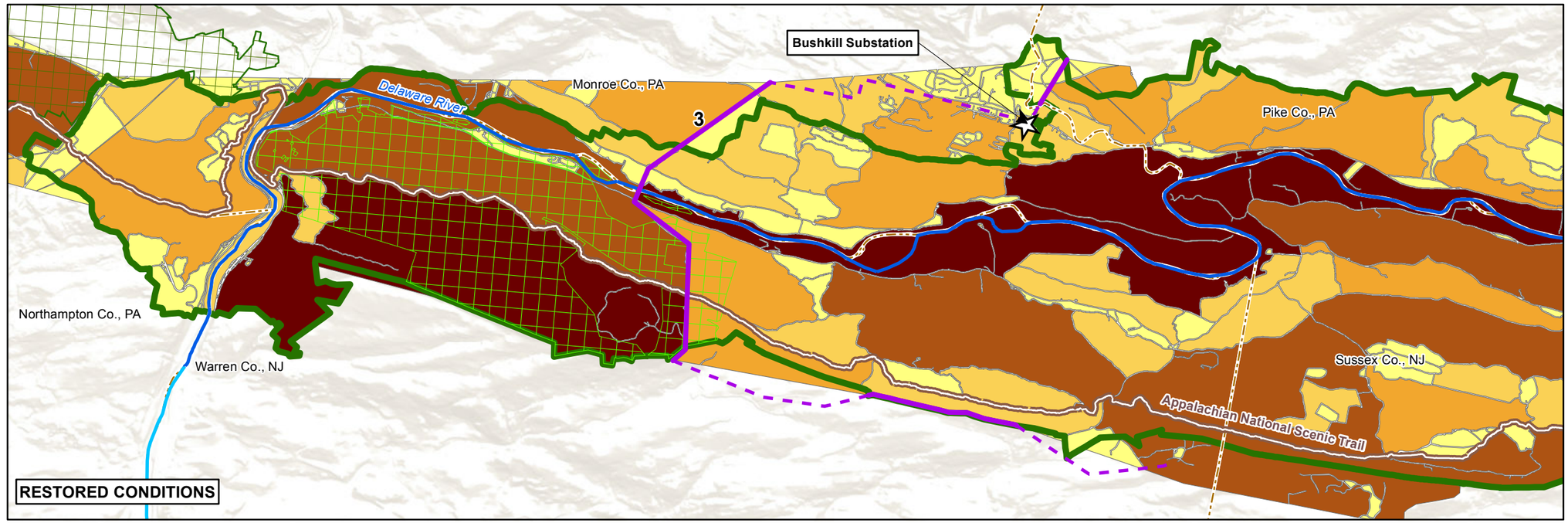
Alternative 3

Landscape Connectivity and Wildlife Habitat: The existing ROW along the alternative 3 alignment ranges from approximately 40 to 125 feet wide. The ROW proposed for alternative 3 would be expanded and permanently maintained at 200 to 300 feet wide, an increase of 60% to 650%. With the ROW expansion and the construction of access roads outside the ROW, approximately 87 to 161 acres of mature forest would be lost under alternative 3 (table 47). As stated for alternative 2, the fragmentation of the landscape and habitats would increase from widening the ROW, and the fragmentation and the amount of edge would increase from the construction of the access roads and the removal of danger trees.

The forest blocks through which the alternative 3 alignment would pass represent some of the larger contiguous forest stands in the parks; the largest patches along alternative 3 are within Worthington State Forest. Currently, 17 habitat patches exist adjacent to the alternative 3 alignment, ranging from 0.15 acre to 4,332 acres. Under alternative 3, the number of habitat patches would increase to 20, the sizes of which would range from 0.012 to 7,272 acres. The increase in the number of patches would be small, with the largest measuring 1.2 acres, and would result from the construction of access roads, which would extend outside the ROW. Ten of the larger patches (more than 150 acres) adjacent to the ROW of alternative 3 would experience a reduction in size ranging from 0.2% to 10%.







Legend

- Substation
- Alternative 3
- Alternative 3 (outside study area)
- Existing Transmission Line
- Outside Study Area
- Appalachian National Scenic Trail
- Middle Delaware National Scenic & Recreational River
- Delaware River
- Delaware Water Gap National Recreation Area
- CVNWR Boundary
- Worthington State Forest
- County Line

Habitat Patch Acreages

- 0 - 150 acres
- 150 - 500 acres
- 500 - 1,200 acres
- 1.200 - 3,200 acres
- 3,200 - 8,000 acres

Note: Designated boundary of CVNWR is depicted, not all property is owned within the boundary

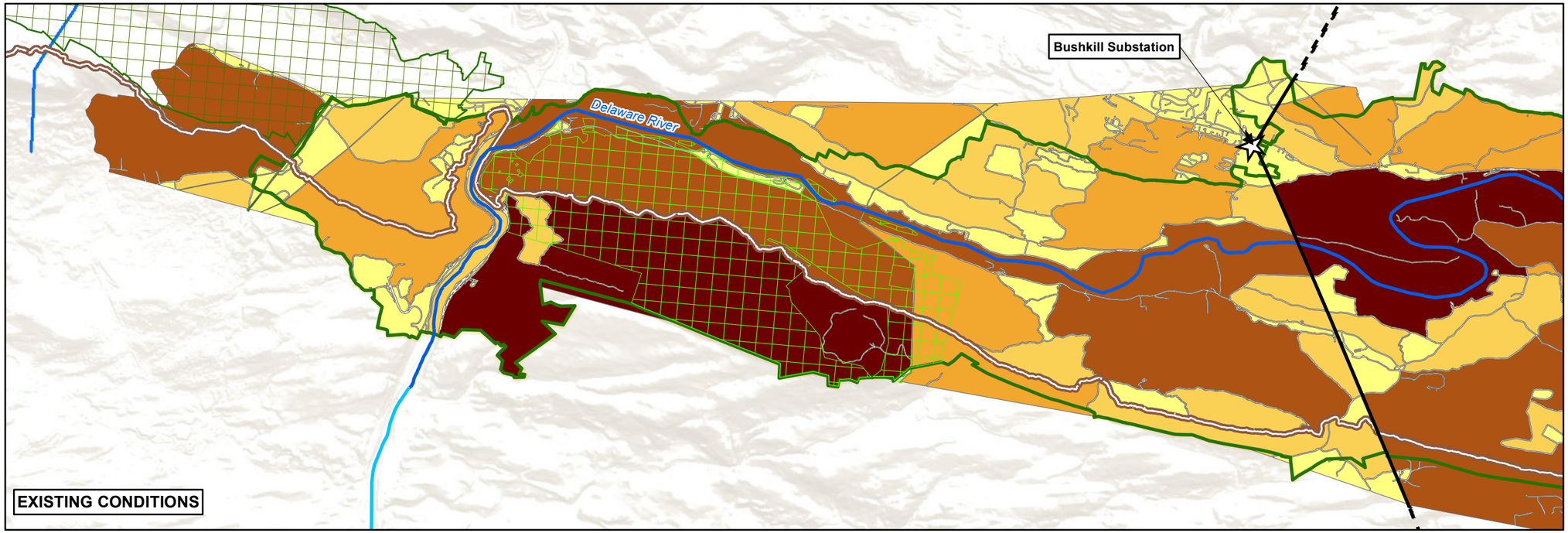
0 1 2
Miles

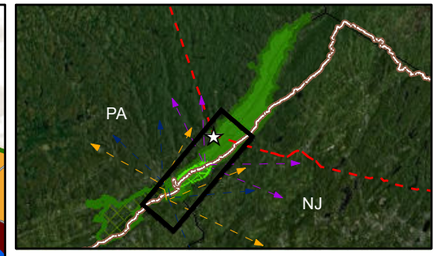
Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

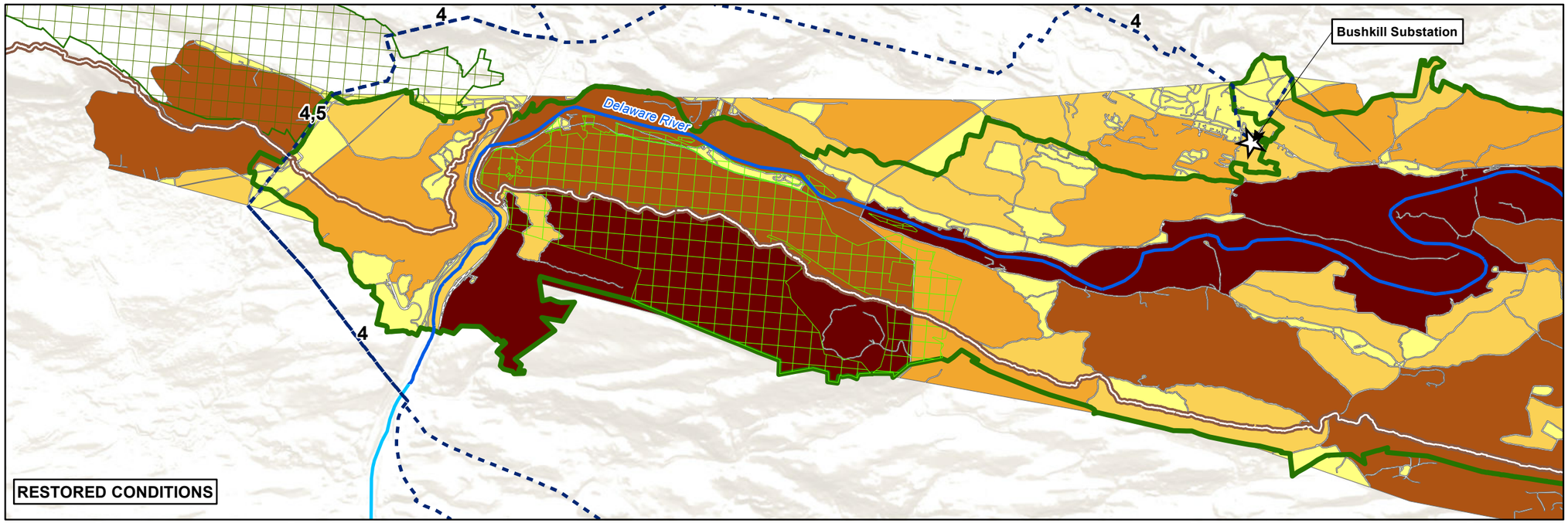
Figure 72
Alternative 3
Existing vs. Restored Conditions

Source: ESRI Streetmap 2009;
NPS 2011;
ArcGIS Map Service 2010;

Projection: NAD 83 UTM Zone 18N
Date: July, 2012







Legend

- Substation
- Alternative 4,5
- Alternative 4,5 (Outside study area)
- Existing Transmission Line
- Outside study area
- Appalachian National Scenic Trail
- Middle Delaware National Scenic & Recreational River
- Delaware River
- Delaware Water Gap National Recreation Area
- CVNWR Boundary
- Worthington State Forest

Habitat Patch Acreages

- 0 - 150 acres
- 150 - 500 acres
- 500 - 1,200 acres
- 1.200 - 3,200 acres
- 3,200 - 8,000 acres

Note: Designated boundary of CVNWR is depicted, not all property is owned within the boundary

0 1 2
Miles

Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 73
Alternative 4/5
Existing vs. Restored Conditions

Source: ESRI Streetmap 2009;
NPS 2011;
ArcGIS Map Service 2010;

Projection: NAD 83 UTM Zone 18N
Date: July, 2012

Alternative 3 would include a portion of the existing B-K Line alignment from the Bushkill Substation to the western boundary of DEWA. This portion of DEWA is currently fragmented by other existing ROWs and roads. The patches of habitat in this area would be reduced in size and some smaller patches would be eliminated completely by the expansion of the ROW; access roads would also create new fragmentation. One patch that is currently 21.4 acres would be bisected by an access road, creating two patches of approximately 2.5 acres and 18.6 acres. The two patches larger than 100 acres would be reduced in size by approximately 0.2% to 1.8%.

Inside the terrestrial study area, there are currently 311 acres of utility ROWs that are maintained as scrub shrub habitat. The permanent loss of forest from access roads and the alteration of forest to maintained scrub shrub habitat as a result of alternative 3 actions would add to this total. The combined area of mechanically and/or chemically maintained corridors would amount to approximately 396 to 470 acres, with an additional 1.6 acres of access roads constructed outside the expanded ROW (table 47). However, while 87 to 161 acres of mature forest would be lost under alternative 3, approximately 53 acres of previously maintained habitat would be restored along the B-K Line, as described above in the "Common to Alternatives 3, 4, and 5" section. The restoration would create the largest habitat patch in DEWA, approximately 7,272 acres, which would generally follow MDSR for approximately 18.3 miles. In the long term, outside the analysis period of this EIS, the total area maintained in utility ROWs would be approximately 343 to 417 acres, resulting in an increase in maintained area of 10% to 34%.

The length of expanded and maintained ROW along the alternative 3 alignment in the parks is approximately 5.4 miles, while the length in the parks that would be restored is approximately 3.7 miles. With the restoration of the B-K Line, there would not be any other east–west feature that would completely linearly fragment habitats in DEWA north of the alternative 3 alignment. The restoration of most of the existing ROW along the B-K Line would counteract some of the impacts from implementing alternative 3; however, the reduction in habitat fragmentation and further habitat isolation would not completely mitigate the adverse effects of constructing, operating, and maintaining the S-R Line along the alternative 3 alignment.

The alternative 3 alignment contains a variety of habitats, including mature hemlock forests, riparian corridors, and abundant wetlands. Tree removal and the expansion of successional habitat in the ROW would permanently alter habitat, creating a wider expanse of successional habitat that would require maintenance for the period of analysis. The alternative 3 alignment is generally an east–west corridor, which would be susceptible to increased sun exposure, which can alter vegetation composition as discussed for alternative 2. Additionally, 100-foot riparian corridors would be retained as previously discussed, which could create wildlife movement corridors between the habitats on either side of the alignment.

Under alternative 3, the impacts on wildlife habitat from fragmentation would include the loss of habitat, reduced habitat patch size, increased edge, and the increased isolation of patches along 6.9 miles of the alignment. These impacts are described in detail under alternative 2. In addition to mature forests, agricultural fields would be affected under alternative 3. The agricultural fields are maintained habitat; however, these fields provide nesting and foraging habitat for a variety of wildlife species, including birds, reptiles, and mammals, and activities in the fields could disrupt these species.

The alternative 3 alignment would traverse 7.2 miles of the terrestrial study area and would affect a variety of habitats. Clearing, construction, and the continued maintenance of the expanded ROW would result in adverse impacts on landscape connectivity and wildlife habitat due to habitat fragmentation, loss, and alteration and further isolation of habitat patches. However, the beneficial impacts from the restoration of a portion of the existing B-K Line ROW would decrease these impacts somewhat.

Wildlife: All activities under alternative 3 (clearing and construction activities, the operation and maintenance of the proposed transmission line, and vegetation maintenance) would affect wildlife. Impacts on all animal groups are described in detail under alternatives 1 and 2. The types of impacts from the construction and operation of the proposed transmission line under alternative 3 would be the same as those described previously. The magnitude of impacts would be slightly higher than alternatives 2 and 2b because alternative 3 would affect an additional 1.3 miles within the study area.

Overall Impacts on Landscape Connectivity, Wildlife Habitat, and Wildlife: Adverse impacts on landscape connectivity, wildlife habitat, and wildlife under alternative 3 would result due to habitat loss, habitat alteration, the continued artificial maintenance of the habitat in the ROW, the isolation of habitat patches, increased edge habitat, the disturbance and direct mortality of wildlife, and the isolation of some species.

Cumulative Impacts

Cumulative impacts on landscape connectivity, wildlife habitat, and wildlife inside the terrestrial study area from past, present, and reasonably foreseeable projects would be adverse, as described previously in the "Cumulative Impacts Common to All Alternatives" section. The transmission line at large would require other actions taken by the applicant to complete construction elsewhere along its expanse. These other actions would further fragment wildlife habitat and reduce landscape connectivity within the broader expanse of these resources in which the parks are located. Alternative 3 would persist as a non-conforming feature in the parks landscape and would remain for the life of the line. When the adverse impacts as a result of alternative 3 are combined with the impacts from the other projects in the terrestrial study area, an overall adverse cumulative impact would be expected. Alternative 3 would not increase the level of impact.

Conclusion

Alternative 3 would result in adverse impacts on landscape connectivity, wildlife habitat, and wildlife from artificially maintaining a ROW that bisects natural landscapes in the parks despite NPS protection and national designations of natural, scenic, and recreational resources. Inside the terrestrial study area, alternative 3 would result in an increase in ROW width of approximately 60% to 650% from current conditions. The implementation of alternative 3 would fragment the habitat patches adjacent to the ROW by the construction of access roads. Additionally, the patches would be reduced in size by the expansion of the ROW. However, under alternative 3, the B-K Line from the Bushkill Substation to the eastern boundary of DEWA would be restored to natural conditions. In the long term, the restoration would allow habitat patches that are currently bisected by the ROW to reconnect, resulting in larger patches of contiguous habitat. The restoration would create the largest habitat patch in DEWA, approximately 7,272 acres, which would generally follow MDSR for approximately 18.3 miles. The restoration of the B-K Line ROW would offset some of the habitat fragmentation and further habitat isolation impacts of alternative 3, but it would not completely mitigate these impacts. The expansion of the alternative 3 ROW would represent a 10% to 34% increase in the amount of maintained scrub shrub habitat in the terrestrial study area.

These changes to landscape connectivity and wildlife habitat would also result in adverse impacts on wildlife. Wildlife species would be affected by the activities of alternative 3 throughout the period of analysis. Disturbance, direct mortality, and isolation would begin with clearing activities and would continue through the vegetation maintenance activities. When the adverse impacts from alternative 3 are combined with the adverse impacts from past, present, and reasonably foreseeable projects, adverse cumulative impacts on landscape connectivity, wildlife habitat, and wildlife would result.

For many of the same reasons outlined for alternatives 2 and 2b, alternative 3 would likely result in significant adverse impacts on landscape connectivity, wildlife habitat, and wildlife. DEWA, MDSR, APPA, and Worthington State Forest are refuges within the densely populated east coast, and are the centerpieces for some of the largest continuous protected lands. While not the same concentration of high-quality resources as the area where alternatives 2 and 2b are located, alternative 3 would cross a diversity of habitats, including some of the largest areas of contiguous forest, and would be located along the same unique topography and geology of Kittatinny Ridge, Delaware River Riparian Corridor, and the mature undisturbed eastern hemlock forests which are the cornerstones of the geography in this region. Alternative 3 would further fragment these habitats, reducing the abundance, diversity, and quality of native vegetation in and around the alignment contrary to the conditions the parks strive to maintain. The additional fragmentation would further isolate wildlife populations and inhibit movement within and along habitat corridors. As with any of the action alternatives, the new line would bisect a major migratory bird flyway, creating potential for mortality of migratory birds as a result of collisions with the lines, the extent of which cannot be accurately predicted or effectively prevented. Cumulatively, the new transmission line would bisect a key protected land corridor and decrease connectivity on regional scale. It would also decrease future possibilities to connect adjacent lands to create contiguous green space corridors. Alternative 3 would have a potentially significant benefit on landscape connectivity, wildlife habitat, and wildlife as a result of the removal of the existing B-K Line and restoration of a large contiguous area of high-quality habitat in the heart of DEWA and the MDSR. This benefit would partially offset the adverse impacts of creating additional fragmentation along the alternative 3 alignment. Compared to alternatives 2 and 2b, the adverse impacts of alternative 3 would be somewhat less because the area crossed by alternative 3 contains fewer high quality resources and the adverse impacts would be offset to some degree by the benefit of removing and restoring the existing line; however, when considered in the context of NPS policies for protecting and managing wildlife and wildlife habitat, including the importance of landscape-scale habitat connectivity, the adverse impacts of alternative 3 would likely be significant.

Permitting the project would adversely affect multiple protected resources inside the parks, in some instances irreversibly. Allowing such adverse effects in order to facilitate private infrastructure expansion would be contrary to NPS practice and principle of protecting and improving these resources, and of removing incompatible infrastructure to do so. This could establish precedent that may invite similar proposals by other applicants in the future, and create an expectation of like treatment for those proposals; it may make it difficult to deny such proposals. DEWA and APPA both contain numerous other utility crossings, which makes the risk of such precedent particularly concerning for these parks. Furthermore, as units of the national park system, wherein all parks are entitled to equal protection, creating such a precedent could have ramifications for parks nationwide. However, it would also set a precedent for routing utilities around MDSR and to the edges of DEWA.

Alternative 4

Landscape Connectivity and Wildlife Habitat: The alternative 4 alignment would be constructed along an existing ROW that varies in width from 70 to 120 feet. Expanding this corridor to 200 to 300 feet for alternative 4 would create a ROW approximately 67% to 328% wider than the existing ROW. Both fragmentation and edge habitat would be increased by clearing, construction, and vegetation maintenance activities under alternative 4.

The types of effects of habitat fragmentation, loss, and alteration and further isolation of habitat patches under alternative 4 would be the same as described in detail under alternative 2. The habitat available along the alternative 4 corridor is diverse; however, the forests surrounding the alternative 4 corridor have been fragmented by additional ROWs, permanent roads, and developed areas near the route (figure 73). Concentrating infrastructure at the edges of DEWA would reduce the amount of fragmentation by

preserving larger contiguous habitat patches. The habitat patches on both sides of the existing ROW that would be affected are generally smaller in size than those described for alternatives 2 and 3, ranging from approximately 1.2 to 945 acres. Currently, three habitat patches adjacent to the alternative 4 alignment contain more than 150 acres. Under alternative 4, these patches would be reduced by 0.2% to 1.8%. Because alternative 4 would mostly use existing access roads, no further fragmentation would result from access road construction.

The permanent loss of forest from access roads and the alteration of forest to maintained scrub shrub habitat as a result of alternative 4 actions would add to the 311 acres of maintained habitat currently in the terrestrial study area. The combined area of mechanically and/or chemically maintained corridors would amount to approximately 377 to 405 acres. While 31 to 59 acres of mature forest would be lost under alternative 4, with an additional acre lost outside the ROW from the construction of access roads, approximately 53 acres of previously maintained habitat would be restored along the B-K Line (table 47), as described in above in the "Common to Alternatives 3, 4, and 5" section. In the long term, outside the analysis period of this EIS, the total area maintained in utility ROWs would be approximately 324 to 352 acres. This range represents an increase of 4% to 13% in maintained areas.

The alternative 4 alignment contains mostly deciduous woodland communities with some wetlands. The types of impacts from habitat fragmentation, loss, and alteration and further isolation of habitat patches under alternative 4 would be expected to be similar in nature to those described under alternative 2. Because the alternative 4 alignment is oriented in a north–south direction, the effects of sun exposure would not be as severe as for east–west-oriented alignments.

Wildlife: Under alternative 4, wildlife would be affected by clearing and construction activities, the operation and maintenance of the proposed transmission line, and vegetation maintenance. Impacts on all wildlife groups are described in detail under alternatives 1 and 2. The types of impacts from the construction and operation of the proposed transmission line under alternative 4 would be the same. The magnitude of impacts would be less than alternatives 2, 2b and 3 because this alternative would affect approximately 2.3 miles within the study area.

Overall Impacts on Landscape Connectivity, Wildlife Habitat, and Wildlife: Adverse impacts on landscape connectivity, wildlife habitat, and wildlife under alternative 4 would result due to habitat loss, habitat alteration, the continued artificial maintenance of the habitat in the ROW, the isolation of habitat patches, increased edge habitat, the disturbance and direct mortality of wildlife, and the isolation of some species.

Cumulative Impacts

Cumulative impacts on landscape connectivity, wildlife habitat, and wildlife inside the terrestrial study area from past, present, and reasonably foreseeable projects would be adverse, as described previously in the "Cumulative Impacts Common to All Alternatives" section. The transmission line at large would require other actions taken by the applicant to complete construction elsewhere along its expanse. These other actions would further fragment wildlife habitat and reduce landscape connectivity within the broader expanse of these resources in which the parks are located. Alternative 4 would persist as a non-conforming feature in the parks landscape and would remain for the life of the line. When the adverse impacts as a result of alternative 4 are combined with the impacts from the other projects in the terrestrial study area, an overall adverse cumulative impact would be expected. Alternative 4 would not increase the level of impact.

Conclusion

Alternative 4 would result in adverse impacts from a decrease in mature forest, an increase in edge habitat, increased habitat fragmentation, the disturbance and direct mortality of wildlife, increased predation, and the isolation of some species. Inside the terrestrial study area, alternative 4 would result in the permanent loss of mature forest through the widening of the existing ROW and the construction of access roads. The habitat patches along the alternative 4 alignment are currently fragmented by existing roads, other ROWs, and encroaching development, because this alignment is sited at the edge of the DEWA boundary. The habitat patches along the alignment (including the portion of the B-K Line from the Bushkill Substation to the western portion of DEWA) currently range from approximately 1.2 to 945 acres and the larger habitat patches would be reduced in size by approximately 0.4% to 1.2%. The restoration of the B-K Line ROW from the Bushkill Substation to the eastern boundary of DEWA would help offset the impacts from habitat fragmentation and further habitat isolation under alternative 4.

Wildlife would be affected by the adverse impacts on landscape connectivity and wildlife habitat. During all activities under alternative 4, wildlife could suffer direct mortality, disturbance, isolation, and an increase in competition for resources in remaining habitat patches. The development of early successional habitat along the ROW as a result of the long-term maintenance of vegetation inside the terrestrial study area would result in a long-term shift in species composition. When the adverse impacts from alternative 4 are combined with the adverse impacts from past, present, and reasonably foreseeable projects, adverse cumulative impacts on landscape connectivity, wildlife habitat, and wildlife would result.

When considered in the context of NPS policies for protecting and managing wildlife and wildlife habitat, including the importance of landscape-scale habitat connectivity, the adverse impacts of alternative 4 would not be considered significant. The area crossed by alternative 4 is much more fragmented than the other alternatives and the additional clearing of the ROW and access roads would not greatly increase the fragmentation, unlike the other alternatives. More importantly, alternative 4 would benefit park management goals by concentrating infrastructure at the edges of DEWA which would help reduce the amount of fragmentation by preserving larger contiguous habitat patches and increasing the potential for opportunities to create future continuous green spaces. Alternative 4 would also have the potentially significant benefit of removing the existing B-K Line and restoring a large, contiguous area of high-quality habitat in the heart of DEWA and the MDSR. For these reasons, the adverse impacts of alternative 4 would not likely be considered significant.

Permitting the project would adversely affect multiple protected resources inside the parks, in some instances irreversibly. Allowing such adverse effects in order to facilitate private infrastructure expansion would be contrary to NPS practice and principle of protecting and improving these resources, and of removing incompatible infrastructure to do so. This could establish precedent that may invite similar proposals by other applicants in the future, and create an expectation of like treatment for those proposals; it may make it difficult to deny such proposals. DEWA and APPA both contain numerous other utility crossings, which makes the risk of such precedent particularly concerning for these parks. Furthermore, as units of the national park system, wherein all parks are entitled to equal protection, creating such a precedent could have ramifications for parks nationwide. However, it would also set a precedent for routing utilities around MDSR and to the edges of DEWA.

Alternative 5

Landscape Connectivity and Wildlife Habitat: The alternative 5 alignment would be constructed along an existing ROW that varies in width from 70 to 100 feet. Under alternative 5, the ROW would undergo an increase in width of approximately 100% to 329%. Fragmentation and edge habitat would be increased under alternative 5.

The wildlife habitat along the alternative 5 alignment is the same as that described for alternative 4 and would be affected by the same habitat fragmentation and isolation impacts, with reductions in the size of the large habitat patches from 0.4% to 0.9% and no further fragmentation from the construction of access roads.

As a result of alternative 5 actions, the combined area of mechanically and/or chemically maintained corridors would amount to approximately 355 to 375 acres in the terrestrial study area, with an additional 0.3 acres of access roads constructed outside the expanded ROW (table 47). While 25 to 45 acres of mature forest would be lost under alternative 5 (including 16 to 28 acres of forest in the parks), approximately 53 acres of previously maintained habitat would be restored along the B-K Line, as described in above in "Common to Alternatives 3, 4, and 5." In the long term, outside the analysis period of this EIS, the total area maintained in utility ROWs would be approximately 302 to 322 acres, which would result in a decrease in maintained habitat of 3% to an increase of 4% from the current 311 acres. The adverse impacts on landscape connectivity and wildlife habitat under alternative 5 from clearing, construction, and the continued maintenance of the expanded ROW would not be completely mitigated by beneficial impacts from the restoration of the B-K Line.

Wildlife: Under alternative 5, wildlife would be affected by direct mortality, increased predation, and isolation through clearing and construction activities, the operation and maintenance of the proposed transmission line, and vegetation maintenance. Impacts on all wildlife groups are described in detail under alternatives 1 and 2. The types of impacts from the construction and operation of the proposed transmission line under alternative 5 would be the same. The magnitude of impacts would be less than the rest of the action alternatives because this alternative would affect the least amount of wildlife habitat within the study area.

Overall Impacts on Landscape Connectivity, Wildlife Habitat, and Wildlife: Adverse impacts on landscape connectivity, wildlife habitat, and wildlife under alternative 5 would result due to habitat loss, habitat alteration, the continued artificial maintenance of the habitat in the ROW, the isolation of habitat patches, increased edge habitat, the disturbance and direct mortality of wildlife, and the isolation of some species.

Cumulative Impacts

Cumulative impacts on landscape connectivity, wildlife habitat, and wildlife inside the terrestrial study area from past, present, and reasonably foreseeable projects would be adverse, as described previously in the "Cumulative Impacts Common to All Alternatives" section. The transmission line at large would require other actions taken by the applicant to complete construction elsewhere along its expanse. These other actions would further fragment wildlife habitat and reduce landscape connectivity within the broader expanse of these resources in which the parks are located. Alternative 5 would persist as a non-conforming feature in the parks landscape and would remain for the life of the line. When the adverse impacts as a result of alternative 5 are combined with the impacts from the other projects in the terrestrial study area, an overall adverse cumulative impact would be expected. Alternative 5 would not increase the level of impact.

Conclusion

Alternative 5 would result in adverse impacts on landscape connectivity, wildlife habitat, and wildlife from artificially maintaining a ROW that bisects natural landscapes in the parks despite NPS protection and national designations of natural, scenic, and recreational resources. Inside the terrestrial study area, alternative 5 would result in the permanent loss of mature forest through the widening of the existing ROW.

Under alternative 5, the expansion of the existing ROW would decrease the size of the habitat patches and eliminate several small patches, which would increase habitat isolation. The larger habitat patches would be decreased by 0.4% to 0.9%. The restoration of the B-K Line from the Bushkill Substation to the eastern boundary of DEWA under alternative 5 would mitigate some of the adverse impacts of constructing, operating, and maintaining the S-R Line. In the long term, decommissioning the existing transmission line along the B-K Line and allowing the ROW to revegetate naturally would result in benefits to landscape connectivity; however, the existing ROW would not return to mature forest within the analysis period of this EIS.

These changes to landscape connectivity and wildlife habitat would also result in impacts on wildlife. Wildlife species would be affected by the actions of alternative 5 throughout the period of analysis. Disturbance and direct mortality would begin with clearing activities and would continue through the vegetation maintenance activities. When the adverse impacts from alternative 5 are combined with the adverse impacts from past, present, and reasonably foreseeable projects, adverse cumulative impacts on landscape connectivity, wildlife habitat, and wildlife would result.

For the same reasons outlined for alternative 4, the adverse impacts of alternative 5 would not likely be considered significant.

Permitting the project would adversely affect multiple protected resources inside the parks, in some instances irreversibly. Allowing such adverse effects in order to facilitate private infrastructure expansion would be contrary to NPS practice and principle of protecting and improving these resources, and of removing incompatible infrastructure to do so. This could establish precedent that may invite similar proposals by other applicants in the future, and create an expectation of like treatment for those proposals; it may make it difficult to deny such proposals. DEWA and APPA both contain numerous other utility crossings, which makes the risk of such precedent particularly concerning for these parks. Furthermore, as units of the national park system, wherein all parks are entitled to equal protection, creating such a precedent could have ramifications for parks nationwide. However, it would also set a precedent for routing utilities around MDSR and to the edges of DEWA.

SPECIAL-STATUS SPECIES (AQUATIC AND TERRESTRIAL)

In this section, impacts on federally and state-listed threatened and endangered species as well as candidate species described as present or with the potential to be found in the study area (see chapter 3) are analyzed and given equal consideration for analysis in this EIS. To date no critical habitat has been designated for any federally listed species in the study area. Included in the analysis is an evaluation of the alternatives as they relate to impacts on both aquatic and terrestrial special-status species.

METHODOLOGIES

The impact analysis for special-status species included a determination of species likely to inhabit areas potentially affected, a determination of habitat types that would be lost or altered (changed from one habitat type to another), and a discussion of other potential direct and indirect effects. Impacts on special-status species were assessed in terms of changes in the amount and connectivity of special-status species habitat, the integrity of the habitat (including past disturbance) and populations, and the potential for increased/decreased disturbance.

Specific impacts on special-status species are described in this section for listed species known to be present or with the potential to be found inside the study area (see chapter 3). In general, it is not known where and to what extent special-status species would be present outside the study area. Potential impacts that could occur outside the study area, including those that may affect listed special-status migratory bird

species, are discussed on a qualitative basis using best available information. Due to a lack of information and the uncertainty of impacts, a range is described for impacts outside the study area.

Inside the study area, impacts on special-status species are analyzed for the transmission line corridor as described for each alternative and any areas outside the corridor where necessary pulling and splicing sites and access road development, including spur roads, are proposed. Outside the study area, a possible route was plotted to the Susquehanna and Roseland substations. Because the NPS cannot dictate where the line would actually go, the direct impacts from the construction and maintenance of the transmission line outside the study area cannot be determined; however, indirect impacts are analyzed.

Resource-specific context for assessing impacts to special-status species includes the following:

- These species are protected by federal and state laws which means that protection of these species is significant on a national scale and/or regional scale (within the state).
- All federal agencies are specifically charged by the Endangered Species Act to conserve listed species and are prohibited from taking actions that would jeopardize the continued existence of these species; NPS *Management Policies 2006* and Director's Order 77 (Natural Resource Protection) also direct the NPS to treat state-listed species in the same way that federally listed species are treated to the extent practicable.
- The presence of special-status species in the parks is an important component of the visitor experience; bald eagles in particular offer visitors a highly valued opportunity for wildlife observation that is not commonly available in adjacent developed areas.
- Maintaining the integrity of local populations (occurrences) of state-listed and federally listed species, and their habitat, is important because these species are rare; have specialized habitat requirements; and because the parks serve as a refuge from surrounding habitat loss and alteration due to development pressure in the region.
- The effectiveness of mitigation measures or BMPs in reducing negative impacts to special-status species or their habitat, if such measures are implemented.
- Additional context for bald eagles is the USFWS National Bald Eagle Management Guidelines, which recommend "To avoid collisions, site wind turbines, communication towers, and high voltage transmission power lines away from nests, foraging areas, and communal roost sites." If these guidelines cannot be followed, a permit must be obtained from the USFWS to authorize "limited, non-purposeful take of bald eagles…in the course of conducting lawful activities…"
- The Kittatinny Ridge is an important migratory corridor for avian species protected under the Migratory Bird Treaty Act.
- Additional context for bats is the alarming decline in many bat populations throughout the Northeast due to white-nose syndrome. Some species may be in danger of extirpation because of white-nose syndrome. Any stressor should be evaluated as a possible contributing factor to overall local and regional population health.

STUDY AREA

The study area for special-status species includes the ROW for each alternative and any area outside the ROWs where necessary pulling and splicing sites, staging areas, and access road development are proposed or would be expected. Because the location of the S-R Line outside the study area cannot be determined at this time, the indirect impacts on special-status species cannot be evaluated per alternative.

The potential impacts outside the study area are generally addressed; however, further surveys would be required prior to construction of the S-R Line.

CUMULATIVE IMPACTS COMMON TO ALL ALTERNATIVES

For this EIS, actions inside and outside the study area could affect vegetation and aquatic communities that provide habitat for special-status plant and wildlife species (including fish; aquatic and terrestrial invertebrates; migratory, breeding, and resident birds; amphibians and reptiles; and small and large mammals). Alteration, degradation, fragmentation, and permanent loss of vegetation communities that provide habitat for special-status plant and wildlife species could occur as a result of development projects, fire suppression, the loss of habitat continuity, water quality degradation, and the establishment of nonnative invasive species. These actions could alter the behavior, reproductive success, and survival of special-status species, which in turn could affect the distribution and abundance of species. In addition, climate change may alter species distribution as a result of the expansion or contraction of breeding ranges, changes in food resources, and the availability of seasonally used habitats. Specific to bats, the spread of white-nose syndrome could decimate communal winter roosts in hibernacula throughout the region, including outside the study area described for this EIS.

Other actions inside and outside the study area may result in the protection, restoration, or enhancement of natural resources that would result in benefits to special-status species and habitat. Past, present, and reasonably foreseeable activities that would affect special-status species inside and outside the study area are listed below and discussed under each alternative as applicable. A complete list of projects that may contribute to cumulative impacts both inside and outside the study area can be found in appendix H.

Projects Inside the Study Area

Inside the study area the cumulative projects with adverse impacts include the following road and utility projects: Old Mine Road South rehabilitation, US Route 209 Raymondskill Creek Bridge rehabilitation (bridge repair), Watergate Dam #10 (dam restoration), the Tennessee Gas Line Proposal (addition to an existing gas pipeline), the Columbia Gas Transmission Company pipeline (replacement of an existing gas pipeline), and the Northeast Supply Link Expansion (Palmerton Loop gas pipeline). The New Jersey Swim Beach (Turtle Beach) project, located on the Delaware River at the Coppermine Inn site, provides an accessible opportunity for protected swimming that meets visitor demand as recommended in the general management plan (GMP) for DEWA and MDSR (NPS 1987). Although this project may initially have an adverse impact on special-status species, the swim beach project has an overall beneficial effect through the closure of the informal swim beach that has evolved over time; the closure of the informal swim beach reduces (but does not eliminate) adverse impacts to special-status species. Although not a project, the illegal collection of special-status plants and animals in DEWA also has adverse impacts on listed species.

Beneficial impacts on special-status species are expected to occur from the McDade Trail realignment as well as from designating lands as IBAs or IMAs. The IBA and IMA designation helps preserve critical habitat and guide habitat management decisions for wildlife, including special-status species, as described in chapter 3. Additionally, there are several land protection programs, including county and township open space and conservation plans, which could protect special-status species and associated habitat. The beneficial effects of many of the listed programs are dependent on the availability of funding for specific projects, which is uncertain and could vary throughout the period of analysis; therefore, the level of benefit resulting from the implementation of any project is also variable.

Although these projects would protect special-status species, the beneficial impacts would not reduce the adverse impacts from the above-mentioned development projects. Overall, cumulative impacts on special-

status species inside the study area from the actions of other past, present, and future projects are expected to be adverse.

Projects Outside the Study Area

Outside the study area, cumulative projects that could result in adverse impacts on special-status species include the following road and utility projects: Marcellus shale natural gas drilling, the Columbia Gas Transmission Company pipeline (replacement of an existing gas pipeline), the PPL proposal for a 138/12-kV substation (which opens up additional areas to electric transmission), and transportation improvement and replacement projects in Pennsylvania and New Jersey. In addition, proposed and future residential and commercial developments in New Jersey and Pennsylvania could cause adverse impacts on special-status species through loss and fragmentation of habitat. Outside the study area, land can be protected by other agencies under federal, state, or private ownership. Nongovernmental organizations such as TNC work toward identifying and preserving land that contains rare or unique features or key habitat for plants and wildlife. The beneficial effects of many of these programs are dependent on the availability of funding for specific projects, which is uncertain and could vary throughout the period of analysis. Therefore, the level of benefit resulting from the implementation of any project cannot be predicted. Despite land protection and conservation programs, land would continue to be subject to development that would continue to cause the loss, alteration, and fragmentation of habitat. As a result, actions and activities in the past, present, and foreseeable future would contribute to the decline in the quality of habitat that may support special-status species. Overall, cumulative impacts on special-status species outside the study area would be adverse.

IMPACTS OF THE ALTERNATIVES ON SPECIAL-STATUS SPECIES

Due to their mobility, it is possible that the special-status aquatic, terrestrial invertebrate, bird, reptile and amphibian, or mammal species described in chapter 3 (tables 13, 15, 16, 17, and 18) could be present inside or outside the study area for any of the alternatives (1 through 5) where adequate appropriate habitat exists. This section focuses on the special-status species (both wildlife and plant species) that have been observed or otherwise documented and those with a high probability of being present inside or outside the study area, as applicable, for each alternative.

Common to All Alternatives

Vegetation Maintenance: Vegetation management would occur at least annually. The details of the applicant's vegetation management plans and techniques for clearing vegetation are explained in chapter 2. Vegetation maintenance activities would sustain habitat in the existing ROW as early successional scrub shrub. Maintenance activities would have the potential to temporarily disturb and/or displace special-status species foraging or nesting in and along the length of the existing ROW as a result of noise and human activity. The impacts from vegetation maintenance are discussed for each alternative, as applicable.

Invasive Plant Species Management: Nonnative, invasive plant species can compete with native species, including special-status species. While not all nonnative species are harmful, those that are invasive can have serious consequences for native habitats. Management of nonnative, invasive species in the study area can indirectly affect special-status species using habitats where management is conducted. Invasive species management programs in the study area are discussed in the "Invasive Plant Species" section of chapter 3 and would also be implemented through the applicant's NPS-approved vegetation management plans (see chapter 2 and appendix F).

Electrocutions with Existing Transmission Lines: Electrocution can occur when a bird simultaneously contacts electrical equipment elements, either phase to phase or phase to ground (APLIC 2006, ix). This normally occurs when a bird attempts to perch on a transmission tower/pole with insufficient clearance between these elements; birds such as raptors may also use the poles for nesting and could be electrocuted attempting to launch from or land in their nests. Bird electrocutions typically occur on power lines with voltages less than 60 kV because there is inadequate separation between energized conductors and hardware or between ground conductors and hardware (APLIC 2006, ix, 106). Because the existing B-K Line is 230 kV, it is unlikely that bird electrocution would occur regularly because the phase-to-phase and phase-to-ground separation is greater than 60 inches, the recommended separation for large raptors such as eagles (APLIC 2006, 60).

Recent literature indicates that electrocution continues to be a cause of mortality for various raptors in North America, particularly eagles, some hawks, and owls, although nonraptor electrocutions have also been documented (APLIC 2006, 10). Other bird electrocutions that have been reported include ospreys and great blue herons (APLIC 2006, 10) as well as barred owls (APLIC 2006, 31). Long-legged wading birds such as herons may be electrocuted on poles where there is insufficient vertical separation between conductors or between conductor and ground (APLIC 2006, 38). Smaller special-status bird species such as warblers are not expected to be electrocuted by the existing transmission lines because they cannot make simultaneous contact with the two elements of electrical equipment. Bald and golden eagles continue to be a focus of electrocution research in North America, with electrocution accounting for less than 1% to 25% of eagle deaths in various studies (APLIC 2006, 10). Habitat is a key factor influencing bird use of poles. For example, in open areas lacking natural perches, power poles provide sites for hunting, feeding, resting, roosting, or nesting (APLIC 2006, 23). In general, there are fewer reported raptor electrocutions in forested habitat versus open habitats (Switzer 1977; Benson 1981). It is possible that some special-status raptor species (e.g., American kestrel, barred owl, short-eared owl, and red shouldered hawk) could use power-line poles for perching, especially when foraging along ROWs. Bald eagles and ospreys are nesting with increasing frequency on artificial structures such as power poles and communication towers (APLIC 2011a; USFWS 2007a, 4). Other species of raptors, such as Cooper's hawk and northern goshawk, that typically inhabit forested areas may be more likely to perch in trees than on the exposed perches provided by electric transmission and distribution facilities (APLIC 2006, 23).

Collisions with Existing Transmission Lines: Bird collisions with power lines may occur when a transmission line runs perpendicular to a flight path used by birds that move back and forth from feeding and roosting or nesting sites on a daily basis or when migrant birds are traveling at reduced altitudes (usually in inclement weather) and encounter the structures. Migrating special-status raptors, such as osprey, Cooper's hawk, northern goshawk, red shouldered hawk, American kestrel, bald eagle, and golden eagle, can encounter transmission lines crossing their flight path if the lines are located along raptor migration corridors. Orientation of tall structures perpendicular to the flight path of ridge-gliding raptors may result in collisions with wires if weather conditions are such that raptors are using lower altitudes along a ridge such as Kittatinny Ridge. Raptors have acute eyesight and are daytime migrants, and would not be expected to collide with transmission lines or structures unless their flight brings them to lower altitudes because of foggy or rainy weather that reduces visibility or when foraging along the ROW.

Mitigation Measures: Mitigation measures would be implemented to minimize impacts on special-status species. Mitigation measures are considered to be integrated into each alternative as applicable for impact analysis. Mitigation measures that would avoid direct impacts on special-status species would be the most efficient measures and would include time-of-year restrictions, preconstruction surveys, construction monitoring, habitat preservation and habitat restoration components, and postconstruction monitoring. Preconstruction surveys in particular are expected to be efficient at reducing direct impacts on special-status species because surveys would identify the presence of special-status species before site

preparation and construction are initiated. Some mitigation measures, such as modifying the location of towers and access roads, may not be possible and other measures, such as road closures and/or patrols, may not be effective at some locations; however, mitigation measures would be implemented to the extent practical to avoid adverse effects on special-status species. The efficacy of mitigation techniques varies widely between mitigation measures, as described in chapter 2 and appendix F, and is considered based on best professional judgment when determining the impacts of each alternative on each special-status species. Mitigation measures proposed for each alternative are discussed below.

Outside the Study Area: Outside the study area, regardless of which alternative is selected, the transmission line could pass through Carbon, Lackawanna, Luzerne, Monroe, Northampton, Pike, and Wayne counties in Pennsylvania and Morris, Sussex, and Warren counties in New Jersey. These counties are largely undeveloped and contain a variety of habitats, including forest, successional habitat, riparian areas, and wetlands, as well as land altered by human activities such as development or agriculture. Because the location of the S-R Line outside the study area cannot be determined at this time, the extent that special-status species or their habitats may be present is unknown. As a result, impacts are considered indirect. Outside the study area, there would be no impact on any special-status species if the species or its habitat is not present in the project ROW.

Special-status Aquatic Species: Impacts on special-status freshwater mussel species could occur if the construction of temporary stream crossings is required, due to the potential for direct mortality and alteration of habitat conditions. If special-status species are present, preconstruction relocation of freshwater mussels would minimize impacts. As a more mobile species, the bridle shiner would be expected to move away from disturbance caused by site preparation or construction activities in open water habitat. The removal of vegetation during the construction of the transmission line could temporarily disturb soils, increasing erosion and sedimentation into open water habitat and affecting water quality, which would indirectly affect special-status aquatic species. The project could be expected to result in an adverse impact on special-status aquatic species outside the study area.

Special-status Bird Species: The impacts on special-status bird species outside the study area would primarily occur from the loss of habitat as a result of clearing during construction activities and displacement and disturbance due to noise from construction and human activities. Habitat use by special-status bird species would likely resume after the cessation of activities and as habitat recovers. However, the use of the habitat in the permanent ROW could change because the habitat in the ROW would be maintained as scrub shrub. The presence of larger and higher transmission line structures and lines could cause collision and electrocution hazards for birds, including special-status species, migrating along the Kittatinny Ridge outside the study area. For all special-status bird species outside the study area, impacts would be adverse.

Special-status Reptile and Amphibian Species: For both Pennsylvania and New Jersey, special-status reptile and amphibian species have the potential to be present for all alternatives outside the study area, provided the proper habitat exists along the chosen route. Reptiles and amphibians would have a higher risk of direct mortality because these species are less mobile and often camouflage themselves in the surrounding substrate. The New Jersey Endangered and Nongame Species Program (NJENSP) reviewed records and data for New Jersey and NPS lands during early consultation (review did not include private lands outside of the study area), but the review did not indicate any known presence of special-status reptile or amphibian species (NJENSP 2010a). However, potential habitat for the bog turtle, a federally listed species, was identified in Morris and Sussex counties, New Jersey, during surveys (EcolSciences 2008, 8–15). If special-status reptile or amphibian species, especially the bog turtle, are present, adverse impacts could occur due to the possibility of direct mortality from construction equipment, the loss or alteration of habitat, and noise associated with construction activities and increased human activity. For all special-status reptile and amphibian species outside the study area, impacts would be adverse. USFWS

is working directly with the applicant to ensure that adequate conservation measures are implemented and adverse effects to the bog turtle and its habitat will be avoided outside of NPS units.

Special-status Mammal Species: Special-status mammal species that may be present include bats (including the federally listed Indiana bat) and the bobcat. For all alternatives outside the study area, habitat for bats (including the Indiana bat) may be affected by the clearing of vegetation, including dead standing trees that function as summer roost trees or trees that act as habitat for maternity colonies. Caves or mines are likely not to be physically affected by the construction of a transmission line; however, disturbance during hibernation could cause bats to abandon the hibernacula. Although no Indiana bats were found during mist netting surveys and no hibernacula were identified (Sanders 2009, 6; ESI 2011, 24), small-footed bats were caught during mist netting surveys outside the study area in Lackawanna, Monroe, and Pike counties, Pennsylvania (Sanders 2009, 6) and Morris County, New Jersey (ESI 2011, appendix B, net KM-47). If winter hibernacula or roost or maternity colony trees for bats are located in the proposed ROW, including the potential for use by Indiana bats, adverse impacts on bats could occur. USFWS is working directly with the applicant to ensure that adequate conservation measures are implemented and adverse effects to the Indiana bat will be avoided outside of NPS units. Mitigation projects such as the Hopatcong Forest Restoration Project (USFWS 2010b) are expected to offset the loss of forested habitat for bats.

Bobcats could be present in appropriate habitat outside the study area and would primarily be affected by disturbance from construction and human activity as well as from the regular maintenance of the ROW during operation. However, it is expected that impacts due to disturbance would be adverse. Daytime activities associated with the clearing and maintenance of the ROW would be expected to have minimal impacts on the bobcat due to the crepuscular/nocturnal nature of the animal. Bobcats could also use the ROW, when completed, as a corridor for movement and hunting and could be expected to maintain territories that may overlap with the ROW and the habitats along the transmission line. There is also the potential for bobcat den sites to be located in the alignment chosen for the ROW. Den sites could be unavoidably or unknowingly destroyed during construction activities but it is expected that den sites would not be encountered frequently. For all special-status mammal species outside the study area, impacts could be adverse.

Special-status Plant Species: Adverse impacts could occur on special-status plant species from construction activities and periodic maintenance. Ground-disturbing activities, including construction of towers and crane pads, the grading of new access roads and spur roads, and tower removal, have the potential to disturb or destroy special-status plant species. If special-status species are identified outside the study area prior to construction, the plants could be relocated prior to ground-disturbing activities. Following the initial clearing activities it would be possible for special-status plant species to reestablish, provided that the requisite habitat conditions remain in the corridor.

Conclusion: Outside the study area, there would be no impact on any special-status species if the species or its habitat are not present in the project's impact area. Adverse impacts on special-status wildlife species could occur from direct mortality, alteration of habitat, loss of habitat, disruption of foraging and nesting behaviors from disturbance due to construction noise and human activity. Adverse impacts on special-status plant species occur from ground-disturbing and maintenance activities.

Alternative 1: No Action

Special-status Aquatic Species: A total of four special-status (state-listed) aquatic species are known to be present or have the potential to be found in the existing ROW under alternative 1: three freshwater mussels (yellow lampmussel, creeper, and alewife floater) and one fish species, bridle shiner (NJENSP 2010a, 2; PFBC 2010a, 1; Horwitz et al. 2008, 75). Vegetation maintenance activities have the potential

to increase sedimentation and turbidity in surface waters by increasing soil erosion and runoff through the removal of stabilizing vegetation and the exposure of soil. Impacts on fish and mussels from increased sedimentation could include smothering, displacement, and a loss of suitable bottom habitat for species that prefer rocky or gravel bottom habitat. Increased turbidity and suspended solids associated with sedimentation could affect respiration and feeding of mussels and fish and could result in mortality. The removal of vegetation along smaller water bodies, such as tributary streams, could result in changes to water temperatures and light attenuation and could affect habitat conditions for some aquatic species, leading to displacement. The use of herbicides could indirectly affect fish and mussel species. The introduction of contaminants such as herbicides would result in acute or chronic effects on aquatic organisms including decreased growth, disturbed reproductive cycles, or increased mortality. Maintenance would not occur directly in surface waters and the use of BMPs, including erosion and sedimentation control practices, NPS-approved herbicides (including herbicides accepted for use near aquatic habitats), low-impact vegetation maintenance techniques, and water-body buffers, would minimize impacts on special-status aquatic species; however, impacts on special-status aquatic species would be adverse.

Special-status Terrestrial Invertebrate Species: Two special-status terrestrial invertebrate species, Arogos skipper and Mitchell's satyr, both butterfly species, have the potential to be present in the existing B-K Line ROW. The herbaceous plant communities and grasses associated with Arogos skipper habitat would be compatible with vegetation requirements for the ROW and may create additional suitable habitat for the Arogos skipper. It is possible that if the ROW could be colonized by the Arogos skipper and conservation measures could be implemented, a beneficial impact could occur.

Suitable wetland habitat (fens) for Mitchell's satyr, a federally listed endangered species, exists in the alternative 1 alignment; approximately 0.99 acre of the Arnott Fen wetland complex is located in the B-K Line ROW. Although it was historically found in New Jersey, Mitchell's satyr is undocumented in Pennsylvania where suitable fen habitat is found inside the study area and Mitchell's satyr was not observed during invertebrate surveys conducted along the ROW (EcolSciences 2009a). Mitchell's satyr is currently only found in 13 locations in Michigan and 2 locations in Indiana (USFWS 2010d, 1). As a result, no impact on Mitchell's satyr is expected under alternative 1. Vegetation maintenance to remove danger trees and incompatible vegetation species (generally tall-growing, nonherbaceous species) and continued NPS protection of the fen would maintain suitable habitat for Mitchell's satyr, should the butterfly find and colonize the habitat or should a program be considered to establish the species in the future.

Special-status Birds: A total of 17 special-status (state-listed) bird species have been observed or have the potential to be present in the ROW under alternative 1: great blue heron, osprey, bald eagle, northern harrier, Cooper's hawk, northern goshawk, red shouldered hawk, peregrine falcon, American kestrel, barred owl, short-eared owl, veery, black-throated green warbler, cerulean warbler, golden-winged warbler, vesper sparrow, and horned lark. Impacts on the bald eagle are discussed in the following section, although some notes are made here regarding general impacts on raptors. The ROW has been established for 80 years and alternative 1 would continue to maintain the existing conditions. Impacts are not expected from the continued presence of the line under alternative 1 except for impacts related to vegetation maintenance in the ROW, as described below.

If vegetation trimming or removal occurs during the nesting season, it is possible that the golden-winged warbler could be adversely affected. During vegetation clearing, nests could be destroyed or become more exposed to scavenging or predation, leading to mortality of eggs and young or abandonment by adults. The gradual reestablishment of successional habitat in the ROW following clearing activities could benefit this species, but this habitat would not be available immediately. Forested and emergent wetlands, as well as riparian areas adjacent to the Delaware River, exist in the ROW and can be used by the

following state-listed bird species: great blue heron, osprey, bald eagle, and red shouldered hawk. Barred owls may use forested wetlands and riparian areas along the Delaware River. Migrant and resident individuals of special-status raptor species such as Cooper's hawk, northern goshawk, American kestrel, and barred owl may hunt along the ROW and would continue to use the ROW and edge habitat under alternative 1. In addition, wetlands in the ROW under alternative 1 would continue to provide breeding and nesting habitat for such special-status bird species as the great blue heron. Other bird species, such as the osprey, bald eagle, and red shouldered hawk, would continue to use the wetland habitat in the Arnott Fen community. Maintenance activities could impact the golden-winged warbler could occur under alternative 1 if they occur during the breeding season, but the possible creation of additional habitat may also occur in the ROW. Potential habitat for other passerine species such as veery, black-throated green warbler, cerulean warbler, vesper sparrow, and horned lark exists along alternative 1. In general, special-status bird species would continue to use requisite habitats available along the existing B-K Line under alternative 1.

Bald Eagle: The alternative 1 alignment bisects an important communal winter eagle roost known as the Hogback Ridge winter roost (USFWS 2010b). No other communal winter roost site for bald eagles has been documented in the southern portion of DEWA. The majority of eagles using the roost fly back and forth through the existing transmission line corridor to forage downriver. Because bald eagles rely on established roost sites based on their proximity to sufficient food sources, the Bald Eagle Guidelines note that ongoing, existing uses may proceed; however, the guidelines recommend against placing transmission lines near communal roost sites (USFWS 2007a, 15). Because no new transmission lines would be placed near communal roost sites under alternative 1, this alternative would be consistent with the Bald Eagle Guidelines (USFWS 2007a, 10).

No studies have been conducted to determine impacts from the existing 230-kV transmission line, but its presence has not appeared to limit the development of both wintering and breeding populations of the bald eagle; the wintering population and winter roost developed with the presence of the transmission line. Because alternative 1 would not result in any changes to the existing transmission line, it is unlikely to adversely affect the bald eagle winter roosting site along the Delaware River. Additionally, no habitat used by bald eagles that is beyond the existing ROW would be removed or altered under alternative 1. Impacts from disturbance and activities associated with maintenance activities would occur primarily during daytime hours and individual eagles may temporarily avoid areas of activity; however, the winter roost would still be available as a nocturnal roost site and minimal additional habitat would be cleared; the bald eagle population could continue to roost and nest along the Delaware River in the study area under alternative 1.

Because the existing power line is 230 kV, it is unlikely that bird electrocution would occur regularly because the phase-to-phase and phase-to-ground separation is greater than 60 inches, the recommended separation for large raptors such as eagles (APLIC 2006, 60). Bird electrocution could occur in the ROW under alternative 1, but it has not been documented in the study area and is considered to be unlikely and infrequent.

The Delaware River is traversed by transmission lines under alternative 1; however, the lines have been in place for 80 years and although they may affect special-status raptors such as ospreys and bald eagles that forage along the river, no observations of collisions with the existing lines have been documented. The Bald Eagle Guidelines note that ongoing, existing uses may continue. Therefore, alternative 1 would be consistent with the Bald Eagle Guidelines (USFWS 2007a, 10). Other special-status bird species include passerine species such as the veery, horned lark, vesper sparrow, and three species of warblers, which would generally not be at risk for power line collisions because these birds migrate at altitudes higher than power lines. The potential for bird collisions with the existing transmission lines exists but collisions

are considered to be unlikely due to the height and structure of the transmission line, which does not present a serious hazard to migrating raptors.

Overall, adverse impacts on the great blue heron, osprey, bald eagle, Cooper's hawk, Northern goshawk, red-shouldered hawk, American kestrel, short-eared owl, and barred owl would occur as a result of electrocution from and collision with the existing transmission line under alternative 1.

Special-status Reptiles and Amphibians: A total of seven special-status (one federally listed and six state-listed) reptiles and amphibians have been observed or have the potential to be present in suitable habitats in the existing ROW of alternative 1: bog turtle, timber rattlesnake, northern fence lizard, wood turtle, eastern box turtle, northern copperhead, and longtail salamander. Maintenance activities have the potential to disturb and temporarily displace northern fence lizards (in Pennsylvania) and all turtle and snake species that may use the existing scrub shrub habitat in the existing ROW, due to noise and increased human activity. Basking, foraging, birthing, and nesting activities could be disturbed during maintenance activities. Conservation measures would be required to reduce the impacts from maintenance to avoid the likelihood of take. Protection measures that include the use of handheld equipment instead of machinery and the implementation of seasonal restrictions during nesting and birthing seasons for turtle and snake species (typically between March and September) would be implemented. However, inadvertent crushing of nests, turtles, or snakes by workers could still occur but conservation measures would be implemented to reduce and/or avoid impacts. Impacts on all special-status reptile and amphibian species are expected to be adverse.

Special-status Mammals: A total of four special-status mammal species have been observed or have the potential to be present in the ROW habitats that have been mapped in the alternative 1 corridor: the bobcat, the small-footed bat, and the northern myotis (state-listed species) and the Indiana bat (a federally listed endangered species).

The ROW would continue to act as a corridor for movement and hunting for bobcats but regular maintenance of the transmission line and ROW vegetation has the potential to disturb and temporarily displace bobcats due to disturbance from noise and increased human activity. Daytime activities associated with the clearing of the ROW would be expected to have minimal impacts on the bobcat due to the crepuscular/nocturnal nature of the animal. Overall, regular maintenance of the ROW would cause disturbance to the bobcat occur along the entire length of the ROW.

Indiana bats are known to hibernate in nearby counties, and it is possible that individuals from these wintering sites are present in DEWA during the breeding season (April through September). In addition, summer foraging or roosting habitat for special-status bats occurs in the alternative 1 corridor. Annual maintenance of vegetation would occur during daylight hours, which would reduce the potential for impacts on bats. If trees that could provide habitat for summer roosts or maternity colonies are in need of removal, surveys would be conducted prior to removal to ensure that no bats are using the trees. As a result, adverse impacts on the Indiana bat, the small-footed bat, and the northern myotis are anticipated under alternative 1.

Overall, adverse impacts on all special-status mammals are expected under alternative

Impacts on Special-status Plants: A total of 12 special-status (state-listed) plant species have been observed or could be present in the existing B-K Line ROW for alternative 1: A-sedge, downy willow-herb, small-headed rush, brook lobelia, Carolina grass-of-Parnassus, bog goldenrod, shrubby cinquefoil, Clinton's wood fern, reed meadowgrass, marsh bedstraw, stiff club moss, and white heath aster.

Listed plant species that have been documented or could be present in suitable open canopy wetland habitat include A-sedge, downy willow-herb, small-headed rush, brook lobelia, Carolina grass-of-Parnassus, bog goldenrod, and shrubby cinquefoil (Mellon 2010a). As low-growing and herbaceous species, these special-status plant species should not require vegetation maintenance, which primarily targets incompatible plant species (generally tall-growing, nonherbaceous species) and danger trees. Disturbance to listed plant species may occur during vegetation management through the removal of incompatible species. Impacts on the above-listed special-status wetland plant species would be adverse.

Suitable habitat for Clinton's wood fern is known from one location outside the existing ROW. Plant surveys for this species did not reveal Clinton's wood fern in the existing transmission line corridor (Mellon 2010a). It is unlikely that this species would be affected by maintenance activities occurring under alternative 1 because the species was only identified in an area outside the ROW that would not undergo vegetation maintenance under alternative 1. Although numerous wetlands have been delineated in the parks, Clinton's wood fern was not observed during the surveys conducted in 2010 (Mellon 2010a).

Reed meadowgrass was observed during surveys conducted in 2010 (Mellon 2010a, 2010b) and marsh bedstraw was observed during vegetation surveys conducted in 2011 (NPS 2011b) in an emergent wetland area bisected by the existing transmission line. As stated for other herbaceous special-status plant species, reed meadowgrass and marsh bedstraw should not require vegetation maintenance, but disturbance may occur during vegetation management for other, incompatible plant species. Impacts on reed meadowgrass and marsh bedstraw would be expected to be adverse under alternative 1.

Stiff club moss was observed during vegetation surveys conducted in 2011 (NPS 2011b) in scrub shrub and forested wetland habitat in the ROW. As a low-growing species, stiff club moss should not require vegetation maintenance, but disturbance may occur during vegetation management for other, incompatible plant species. Impacts on stiff club moss would be adverse under alternative 1.

The white heath aster has been documented along the Delaware River (NPS 1986, 106) but communications with DEWA park staff indicate that the white heath aster is located near but not in the study area (Mellon 2010a, 8). The species was not detected during the field surveys conducted along the alternative 1 alignment (Mellon 2010a; NPS 2011b) and it is unlikely that this plant species is present in the existing B-K Line ROW.

Cumulative Impacts

Cumulative impacts on special-status species inside the study area would be adverse, as described previously in the "Cumulative Impacts Common to All Alternatives" section. When the beneficial and adverse impacts on special-status species as a result of alternative 1 are combined with other past, present, and reasonably foreseeable projects in the study area, an adverse cumulative impact would be expected. Alternative 1 would not alter the level of impact.

Conclusion

Operation and maintenance activities associated with alternative 1 could have potential for adverse impacts on federally endangered bog turtles and Indiana bats from disturbance and habitat alteration. These impacts could be effectively minimized by implementing appropriate protection and conservation measures in consultation with the USFWS; therefore, the impacts of alternative 1 are "***not likely to adversely affect***" federally listed threatened and endangered species.

Operation and maintenance activities would adversely impact state listed species including three freshwater mussels and bridle shiner due to increases in sedimentation and turbidity in surface waters;

however, the use of BMPs would minimize impacts on aquatic species. If vegetation clearing and maintenance activities are conducted during the nesting and breeding season of the golden-winged warbler, adverse impacts could occur, but the creation of additional habitat may also benefit this species. Adverse impacts to state-listed reptiles and amphibians are expected from the disruption of basking, foraging, and nesting behavior, as well as the introduction of invasive plant species.

There is some potential for unknown risks to wintering bald eagles. The wintering population of eagles in DEWA is a mix of resident eagles and winter migrants. The winter residents are nesting eagles that remain in DEWA through the winter. The winter migrants consist of eagles from the northern states and Canada who migrate to DEWA and spend the majority of the winter within the park plus additional eagles that migrate through the Delaware River valley, spending a shorter amount of time in DEWA. The total number of eagles that use the communal winter roost even for a short period each year is unknown. The potential for eagles to collide with power lines is also dependent on the visibility of the lines. The present lines do not have mitigation measures installed to increase the visibility of the lines but the height of the lines are at or below tree level and are therefore not in the direct flight path of eagles flying to and from the roost. There is a possibility that some collisions with the power lines have occurred and gone undetected. However, this risk is comparatively low, and, given that the lines are at or below tree level and given that the power line has been in place for many years, it is likely that the winter roost developed with the existing power line already present.

In the context of laws and policies that protect special-status species, the adverse impacts of alternative 1 would not likely be significant because it is unlikely that the impacts would adversely affect population viability or overall habitat quality. Adverse impacts to special-status species would be avoided and minimized through required consultation and permitting processes; thus, the impacts would be consistent with the laws and policies that govern these resources.

Common to All Action Alternatives

Removal of Existing Structures: All action alternatives (2, 2b, 3, 4, and 5) would involve the removal of all or a portion of the B-K Line, as described in chapter 2. For all action alternatives, the B-K Line structures would be removed but the foundations for these structures would remain in place. For alternatives 2 and 2b, the S-R Line would be constructed along the same alignment. The removal of the structures would require constructing access roads (either permanent or temporary, depending on the alternative). The removal of the B-K Line would require constructing access roads, wire pull sites, and the removal of the line as described in chapter 2. Because access roads would also be required for the construction and long-term maintenance of the new line, adverse impacts from removing the line would be the same as (or less than) the impacts discussed for construction of the S-R Line.

Vegetation Clearing: The ROWs would be cleared of vegetation for the construction of the new double 500-kV transmission line for alternatives 2 through 5, which would affect wetlands. Alternatives 2, 3, 4, and 5 would include clearing for construction up to 350 feet; the ROW would be extended up to 175 feet from either side of the centerline of the existing ROW. Under alternative 2b, the applicant proposes to operate the S-R Line within the existing ROW. The NPS anticipates that the applicant would require additional area for construction; therefore, it is estimated that under alternative 2b, the applicant would expand the ROW to the extent of their deeded property rights, which ranges from 100 feet to 380 feet. For alternative 2b, the ROW would be cleared on either side of the centerline to an appropriate width based on the deeded property rights. Clearing would be complete for all action alternatives, with the exception of the 50-foot buffer near intermittent streams/wetlands and the 100-foot buffer near perennial waterways such as the Delaware River (PPL and PSE&G 2008, 7). The impacts from vegetation clearing are discussed for each alternative because the amount of clearing for each is different.

Construction Components: Construction activities are described in detail in chapter 2; the activities that would affect listed species if these areas cannot be avoided include site preparation; construction of access roads, tower foundations, crane pads, wire pull locations, and pulling and splicing sites; and the use of heavy equipment and staging areas. These activities could disturb special-status species directly as well as affecting existing and potential habitat that supports special-status species. All action alternatives would require drilling as part of the construction process, but because drilling is unlikely to affect groundwater (see discussion in "Geologic Resources") it would not affect special-status species in the vicinity, and drilling impacts to groundwater are not discussed further.

Avian Protection Plan: As recommended by the New Jersey USFWS Field Office, the applicant has drafted an Avian Protection Plan to address electrocution, collision, and other impacts. The finalization of the APP will include input from all affected natural resource agencies.

Illegal Collection: Illegal collection of special-status plants and animals currently poses a threat to these species. Construction and maintenance of access roads could provide access to areas that contain these species, allowing for a greater threat of collection and creating adverse impacts to special-status species.

Alternative 2

Special-status Aquatic Species: A total of four special-status (state-listed) aquatic species are known to be present or have the potential to be found in the proposed ROW under alternative 2: three freshwater mussels (yellow lampmussel, creeper, and alewife floater) and one fish species, bridle shiner (NJENSP 2010a, 2; PFBC 2010a, 1; Horwitz et al. 2008, 75). These aquatic species could be affected by vegetation removal and construction activities. The removal of vegetation near surface waters could alter habitat conditions by reducing land-based food sources, increasing water temperatures, changing light attenuation, and exposing streambanks and shorelines to erosion. Excavation and grading activities could increase runoff in the watershed, resulting in increased inputs of sediment to surface waters inhabited by special-status aquatic species. Impacts on the bridle shiner and special-status mussels from increased sedimentation, including turbidity and suspended solids in the water column, could alter and thereby reduce bottom habitat, smother mussels as well as the eggs and larvae of bridle shiner, and interrupt the feeding, respiration, or reproductive activities of bridle shiner and mussels. The use of construction equipment could result in the introduction of contaminants such as fuel or oil to surface waters due to leaks or spills, which could result in acute or chronic effects on special-status species including decreased growth, disturbed reproductive cycles, or mortality. The construction of access roads and spur roads that could necessitate stream crossing structures could result in adverse impacts on mussels located directly in the construction area as a result of direct mortality from crushing by vehicles and equipment. Freshwater mussels, including downstream populations, could also be affected because stream crossing structures could block access to host-fish species, restrict the transport of food particles, and alter geomorphic and hydraulic processes that provide suitable habitat conditions. Stream crossing structures could be installed in the tributary streams in the alternative 2 alignment, including Big Bushkill Creek, Sand Hill Creek, and Van Campen Brook. Preconstruction surveys would be necessary to determine whether any special-status mussel species exist in these tributaries and any mussels found could be relocated out of the construction zone prior to construction activity. The construction of the transmission line across the Delaware River (MDSR) would not include stream crossing structures.

Following construction, activities would include maintenance of vegetation at least annually according to the applicant's NPS-approved vegetation management plans. Impacts to special-status aquatic species would be the same as described for alternative 1, increased sedimentation and turbidity. Under alternative 2, control of invasive plant species near surface waters would include the use of NPS-approved herbicides safe for application in aquatic environments. To minimize impacts from construction activities, forested

buffers around streams and other water bodies would generally be left intact, sediment control devices would installed, and disturbed areas would be revegetated following construction activities.

Special-status Terrestrial Invertebrate Species: Two butterfly species, the Arogos skipper and the Mitchell's satyr, could be present along alternative 2. Clearing and construction activities along the alternative 2 alignment would result in the physical removal of vegetation that could include plant communities that could support the Arogos skipper. Vegetation clearing would be nearly complete in the 350-foot corridor during construction activities as well as for the access roads and spur roads, tower foundations, crane pads, and pulling and splicing sites that would be constructed. Avoidance of sensitive areas, as described in the "Vegetation Clearing" section of chapter 2, would occur to the extent practicable. During the period of analysis for this EIS, the vegetation maintenance of the ROW would occur at least annually to maintain low vegetation growth, which may result in the creation of additional habitat suitable for colonization by the Arogos skipper. If these areas become colonized by the Arogos skipper and conservation measures are implemented, a beneficial impact could occur.

The Arnott Fen wetland complex contains suitable habitat for the Mitchell's satyr. However, this butterfly was not known to occur historically in Pennsylvania, and has been extirpated from its historical range in northern New Jersey. This species is now only found in 13 locations in Michigan and 2 locations in Indiana (USFWS 2010d, 1); therefore, it is unlikely to be present in the study area. No new towers would be placed in the Arnott Fen wetland complex, new towers would be constructed on either side of the fen. The greatest threat to the Mitchell's satyr is habitat destruction, including invasion by nonnative, invasive plants that threaten the fens on which the butterfly depends (USFWS 2010d, 1).

Special-Status Birds: A total of 17 special-status (state-listed) bird species have been observed or have the potential to be affected under alternative 2: great blue heron, osprey, northern harrier, bald eagle, Cooper's hawk, northern goshawk, red shouldered hawk, peregrine falcon, American kestrel, short-eared owl, barred owl, veery, black-throated green warbler, cerulean warbler, golden-winged warbler, vesper sparrow, and horned lark.

Neotropical migrant species and special-status raptor species that use forested habitat could be adversely affected by the loss of trees as a result of linear clearing beyond the width of the existing ROW, including the loss of potential nesting habitat. Migrant and potential summer resident species such as veery, cerulean warbler, and black-throated green warbler could be adversely affected by the clearing of forested habitat. Nests may be lost due to clearing, abandoned by adults because of disturbance, or found by scavengers or predators when exposed as a result of clearing; however, this would be minimized though the seasonal restriction on tree cutting.

Nine raptor species (osprey, northern harrier, Cooper's hawk, northern goshawk, red shouldered hawk, American kestrel, peregrine falcon, short-eared owl, and barred owl) could be present as migrant, resident, or seasonally present species in habitats being cleared under alternative 2. As forest-dwelling and potentially forest-nesting species, Cooper's hawk, northern goshawk, red shouldered hawk, and barred owl could all nest in forested tracts along the length of the ROW. The amount of forest edge habitat would effectively remain the same and opportunistic predators and passerine brood parasites (brown-headed cowbirds) could be expected to continue to affect nesting success for nesting species present along edge habitat. In addition, as edge effects extend further into the undisturbed forest, the area of interior forest habitat (i.e., far enough away to be free of edge effects) is expected to decrease, with the potential to incrementally decrease the forest's carrying capacity for interior-nesting bird species. The northern harrier and short-eared owl are ground-nesting species that use densely vegetated fields or marsh habitat, although it is primarily a migrant through the study area. A 1,000-foot buffer surrounding identified nest areas would be established prior to construction activities to minimize adverse impacts.

The corridor, as proposed under alternative 2, would provide a slightly larger foraging area for all migrant, resident, or seasonally present special-status raptor species.

If the corridor, as proposed under alternative 2, was maintained as scrub shrub habitat and not grassland habitat, it could expand the amount of successional habitat for golden-winged warbler, resulting in a beneficial impact. Although ROW clearing would not occur during the nesting season, adverse impacts on the golden-winged warbler would occur from disturbance as described in alternative 1. These impacts would be offset by the creation of additional scrub shrub habitat available to this species in the new ROW, although this habitat may not be immediately available. The clearing of vegetation would also benefit the vesper sparrow and horned lark, as these species prefer open areas.

Forested and emergent wetland areas as well as riparian areas adjacent to the Delaware River are present in the ROW and would be avoided to the extent practicable under alternative 2. Forested wetlands, emergent wetlands, and riparian areas can be used by state-listed bird species. The great blue heron is known to nest in wetlands and areas adjacent to wetlands along the alternative 2 alignment. If vegetation in these areas, especially tall trees that offer the potential for use by great blue herons, is removed, the great blue heron would be adversely affected. In addition to the loss of habitat, during site preparation and the construction of the transmission line under alternative 2, all special-status bird species may be affected by noise and construction activities, which would result in temporary disturbance or displacement from habitats. Construction-related activity in the area could affect bird behavior, including foraging and breeding, in the ROW and adjacent habitats. Helicopters would potentially be used during construction activities to string the transmission line, as described in chapter 2. Due to the linear nature of the project, helicopter activities in most cases would move frequently and would occur in a limited section of the ROW, so noise would not continue for lengthy periods at any one tower location. Individual birds may temporarily avoid areas during helicopter use but the majority of the special-status bird species could be expected to return to their usual habitats when helicopter activity has ceased. In addition, in the context of the regional abundance of habitat outside the study area that may be used by special-status bird species, the short duration of helicopter use at any one location would attenuate adverse effects. Any temporary noise impacts on special-status bird species that may occur from helicopter-aided construction would not be expected to reduce the populations below self-sustaining levels in or adjacent to the project area. In addition to noise from construction activities, the presence of project personnel could result in the disruption of breeding or nesting behavior such as incubating eggs or tending to nestlings. If birds attempt to relocate nesting territories during construction activities, they would expend time and energy in locating and defending new nesting territories that would otherwise be used for reproduction; this could result in lower productivity and nesting success until individuals establish new territories, which may not occur until the following nesting season. A seasonal restriction on tree clearing from March 15 through August 31 would prevent unauthorized take of nests and unfledged young protected under the Migratory Bird Treaty Act (USFWS 2010b); however, the seasonal restriction does not incorporate the nesting dates for bald eagles, which are discussed under “Bald Eagle” in this section. Because the seasonal restriction on tree clearing would be observed, the permanent and seasonally present nesting special-status species should not be forced to abandon nests or young. Any noise or disturbance impacts on special-status bird species that may occur from construction would not be expected to reduce the populations below self-sustaining levels in or adjacent to the project area.

Maintenance activities have the potential to disturb and temporarily displace special-status bird species using habitat in or near the ROW for nesting and/or foraging. The annual maintenance of the ROW would cause disturbance to occur throughout the period of analysis; however, it is expected that maintenance would not occur simultaneously along the entire length of the ROW.

Bald Eagle: The bald eagle is known to nest, roost, and forage along the Delaware River where the alternative 2 alignment crosses the river. The USFWS has stated in a 2010 letter that several active bald

eagle nests are located along the eastern end of alternative 2 (USFWS 2010b), but there is also the potential for inactive or alternate nests (not used for breeding by eagles in a given breeding season) to be used (USFWS 2007a, 17). Additionally, a communal wintering eagle roost is located along the alternative 2 corridor (USFWS 2010b, 5) and the alignment also crosses bald eagle foraging habitat (USFWS 2010b). The implementation of alternative 2 would not be consistent with the Bald Eagle Guidelines.

Direct impacts on nesting bald eagles would primarily occur as a result of clearing and construction activities required to implement alternative 2. During the breeding season, bald eagles may be sensitive to human activities; however, not all eagles react in the same manner to disturbance. Some eagles may continue nesting activity while others may abandon nesting. Bald eagles may also react to disturbance differently at different stages of the breeding season (USFWS 2007a, 7). The most sensitive period is considered the time when bald eagles are courting and nest building. Clearing and construction during this period (generally the beginning of December to the end of February) could result in nest abandonment. During egg laying and incubation (generally the end of January to the end of April), the prolonged absence of adults can jeopardize eggs or young. From four to eight weeks after hatching, nest abandonment is less likely, but nestlings may miss feedings, potentially affecting their survival (end of March to end of June). From mid-May to the end of August, young eagles begin to gain flight capability and disturbance from clearing and construction in the vicinity of the nest may cause the young to flush from the nest prematurely, causing injury and death (USFWS 2007a, 8).

If nesting activity is observed before or during construction, additional protections of the nest site would occur as required in the Bald Eagle Guidelines (USFWS 2007a, 12). Specifically, to avoid disturbing nesting bald eagles, the guidelines recommend (1) keeping a distance between the activity and the nest (distance buffers), (2) maintaining preferably forested (or natural) areas between the activity and around nest trees (landscape buffers), and (3) avoiding certain activities during the breeding season. These guidelines would minimize potential impacts on nesting bald eagles. The distance and landscape buffers serve to minimize visual and auditory impacts and would be large enough to protect existing nest trees and provide replacement nest trees. The size and shape of the buffers vary depending on topography and other site characteristics, as well as on the historical tolerance by eagles of human activities in the area. The height of the nest above ground may also reduce the impacts from human activities; eagles with nests at higher elevations may be less prone to disturbance. Specific guidance for disturbance and landscape buffers should be determined through contact with the USFWS and would minimize potential impacts on nesting bald eagles (USFWS 2007a, 10). Nesting of bald eagles in the New Jersey and Pennsylvania area can generally be said to occur between December 1 and August 31; however, nesting chronology in the area would be verified through contact with the regional USFWS office and through NPS biologists (USFWS 2007a, 17).

Bald eagles have used the communal wintering roost site historically, as documented in records, and this roost site may be an important attribute contributing to the suitability of DEWA as a wintering area for bald eagles. Bald eagles rely on established roost sites because of their proximity to sufficient food sources. The Bald Eagle Guidelines recommend against placing transmission lines near communal roost sites (USFWS 2007a, 15); therefore, the implementation of alternative 2 would not be consistent with the Bald Eagle Guidelines and would result in the presence of taller towers and lines that could increase the potential for collision or electrocution of eagles moving to and from the existing roost site. Roosting eagles may also be affected by the removal of trees and disturbance from construction activities, including noise and human presence. Human activity near bald eagles can force eagles to abandon the immediate area, preventing local foraging and causing unnecessary expenditure of energy to forage elsewhere. Repeated intrusions into their wintering habitat can result in physiologic stress at a time when cold weather and reduced foraging opportunities can weaken individuals, making them susceptible to disease, and can lower the reproductive success of adults (USFWS 2007a, 8–9). Measures to protect roosting eagles would be adapted as needed. Consultation with USFWS would ensure that adverse impacts on roosting bald eagles

would be avoided whenever possible. However, even though mitigation measures would be implemented responsibly, adverse impacts on the bald eagle are possible during construction activities that occur in the wintering eagle roost area and in foraging areas. Impacts would occur because individuals may temporarily avoid areas and the potential for negative impacts on feeding, reproduction, and resting would exist and could affect local population levels. Although the new double 500-kV transmission line would be constructed using APLIC standards and the best available deterrence technology to reduce the potential for impacts, alternative 2 is likely to adversely affect the daily foraging movements and winter roosting of bald eagles along the Delaware River.

Electrocution: As stated in alternative 1, eagles, hawks, barred owls, ospreys, and great blue herons have been electrocuted by transmission lines (APLIC 2006, 10, 31). Because the power lines proposed under alternative 2 are two 500-kV lines, it is unlikely that bird electrocution would occur. Bird electrocution typically occurs on power lines with voltages less than 60 kV, as described under "Common to All Alternatives" (APLIC 2006, ix). In order to minimize the potential for bird electrocution as a result of alternative 2, the applicant would meet or exceed the 2006 APLIC recommendations for reducing bird risks by employing the recommended horizontal and vertical separation as described in the Avian Protection Plan (ERM 2010) and using the current best available technology for minimizing the potential for electrocution. Therefore, the likelihood of electrocutions occurring at the proposed voltage, which is over 60 kV, would be considered low (APLIC 2006, 60). The proposed S-R Line would be constructed with the minimum clearances between phase conductors or between phase conductors and grounded hardware, which are sufficient to protect even the largest special-status bird species in the vicinity, including bald eagles, as recommended by APLIC (2006).

Power Line Collisions: Alternative 2 is not consistent with the Bald Eagle Guidelines, which state that communication towers and high-voltage transmission power lines should be sited away from bald eagle nests, foraging areas, and communal roost sites (USFWS 2007a, 15). Although the transmission lines would span the Delaware River under alternative 2 in the same area as the existing ROW, the new lines could affect special-status raptors (ospreys and bald eagles) that forage along the river due to the higher and more numerous transmission lines proposed under this alternative. Heavy-bodied, less agile birds or birds in flocks may lack the ability to quickly negotiate obstacles, making them more vulnerable to power-line collisions (APLIC 2011b). Additionally, the location of transmission lines close to bald eagle nesting areas would increase the likelihood of collisions for younger individuals that are less experienced fliers. Collisions most often occur with the overhead static wire, which may be less visible than energized conductors due to its smaller diameter (APLIC 2011b). To reduce bird collisions, a variety of mitigation techniques are proposed to make the proposed double 500-kV transmission line more visible to birds. In order to minimize the potential for bird collisions as a result of alternative 2, the applicant would develop an approved bird protection plan and through that document, meet or exceed the 2006 APLIC recommendations for reducing bird risks by employing various mitigation measures that are described in the bird protection plan. Kittatinny Ridge, as described in chapter 3, is a major north–south fall migration corridor for raptors and because of its north–south orientation provides ideal conditions for migrating hawks. Under alternative 2 larger, taller transmission lines crossing Kittatinny Ridge nearly perpendicularly in the study area could create a bird collision hazard. Electrocution and collision with the new, higher line would be possible, for the bald eagle, northern harrier, osprey, great blue heron, barred owl, short-eared owl, peregrine falcon, American kestrel, Cooper's hawk, northern goshawk, and red shouldered hawk.

Special-status Reptiles and Amphibians: The special-status reptile and amphibian species that may be affected by alternative 2 include bog turtle, timber rattlesnake, northern fence lizard, wood turtle, eastern box turtle, northern copperhead, and longtail salamander. In general, removing vegetation along the corridor, the construction of access roads and spur roads, and the construction of the transmission line could adversely affect the listed reptiles and amphibians. The removal of vegetation, specifically clearing

of forested areas that would increase sun exposure and reduce forest canopy, would destroy or reduce preferred habitat of special-status reptile and amphibian species; habitat fragmentation would also result from vegetation clearing and access road construction. Reptiles and amphibians are typically active from March through November and most breeding occurs in early spring or summer, but they are generally not very mobile species and individuals (or eggs) may be crushed or killed as a result of their inability to avoid contact with construction vehicles, equipment, and materials during vegetation clearing and construction activities. During the heat of the day many reptiles and amphibians seek shelter under logs, rocks, or piles of leaves; therefore, the presence of individuals on site could be overlooked by equipment operators. Reptiles and amphibians are also small and typically camouflage themselves or blend in with the surrounding substrate. Specific impacts analyses by species are included in the discussions below.

Wood turtles and eastern box turtles are listed species in New Jersey and use forested, scrub shrub, and wetland habitats during different behaviors or stages of their life. Both species were observed in the alternative 2 corridor during the 2008–2011 surveys and have been documented foraging and nesting in or near the existing ROW. Wood turtles have varied home ranges across their geographic range, from less than 7 acres (3 hectares) to more than 69 acres (28 hectares), with smaller ranges being noted in Pennsylvania than in the northern limits of the species range in Canada (CRACM 2004, 5). Wood turtles mate underwater; once impregnated, the female travels away from the wetland area and excavates a nest in an upland site with scant vegetation and abundant sunlight. Nesting activities typically occur in May or June and hatchlings typically emerge in September. Wood turtles also use forested and scrub shrub habitat for foraging and basking and return to streams or other aquatic habitats to hibernate from November through March (CRACM 2004, 1). The New Jersey Landscape Project identified numerous areas of potential habitat for wood turtles along the proposed ROW and NJENSP (2010a) also identified the wood turtle as present in the proposed ROW. Eastern box turtles spend most of their lives in upland areas foraging, feeding, and nesting, but can sometimes be found in wetland areas. Nesting usually occurs in June or July, with hatchlings emerging in September. During the winter months eastern box turtles hibernate a few inches below the soil in forested areas (NHESP 2007, 1). The use of heavy machinery and other construction equipment and/or soil excavation activities may destroy turtle nests and crush or kill hibernating eastern box turtles; however, this would be kept to a minimum through the implementation of preconstruction surveys. Other protection measures would be implemented, including the use of handheld equipment instead of machinery and the implementation of seasonal restrictions during nesting and birthing seasons for turtles (typically between March and September); however, inadvertent crushing of nests or turtles by workers could still occur. Specifically for wood turtles, the use of barrier fencing along streams could also be implemented during construction to keep the turtles from entering construction sites. These mitigation measures would further reduce the risk of mortality during the winter months when wood turtles are in hibernation along streambanks away from construction areas.

The NJDEP identified the timber rattlesnake and northern copperhead as present along the proposed ROW inside the study area; both species were observed during 2008–2011 surveys. Timber rattlesnakes can be found in the forested, scrub shrub, or rocky outcrops habitat along the alternative 2 alignment. Northern copperheads occupy a variety of habitats during the warm months, including emergent wetlands, areas along streams, and upland areas where foraging and basking occurs. For both snake species, a potential for direct mortality exists if individuals are struck by construction vehicles and equipment during construction in the ROW, although preconstruction surveys, construction monitoring, seasonal restrictions, exclusion fencing, and postconstruction habitat restoration and monitoring would reduce this risk. Drilling activities required for the installation of tower foundations have the potential to adversely affect den sites in the rocky outcrops; however this potential is relatively low. The applicant would be required to develop a buffer zone, an area beyond which drilling activities would not impact the geology and the dens. Preconstruction surveys and seasonal restrictions (no drilling between September and April, when timber rattlesnakes occupy dens) would also be implemented. Following construction, the dens would be monitored to determine whether dens were affected by construction activities. If impacts are

documented during monitoring, additional mitigation could be required, including relocation of rattlesnakes, in consultation with the NPS. There is one known timber rattlesnake den location in the alternative 2 ROW inside the study area (Boder et al. 2005). The den is located close to the construction zone for a proposed tower and it is likely that snakes would be disturbed by the vibrations and noise associated with the drilling activities. If empty dens are destroyed by drilling activities it could result in eventual mortality for timber rattlesnakes or northern copperheads, because these species return to the same dens year after year and may be unable to find suitable overwintering areas if their original dens have been destroyed.

Northern fence lizards prefer open wooded areas, sunny grassy areas, and rock outcroppings for foraging and basking. Northern fence lizards are typically active May through September and this species was observed during the 2010-2011 vegetation surveys (NPS 2011b). During late spring, females lay eggs in loose soil. Impacts on northern fence lizards would result from the direct mortality of individuals from construction equipment. The removal of forested areas would destroy the preferred habitat of the northern fence lizard. In addition, the excavation of soil has the potential to destroy lizard nests.

Longtail salamanders and bog turtles spend the majority of their time in wetland habitats and have been observed in calcareous wetlands along the alternative 2 ROW inside the study area. Bog turtles inhabit a variety of wetland types throughout their range, but are usually found in small, open canopy, herbaceous sedge meadows and fens bordered by wooded areas. These wetlands are a mosaic of microhabitats that include dry pockets, saturated areas, and areas that are periodically flooded. Bog turtles depend on this diversity of microhabitats for foraging, nesting, basking, hibernation, and shelter (USFWS 2001, 12). Bog turtles typically spend most of their time in the wetland areas, using the upland areas only as travel corridors. Longtail salamanders and other amphibians sometimes travel to upland areas and find cover under moist logs or leaf piles. Calcareous wetland habitats are highly vulnerable to degradation from direct disturbance and from activities in nearby upland areas. Runoff from road surfaces, disruption of groundwater flow by nearby excavation, sedimentation from construction activity, or direct physical disturbance can lead to changes in the character of the wetland habitat, including a decline in overall plant diversity and invasion by non-native species and tall shrubs. Such changes could render the habitat unsuitable for the bog turtle and longtail salamander. Additional impacts would also occur if bog turtles or longtail salamanders travel in the upland community, where there is a risk of direct mortality from contact with construction vehicles and equipment.

Additional habitat fragmentation resulting from the widening of the existing ROW inside the study area (as described in detail in previous sections of chapter 4) would occur from the removal of the forested habitat; however, vegetation would become reestablished and would be managed as permanent scrub shrub habitat in the ROW. Habitat along the edge of the ROW not required for the maintenance of the ROW would be allowed to revegetate and succeed to mature forest over time, but this would not occur within the period of analysis. Seasonal restrictions and other mitigation measures could be implemented to protect reptiles and amphibians from impacts during hand clearing of vegetation such as inadvertent crushing of nests, reptiles, or amphibians by workers.

Projects in and adjacent to bog turtle habitat can cause habitat destruction, degradation, and fragmentation. For example, soil compaction in wetland areas can affect hydrology and wetland function, and can degrade bog turtle habitat. Alternative 2 could result in direct and indirect adverse impacts on bog turtles within wetlands; however, avoidance of bog turtle habitat is reflected in the current routing described in alternative 2. Adverse effects to the bog turtle have also been minimized through the adoption of conservation measures such as pre-construction surveys, avoidance, time of year restrictions, fencing and monitoring during constructions, steps to limit increased visitor access via new access roads, and a NPS-approved vegetation management plan. These conservation measures are consistent with the generalized recommendations and bog turtle conservation zones, developed by USFWS, as described in

the recovery plan for this species (USFWS 2001, appendix A) and in chapter 3. A BA was completed to evaluate the likely effects of alternative 2 on the bog turtle and its habitat. Given the adopted conservation measures, the BA concluded that alternative 2 "***may affect, but is not likely to adversely affect***" the bog turtle. The USFWS concurred with this determination on July 6, 2012.

Special-status Mammals: Four special-status mammal species, the bobcat and three bats (Indiana bat, small-footed bat, and northern myotis), have the potential to be present in the corridor of alternative 2. The Pennsylvania Game Commission has stated that alternative 2 is located outside the buffers (habitat that could support the bat) of the northern myotis (PGC 2010c).

If bobcat dens are near new areas being cleared, bobcats may temporarily or permanently leave their territories to avoid construction activity. This could lead to perceptible or measurable changes in behavior, den use, or the location or size of a territory. Adverse impacts on bobcats that may occupy territory (dens) in the area would occur due to habitat disturbance during site preparation and construction activities. The regular maintenance of the ROW could cause periodic disturbance throughout the period of analysis. Bobcats would avoid the areas of activity and disturbance during maintenance but would continue to use the existing ROW as a corridor for movement and hunting and could be expected to maintain territories that may overlap with the ROW and the habitats along the transmission line.

No bat hibernacula were found that could be used by small-footed or Indiana bats (Sanders 2009). Indiana bats are known to hibernate in nearby counties, and it is possible that individuals from these wintering sites are present in DEWA during the breeding season (April through September). Summer habitat for special-status bat species is available along the corridor of alternative 2, and surveys conducted in the alignment of alternative 2 documented northern myotis but failed to detect the Indiana bat (Sanders 2009, 6). An observation of small-footed bats during field studies along the alternative 2 corridor provides the possibility that small-footed bats could be foraging in the area or using rock crevices as habitat in the area. As nocturnal foragers, bats feed mainly in the forest canopy, grabbing flying insects, and may concentrate in the open space of ROWs, trails, or over streams that provide travel and foraging corridors. Transmission line construction at several river and stream crossings under alternative 2 would be expected to have few impacts on bat foraging habitat. Summer habitat and foraging habitat for all three species of bats is present in the study area and could be affected by the removal of trees, which may contain roost sites or maternity colonies, during clearing and construction activities. The foraging activities of special-status bats would not be affected unless construction activities occurred at night. If construction occurred at night, noise and activity could deter foraging; however, the use of lights could attract bats to the arc of lighting in order to feed on insects attracted to the light.

Due to potential impacts on summer habitat for special-status bat species, the applicant has specified that conservation measures would be implemented to ensure that the project would not be likely to adversely affect the Indiana bat (or the small-footed bat or the northern myotis). For example, seasonal restrictions would be followed, as described in the BA, to reduce and avoid any unforeseen disturbance or injury to roosting Indiana bats from the construction of the project. Seasonal restrictions for the cutting of potential roost trees (trees with a diameter at breast height greater than 5 inches [12.7 centimeters]) would prohibit cutting between April 1 and September 30, when Indiana bats could be present. Both the small-footed bat and the northern myotis would also likely benefit from the seasonal restrictions for the protection of the Indiana bat. Mitigation that has been specified for impacts on forested habitat could also offset loss of forested bat habitat. Projects include the Hopatcong Forest Restoration Project and mitigation proposed along the Passaic River (USFWS 2010b). Mitigation is expected to benefit the Indiana bat as well as the small-footed bat and the northern myotis. Impacts associated with the loss of forest would be offset by the Hopatcong Forest Restoration Project (USFWS 2010b). The implementation of mitigation measures would minimize adverse effects to the Indiana bat, resulting in a NPS determination in the BA that

alternative 2 "***may affect but is not likely to adversely affect***" the Indiana bat. The USFWS concurred with this determination on July 6, 2012.

Special-status Plants: A total of 12 special-status (state-listed) plant species have been observed or have the potential to be present in the habitats that have been mapped in the alternative 2 ROW and are described by habitat or presence in this section: A-sedge, downy willow-herb, small-headed rush, brook lobelia, Carolina grass-of-Parnassus, bog goldenrod, shrubby cinquefoil, Clinton's wood fern, reed meadowgrass, marsh bedstraw, stiff club moss, and white heath aster.

Suitable habitat and special-status plant species (including A-sedge, downy willow-herb, small-headed rush, brook lobelia, Carolina grass-of-Parnassus, bog goldenrod, and shrubby cinquefoil) have been identified in open canopy wetland areas within the corridor of alternative 2 but has not been found at other locations in the alternative 2 study area during surveys (Mellon 2010a). The wetland habitats in the ROW have the potential to support a number of listed special-status plant species. Indirect adverse impacts on these special-status plants could occur from clearing and construction. These activities could facilitate the spread of invasive species through forest clearing and access road construction, and drilling could adversely affect wetland functionality through erosion and alteration of hydrology.

Plant surveys did not document the presence of Clinton's wood fern in the study area under alternative 2 (Mellon 2010a); however, suitable habitat for Clinton's wood fern is present in wetland areas that would be bisected by the alternative 2 alignment. Clinton's wood fern has been found in the past in wetland areas surrounded by eastern hemlock in the study area (NPS 2009g, 2, 4) and could also be found outside wetland areas. It is possible that this species could be affected by the implementation of alternative 2 because some suitable habitat containing mature mixed forests may potentially be cleared. Mixed forest areas could contain the habitat requirements for Clinton's wood fern. The development of access roads and the installation of towers would not affect the wetland area where suitable habitat is found, and vegetation maintenance would occur throughout the period of analysis; however, Clinton's wood fern is low growing and therefore would be compatible with the applicant's vegetation management plans. The loss of mature tree species that provide a canopy for this understory fern would particularly affect habitat for this species and would facilitate the spread of invasive species. However, following the initial clearing activities, it is possible that Clinton's wood fern could be established in the corridor if suitable forested areas remain intact.

Reed meadowgrass was observed during surveys conducted in 2010 (Mellon 2010a, 2010b) and marsh bedstraw was observed during vegetation surveys conducted in 2011 (NPS 2011b) near wetland areas in the ROW. Reed meadowgrass was found in the ROW in a seepage area with other herbaceous wetland plants (Mellon 2010b). It is likely that both of these species would be directly affected under alternative 2 because the emergent wetland habitat, including the seepage area that supports reed meadowgrass and marsh bedstraw, is in an area that may be cleared to allow the construction of a tower. Indirect impacts on both plants could occur through vegetation maintenance, adjacent forest clearing, and access road construction, which may increase erosion in these areas and affect the functionality of the wetlands that support both species.

Stiff club moss was observed in scrub shrub and forested wetland habitat in the ROW during vegetation surveys conducted in 2011 (NPS 2011b). During construction and the widening of the ROW, vegetation removal (including incompatible species and trees) and ground disturbance could affect existing stems of stiff club moss and the surrounding habitat. Stiff club moss would also be disturbed by the construction of an access road that would be constructed through the species' habitat. Regular maintenance of the ROW is required to maintain low vegetation growth, including the removal of incompatible plant species.

White heath aster, although reported to be rare, has been found to be locally common in dry spots along the Delaware River, particularly in limestone ledge areas (NPS 1986, 106). This species has also been observed on limestone rocks in the forest adjacent to wetland areas (Mellon 2010a, 13). Communications with DEWA indicate that white heath aster grows near, but not in, the study area (Mellon 2010a, 8) and the species was not found during the field surveys conducted along the alternative 2 corridor (Mellon 2010a; NPS 2011b).

For all listed plant species, mitigation as described in appendix F would be employed to minimize and avoid impacts. Such mitigation includes monitoring areas to be avoided during construction, as identified during preconstruction surveys, and minimizing fugitive dust and runoff from construction sites (reducing sedimentation), which would reduce the potential adverse impacts on special-status plant species. Although mitigation techniques would be employed, adverse impacts on listed plants would still occur.

Cumulative Impacts

Cumulative impacts on special-status species inside the study area would be adverse, as described previously in the "Cumulative Impacts Common to All Alternatives" section. When the beneficial and adverse impacts on special-status species as a result of alternative 2 are combined with other past, present, and reasonably foreseeable projects in the study area, an overall adverse cumulative impact would be expected. Alternative 2 would not alter the level of impact.

Conclusion

Alternative 2 would cross in the center part of DEWA, including the MDSR. In general, this area is one of the most undeveloped areas of the park and is a particularly sensitive area because it contains high concentrations of many important and unique natural features, including rare limestone formations, the Arnott Fen, the Delaware River riparian corridor, eastern hemlock forests, the Hogback Ridge, the Kittatinny Ridge, and the Van Campen Brook riparian area, all of which provide unique and important high-quality habitat for special-status species. In addition, under alternative 2, the transmission line would bisect a major migratory bird flyway and is adjacent to an important communal roost for wintering bald eagles that is one of only two known winter roosts in DEWA.

Alternative 2 has the potential for adverse impacts on federally threatened bog turtles. Adverse impacts to bog turtles would be minimized through implementation of appropriate mitigation and conservation measures in consultation with the USFWS; therefore, alternative 2 may affect, but is not likely to adversely affect the bog turtle and bog turtle habitat (pursuant to Section 7 of the Endangered Species Act).

There is potential for adverse impacts on federally endangered Indiana bats from tree clearing and construction activities that could interfere with bat foraging and could result in the removal of trees that may contain roost sites or maternity colonies. These impacts would be minimized by implementing appropriate mitigation and conservation measures in consultation with the USFWS; therefore, alternative 2 may affect but is not likely to adversely affect Indiana bats (pursuant to Section 7 of the Endangered Species Act).

There is also some potential for adverse impacts on federally listed freshwater mussels from vegetation clearing and construction activities. These impacts would be minimized by implementing appropriate mitigation and conservation measures in consultation with the USFWS; therefore, alternative 2 may affect but is not likely to adversely affect freshwater mussels (pursuant to Section 7 of the Endangered Species Act).

he transmission line would be oriented perpendicular to a major flyway for migratory birds, creating an aerial hazard and increasing the risk of bird collisions. It is not possible to predict the percentage of migrating birds that might be killed or injured from colliding with the wires or towers but the height of the towers and number of conductors are believed to greatly increase the potential for bird collisions and resulting mortality or injury. In addition, the transmission line would be located next to one of only two known communal roosts for wintering bald eagles and collision risk would be especially high as eagles move to and from the roost. The roost developed with the existing, lower transmission line in place and there have been no known instances of eagle collisions, although some may have occurred; however, the taller towers and more numerous wires directly in the flight path of wintering eagles that use the communal roost on a regular basis presents an extremely high risk of collisions resulting in loss or injury of bald eagles. Bird diverters would be used to make the wires more visible to migrating birds and eagles but the effectiveness of these devices is uncertain. The high risk of bird collisions as a result of creating an aerial hazard on a major migratory flyway coupled with the unknown extent of the potential mortality of and injury to migrating birds and the uncertainty as to the effectiveness of mitigation measures is counter to the protection afforded migratory birds under Migratory Bird Treaty Act. The siting of a transmission line adjacent to a bald eagle roost is counter to the recommendations in the National Bald Eagle Management Guidelines and mitigation of the risk of eagles colliding with the lines is uncertain; therefore, it is likely that the potential loss of eagles through collisions would require a permit from the USFWS for “take” of bald eagles associated with operation of the transmission line. “Take” of bald eagles, meaning killing or injury, would occur for as long as the transmission line remains.

Overall, the significance of the impacts of alternative 2 is a result of two considerations: the particularly resource-rich area through which the alternative crosses, and the potential to inflict harm to those resources because of the magnitude and duration of the adverse impacts. Although it is true that not all impacts can be predicted with great certainty, in the context of the purpose and significance for which DEWA, APPA, and MDSR were established and NPS mandates to specifically preserve the natural, cultural, and scenic resources within them, additional precautions are warranted when considering risks to these resources, many of which are of national importance. This is especially important when considering that many of these resources, such as migratory birds, are under threat by other actions and outside pressure. The context of the function of the parks as an “oasis” or refuge within the highly developed east coast elevates the need to preserve and protect these scarce, sensitive resources. For these reasons, the adverse impacts of alternative 2 are likely to be significant when considering the intensity of the impacts in the context of the laws and policies for protection of special-status species.

Permitting the project would adversely affect multiple protected resources inside the parks, in some instances irreversibly. Allowing such adverse effects in order to facilitate private infrastructure expansion would be contrary to NPS practice and principle of protecting and improving these resources, and of removing incompatible infrastructure to do so. This could establish precedent that may invite similar proposals by other applicants in the future, and create an expectation of like treatment for those proposals; it may make it difficult to deny such proposals. DEWA and APPA both contain numerous other utility crossings, which makes the risk of such precedent particularly concerning for these parks. Furthermore, as units of the national park system, wherein all parks are entitled to equal protection, creating such a precedent could have ramifications for parks nationwide. The location of this particular crossing through the center of DEWA could make such a precedent even more potent. Installing the S-R Line on this alignment may invite future utilities proposing to follow the same route.

Alternative 2b

Special-status Aquatic Species: A total of four special-status (state-listed) aquatic species (bridle shiner and three mussels: yellow lampmussel, creeper, and alewife floater) are known to be present or have the potential to be found in the proposed ROW for alternative 2b, as discussed under alternative 2. Due to the

similar amount of access roads, impacts on habitat for aquatic species from the construction of access roads and crane pads would be similar to those under alternative 2. Impacts on the bridle shiner and freshwater mussel species include changes in water quality, alteration of bottom habitat, decreased growth, and interruption of feeding, respiration, and reproductive activities; freshwater mussels could also be smothered by sediment deposition, whereas bridle shiners should be able to relocate out of the construction area. Structures associated with proposed stream crossings could result in adverse impacts on special-status mussels from direct mortality of mussels in the construction area. Because the bridle shiner would be able to avoid construction areas, adverse impacts are expected as a result of sedimentation and alteration of water quality. Stream crossing structures could affect special-status freshwater mussels by potentially blocking access to host-fish species, restricting the transport of food particles, and altering geomorphic and hydraulic processes that provide suitable habitat conditions. Preconstruction surveys would be necessary to determine whether any special-status mussel species exist in the tributaries and any mussels found could be relocated out of the construction zone prior to construction activity to minimize impacts. Mitigation measures described in appendix F would include the use of BMPs to minimize soil erosion and sedimentation that could affect water quality and habitat suitability for aquatic special-status species. Construction of the transmission line across the Delaware River (MDSR) would not include stream crossing structures and would not affect freshwater mussel species.

Following construction, maintenance activities would be performed but would not occur in surface waters in the ROW and would generally not include the removal of vegetation near water bodies; it is also expected that bridle shiners could avoid temporary disturbances to surface water conditions. In addition, control of invasive plant species near surface waters would include the use of NPS-approved herbicides safe for application in aquatic environments. To minimize impacts from construction activities, forested buffers around the Delaware River would be left intact, sediment control devices would be installed, and disturbed areas would be revegetated.

Special-status Terrestrial Invertebrate Species: Clearing beyond the current ROW would not be required under alternative 2b, but regular maintenance of the ROW would be required to maintain low vegetation growth. The herbaceous plant communities and grasses associated with Arogos skipper habitat would be compatible with vegetation requirements for the ROW and in the long term maintenance of the ROW may create additional suitable habitat for the Arogos skipper. It is possible that the ROW could be colonized by the Arogos skipper and conservation measures could be implemented for this species, resulting in a beneficial impact. As stated above for alternative 2, new towers would be constructed on either side of Arnott Fen, which is potential habitat for Mitchell's satyr. The greatest threat to the Mitchell's satyr is habitat destruction, including invasion by nonnative plants that threaten the fens on which the butterfly depends (USFWS 2010d, 1). However, because this butterfly is extirpated from its historical range in New Jersey and is only found in 13 locations in Michigan and two locations in Indiana (USFWS 2010d, 1), it is unlikely to be present in the alignment for alternative 2b.

Special-status Birds: Alternative 2b would remain inside the existing ROW, as described for alternative 1; impacts are analyzed for a total of 17 special-status (state-listed) bird species that have been observed or have the potential to be present in the ROW habitats. Neotropical migrant species and special-status raptor species that use forested habitat could be adversely affected by the loss of forested habitat as a result of clearing beyond the existing ROW, but the permanent loss of forested habitat would be considered small (4.5 acres) compared to other alternatives. Additional trees would be removed as danger trees if they are determined by the applicant to be a threat to the transmission line; however, the number of trees cannot be estimated, so impacts are unknown. Five forest-dwelling and potentially forest-nesting raptor species, the northern harrier, Cooper's hawk, northern goshawk, red shouldered hawk, and barred owl, could be present as migrant, resident, or seasonally present species in habitat being cleared under alternative 2b. The amount of forest edge habitat would effectively remain the same and opportunistic predators and passerine brood parasites (brown-headed cowbirds) could be expected to affect nest sites

along the newly created edge habitat. Adverse impacts on the golden-winged warbler would also occur in scrub shrub habitat in the ROW during vegetation clearing if clearing occurs during the nesting season; current practices do not have a seasonal restriction. These impacts could be offset by the use of seasonal restrictions on clearing. The clearing of vegetation may benefit the American kestrel, short-eared owl, vesper sparrow, and horned lark, because these species prefer open areas.

Forested and emergent wetland areas as well as riparian areas adjacent to the Delaware River are present in the ROW and would be avoided to the extent practicable under alternative 2b; very little forested habitat would be lost through vegetation clearing as a result of construction activities under alternative 2b. The great blue heron is known to nest in and adjacent to wetlands along the alternative 2b corridor. No access roads are proposed in the wetland where these species are present, but one tower would be placed in an herbaceous wetland area that could be used by great blue heron for foraging. Disturbance during vegetation maintenance could occur from human presence and activity, resulting in the temporary relocation of any foraging herons. In addition to the loss of habitat, during site preparation and the construction of the transmission line under alternative 2b, all special-status bird species may be disturbed by noise and activities associated with construction that would result in temporary disturbance or displacement from habitats. Activity from construction in the area could disrupt bird behavior, including foraging and breeding, in the ROW and adjacent habitats. Helicopters would potentially be used during construction activities to string the transmission line, as described in chapter 2 and in alternative 2 in this chapter. Maintenance activities have the potential to disturb and temporarily displace special-status bird species using habitat in or near the ROW for nesting and/or foraging. Annual maintenance of the ROW would cause disturbance along the entire line and throughout the period of analysis.

Bald Eagle: The bald eagle is known to nest, roost, and forage along the Delaware River where the alternative 2b alignment crosses the river (the same location as for alternatives 1 and 2). As described for previous alternatives in this section, a communal wintering eagle roost is located along the alternative 2b ROW (USFWS 2010b, 5) and the ROW crosses bald eagle foraging habitat (USFWS 2010b). Like alternative 2, alternative 2b would be inconsistent with the Bald Eagle Guidelines because the larger, higher line would be located adjacent to bald eagle nest, foraging, and roost sites. Adverse impacts on the bald eagle would occur during construction activities in the area of the wintering eagle roost and foraging areas; individuals may temporarily avoid areas undergoing demolition and construction. Potential negative impacts from disturbance that would result in disruption of feeding, reproduction, and resting could occur and may affect local population levels. Maintenance would not require heavy equipment and the disturbance from maintenance activities would be less than that from clearing and construction activities. Bald eagles would be expected to respond negatively to construction and demolition activities under alternative 2b because disturbance from activities and human presence would affect foraging, roosting, resting, and potentially nesting behaviors, affecting local population levels. Overall, as a result of vegetation clearing and construction/demolition activities, adverse impacts on the bald eagle would be possible in the wintering eagle roost area and in foraging areas. The permanent presence and maintenance of the transmission line along the bald eagle roost site would result in impacts on the bald eagle and would be inconsistent with Bald Eagle Guidelines.

Electrocution: The potential for electrocution of special-status bird species such as the bald eagle, great blue heron, barred owl, and red shouldered hawk under alternative 2b would be similar to the potential under alternative 2. Under alternative 2b, the proposed transmission line would be completed according to APLIC (2006) standards and would use the current best available technologies for minimizing the potential for electrocutions. However, the potential for electrocution would still exist and could result in impacts on the bald eagle, osprey, great blue heron, barred owl, American kestrel, peregrine falcon, short-eared owl, and special-status hawk species (Cooper’s hawk, northern goshawk, northern harrier, and red shouldered hawk).

Power Line Collisions: The alternative 2b alignment is located along a major north–south fall migration corridor for raptors and the newly constructed transmission lines would create a bird collision hazard where they are oriented in an east–west direction, nearly perpendicular to the line of flight. Migratory and resident special-status raptor species that could be affected by power line collisions include osprey, bald eagle, northern harrier, northern goshawk, Cooper's hawk, red shouldered hawk, American kestrel, peregrine falcon, short-eared owl, and barred owl. Great blue herons could also be affected by power line collisions. Additionally, the location of transmission lines close to bald eagle nests may increase the likelihood of collisions for younger individuals that are less experienced fliers. Bird collisions with power lines can be reduced and minimized through a variety of mitigation measures, including the application of bird-safe designs to new construction and retrofitting existing lines, as described in the APP (APLIC 2006, 7).

Electrocution and collision with the new, higher line would be possible for the following bird species: bald eagle, northern harrier, osprey, great blue heron, barred owl, Cooper's hawk, northern goshawk, American kestrel, peregrine falcon, short-eared owl, and red shouldered hawk.

Special-status Reptiles and Amphibians: As described for alternative 2, a total of seven special-status reptiles and amphibians have been observed or have the potential to be present or use suitable habitats along the ROW that would also provide the alignment for alternative 2b. In general, impacts on the special-status species reptiles and amphibians as a result of alternative 2b would be less than those under alternative 2 because very little forested habitat would be permanently disturbed (4.5 acres) and minimal permanent wetland impacts would occur from tower foundation and crane pad construction. Destruction of wood turtle, northern fence lizard, and eastern box turtle nests could occur during excavation activities. Special-status reptile and amphibian species in areas near construction activities may be disturbed by the increase of noise and activity and individuals of some species would avoid areas that may have been habitually used for basking, foraging, breeding, and nesting. Impacts on bog turtles and longtail salamanders would be adverse due to the risk of mortality from clearing and construction activities as well as from equipment and vehicle strikes. Specifically for wood turtles, the use of barrier fencing along streams could be implemented during construction to keep the turtles from entering construction sites.

There is one timber rattlesnake den location in the ROW for alternative 2b (Boder et al. 2005). Because the snake den is close to the proposed tower location, where drilling would occur, it is likely that snakes would be disturbed by the vibrations and noise associated with the drilling activities. Drilling activities would not occur between September and April when timber rattlesnakes occupy dens. However, if empty dens are destroyed by drilling activities, it could result in eventual mortality for timber rattlesnakes as this species returns to the same dens year after year and may be unable to find suitable overwintering areas if their original dens have been destroyed.

Additional impacts on special-status reptiles and amphibians would occur from habitat fragmentation, as described under alternative 2, but these impacts would be less under this alternative because the majority of access roads and spur roads would be constructed in the existing ROW. Habitat fragmentation would create adverse impacts on the longtail salamander because the habitat required by the salamander provides cover and moisture; the maintenance of the ROW would result in more open and potentially drier conditions, limiting habitat for the longtail salamander. Protection measures, including the use of handheld equipment instead of machinery and the implementation of seasonal restrictions during nesting and birthing seasons for turtles and snake species (typically between March and September), could be implemented; however, inadvertent crushing of nests, turtles, or snakes by workers could still occur.

Special-status Mammals: The four mammal species (bobcat and three bats) previously discussed under alternative 2 have the potential to be present under alternative 2b. Impacts on bobcat as a result of alternative 2b would be the same as those described for alternative 2.

Summer habitat for all three species of bats is present in the study area; however, due to the small amount of forest habitat that would be removed (4.5 acres), the loss of trees and/or maternity colonies in trees would not be considered large enough to be adverse under alternative 2b.

Special-status Plants: As stated in chapter 3, suitable habitat for A-sedge, downy willow-herb, small-headed rush, brook lobelia, Carolina grass-of-Parnassus, bog goldenrod, and shrubby cinquefoil has been identified in open canopy wetland areas near the ROW used for the implementation of alternative 2b. No direct impacts from access roads would occur because the access road under alternative 2b was designed to entirely avoid this wetland area. It is possible that indirect impacts on these plant species could occur under alternative 2b from adjacent forest clearing and access road construction, which may increase erosion. Soil movement from erosion could affect the functions of the wetland that supports these species.

Clinton's wood fern was not found in the existing ROW (Mellon 2010a), as described in alternative 2. Clinton's wood fern has been found in the past in wetland areas surrounded by eastern hemlock (NPS 2009g, 2, 4) but could also be found outside wetland areas. Because the same ROW would be used for alternative 2b, it is unlikely that this species would be affected under this alternative. Some wetland vegetation in the ROW may require maintenance, but access roads and installation of towers would not affect the wetland area where suitable habitat is present. The loss of mature tree species in the ROW that provide a canopy for this understory fern could affect habitat for this species and would facilitate the spread of invasive species.

Reed meadowgrass was observed during surveys conducted in 2010 (Mellon 2010a, 2010b) and marsh bedstraw was observed during vegetation surveys (NPS 2011b) near wetland areas in the corridor of alternative 2b. Reed meadowgrass was found in the corridor tucked in a seepage area with other herbaceous wetland plants (Mellon 2010b). It is likely that this species would be directly affected under alternative 2b because the emergent wetland habitat that supports the reed meadowgrass and marsh bedstraw is in an area that may be cleared to allow the construction of a tower in the wetland area. Indirect impacts on both plant species could occur as a result of adjacent forest clearing, access road construction, and vegetation management, which may increase erosion and affect wetland functions in the habitat that supports reed meadowgrass and marsh bedstraw.

As described in alternatives 1 and 2, stiff club moss was observed during vegetation surveys conducted in 2010 and 2011 (NPS 2011b) in scrub shrub and forested wetland habitat in the ROW and would be similarly affected by vegetation removal and tree removal under alternative 2b. Stiff club moss would be disturbed by an access road that would be constructed through the habitat that supports this plant species. The regular maintenance of the ROW required to maintain low vegetation growth may affect this species, but the species is low growing and compatible with the applicant's approved vegetation management plans.

Although white heath aster has been documented along the Delaware River and has been found to be locally common in dry spots along the Delaware River and on limestone rocks in the forest adjacent to wetland areas (Mellon 2010a, 13), it was not detected during surveys conducted in the alternative 2b ROW (Mellon 2010a; NPS 2011b). Communications with DEWA indicate that white heath aster grows near, but not in, the study area (Mellon 2010a, 8). It is unlikely that this plant species is present in the ROW for alternative 2b.

For all listed plant species, mitigation as described in appendix F would be employed to minimize and avoid impacts. Such mitigation includes monitoring areas to be avoided during construction, as identified during preconstruction surveys, and minimizing fugitive dust and runoff from construction sites (reducing sedimentation), which would reduce the potential adverse impacts on special-status plant species. Although mitigation techniques would be employed, impacts on listed plants would still occur.

Cumulative Impacts

Cumulative impacts on special-status species inside the study area would be adverse, as described previously in the "Cumulative Impacts Common to All Alternatives" section. When the beneficial and adverse impacts on special-status species as a result of alternative 2b are combined with other past, present, and reasonably foreseeable projects in the study area, an overall adverse cumulative impact would be expected. Alternative 2b would not alter the level of impact.

Conclusion

Alternative 2b would follow the same existing corridor as alternative 2 and would present the same hazards and adverse impacts to migratory birds and bald eagles due to the height of the towers and orientation of the transmission line perpendicular to a major migratory flyway and adjacent to a bald eagle communal roost. For the same reasons outlined for alternative 2, alternative 2b would likely result in significant adverse impacts to special-status species.

Permitting the project would adversely affect multiple protected resources inside the parks, in some instances irreversibly. Allowing such adverse effects in order to facilitate private infrastructure expansion would be contrary to NPS practice and principle of protecting and improving these resources, and of removing incompatible infrastructure to do so. This could establish precedent that may invite similar proposals by other applicants in the future, and create an expectation of like treatment for those proposals; it may make it difficult to deny such proposals. DEWA and APPA both contain numerous other utility crossings, which makes the risk of such precedent particularly concerning for these parks. Furthermore, as units of the national park system, wherein all parks are entitled to equal protection, creating such a precedent could have ramifications for parks nationwide. The location of this particular crossing through the center of DEWA could make such a precedent even more potent. Installing the S-R Line on this alignment may invite future utilities proposing to follow the same route.

Overall, the significance of the impact of alternative 2b is a result of two considerations: the particularly resource-rich area through which the alternative crosses and the potential to inflict harm to those resources because of the magnitude and duration of the adverse impacts. Although it is true that not all impacts can be predicted with great certainty, in the context of the purpose and significance for which DEWA, APPA, and MDSR were established and NPS mandates to specifically preserve the natural, cultural, and scenic resources within them, additional precautions are warranted when considering risks to these resources, many of which are of national importance. Similarly, certain resources are non-renewable, which makes any impacts to them all the more serious because they cannot be replaced if lost. And some resources are under threat by other actions and outside pressure, which in the context of the function of the parks as an "oasis" or refuge within the highly developed east coast, elevates the need to preserve and protect these scarce, sensitive resources. For these reasons, the environmental consequences of alternative 2b would be significant.

Common to Action Alternatives 3, 4, and 5

Restoration of the B-K Line: For alternatives 3, 4, and 5, the portion of the B-K Line between the Bushkill Substation and the eastern boundary of DEWA would be permanently removed and the ROW would be restored, as described in chapter 2. Although natural communities would not return to mature conditions in the period of analysis of this EIS, the process would begin and would create a beneficial impact.

Special-Status Terrestrial Invertebrate Species: Because no habitat for or presence of special-status terrestrial invertebrates exists along the alignments for alternatives 3, 4 and 5, special-status invertebrate species will not be discussed for these alternatives.

Alternative 3

Special-status Aquatic Species: Three special-status freshwater mussel species (yellow lampmussel, creeper, and alewife floater) have the potential to be present in open water areas in the proposed ROW under alternative 3; however, during consultation, PFBC did not specify the species as present in the Delaware River (PFBC 2010a, 1). Although no stream crossing structures would be constructed under alternative 3, vegetation removal and the construction of the transmission line could adversely affect freshwater mussels through changes in water quality, the alteration of bottom habitat (sedimentation), the smothering of mussels, decreased growth, and the interruption of feeding, respiration, and reproductive activities. Annual vegetation maintenance activities would not occur in surface waters in the ROW and would generally not include the removal of vegetation near water bodies. In addition, any control of invasive plant species near surface waters would include NPS-approved herbicides safe for application in aquatic environments. To minimize impacts from construction activities, forested buffers around the Delaware River would be left intact, sediment control devices would be installed, and disturbed areas would be revegetated.

Special-status Birds: The NJENSP identified four special-status bird species with the potential to be present in appropriate habitat along alternative 3: great blue heron, Cooper's hawk, red shouldered hawk, and barred owl. Only the great blue heron was observed in alternative 3 during the 2010 and 2011 vegetation surveys (NPS 2011b, 29). Documented bald eagle foraging areas along the Delaware River have been mapped in the vicinity of alternative 3 and are analyzed for impacts below. Additionally, special-status bird species discussed under alternative 2 that could be affected similarly by alternative 3 include the following: northern harrier, short-eared owl, peregrine falcon, American kestrel, vesper sparrow, and horned lark which could be present in open habitat such as the agricultural fields located adjacent to the Delaware River, particularly during migration; osprey, which could use riparian habitat along the Delaware River; northern goshawk, which could use forested areas in the alternative 3 corridor; and Neotropical migrants such as veery, cerulean warbler, and black-throated green warbler, which would also use forested areas as migrants and potentially as breeding species. The New Jersey Landscape Project also identified habitat for the golden-winged warbler along alternative 3 (Niles et al. 2008).

The alternative 3 ROW would traverse the Delaware River and Worthington State Forest inside DEWA. Tree removal and the expansion of successional habitat in the new ROW would permanently alter habitat along the route in Worthington State Forest. The widening of the ROW would further increase the fragmentation of habitat but would not significantly increase the amount of forest edge because the configuration would follow the edge of the existing ROW. After construction is completed, an undetermined portion of the ROW could be allowed to revegetate and only the width of the ROW necessary to maintain access roads and the transmission line would continue to be maintained. A portion of alternative 3 would also pass between two mowed/maintained agricultural areas on the western side of the Delaware River. The ROW in this area is currently 100 feet wide and the additional expansion of the ROW for alternative 3 could eliminate the wooded hedgerow between the fields, creating one large open expanse of maintained habitat. This enlarged open area may benefit the northern harrier, short-eared owl, American kestrel, vesper sparrow, and horned lark which forage in open fields. Special-status raptors that may hunt along the ROW, including the agricultural land, would continue to use these areas. These resident and migrant special-status raptor species include Cooper's hawk, red shouldered hawk, American kestrel, short-eared owl, and barred owl. Riparian habitat composed of mature forest is present in alternative 3 and could support foraging and nesting habitat for the cerulean warbler; other forested areas could support the black-throated green warbler.

Forested and emergent wetland areas as well as riparian areas adjacent to the Delaware River are present in the study area and would be avoided to the extent practicable under alternative 3. However, great blue heron, bald eagle, red shouldered hawk, and cerulean warbler could be adversely affected by forest clearing in areas adjacent to the Delaware River and wetlands that are currently used for foraging or nesting. Black-throated green warbler could be adversely affected by the loss of forested habitat in more upland areas of alternative 3.

The existing B-K Line between the Bushkill Substation and the eastern boundary of DEWA would be removed and the ROW would be restored, as described in chapter 2. During site preparation and the construction of the transmission line under alternative 3, all special-status bird species may be disturbed by noise and construction activities that could result in temporary displacement from habitats. Helicopters could be used during construction activities to string the transmission line, as described in chapter 2. Construction impacts on special-status bird species would be the same as those under alternative 2 because individuals may temporarily avoid areas and there is a potential that noise would affect feeding, reproduction, resting, or other behavioral factors that may affect local population levels. Barred owls are particularly loyal to their territory year-round; therefore, if construction occurs in their territory, disturbance and displacement would adversely affect barred owls. A seasonal restriction on tree clearing from March 15 through July 31 would be in place under alternative 3 that would prevent unauthorized take of nests and unfledged chicks protected under the Migratory Bird Treaty Act (USFWS 2010b). Additionally, impacts on special-status bird species inside the study area would be expected from maintenance activities (including annual vegetation maintenance) that would occur throughout the period of analysis; localized disturbance from noise and activity would be expected to cause temporary disturbance to birds near the activity.

Bald Eagle: Bald eagles are known to nest along the Delaware River close to where alternative 3 crosses the river. An active bald eagle nest is located within 0.2 mile (1,056 feet) of the alternative 3 alignment (USFWS 2010b). There is no known wintering bald eagle communal roost in or near the alternative 3 ROW. To avoid collisions, the Bald Eagle Guidelines state that communications towers and high-voltage transmission power lines should be sited away from bald eagle nests, foraging areas, and communal roost sites (USFWS 2007a, 15). Because of the nearby nest, the new transmission line corridor would not be consistent with the Bald Eagle Guidelines. However, if nesting activity is observed before or during the proposed construction, additional protections of the nest site would occur as required in the Bald Eagle Guidelines (USFWS 2007a, 12). These guidelines would minimize the potential take of bald eagles, which could occur because human activity within 1,312 feet (400 meters) of eagles can force them to abandon the immediate area (Anthony and Isaacs 1989). Impacts from construction activities and noise would adversely affect nesting bald eagles; impacts on the bald eagle from habitat loss would be similar to those for other raptor species.

Electrocution: The potential for electrocution of special-status bird species such as the bald eagle, great blue heron, barred owl, and red shouldered hawk under alternative 3 would be similar to the potential for electrocution discussed under alternative 2. Under alternative 3, the proposed transmission line would be completed according to APLIC (2006) standards and would use the current best available technologies for minimizing the potential for electrocutions.

Power Line Collisions: Similar to alternative 2, alternative 3 would be located along a major north–south fall migration corridor for raptors, and the newly constructed transmission lines would create a bird collision hazard where they are oriented in an east–west direction. Migratory and resident special-status raptor species could be affected by power line collisions. Bird collisions with power lines can be reduced and minimized through a variety of mitigation measures that include applying bird-safe designs to new construction and retrofitting existing lines according to APLIC standards (APLIC 2006, 7) in the draft Avian Protection Plan.

Overall, electrocution and collision with the lines would be possible to the following bird species: bald eagle, osprey, great blue heron, barred owl, Cooper's hawk, northern goshawk, red shouldered hawk, peregrine falcon, short-eared owl, American kestrel, and northern harrier.

Special-status Reptiles and Amphibians: The special-status species that may be present in suitable habitat along the alternative 3 alignment include the same seven species of reptiles and amphibians described under alternative 2: bog turtle, wood turtle, eastern box turtle, northern fence lizard, northern copperhead, timber rattlesnake, and longtail salamander. The USFWS New Jersey Field Office states that potential habitat for the bog turtle is present in the proposed ROW for alternative 3 (USFWS 2010b). This was confirmed in the 2011 Phase I field study (NPS 2012a, 12). The New Jersey Landscape Project also identified areas of potential habitat for longtail salamander, northern copperhead, wood turtle, and eastern box turtle along the proposed alternative 3 alignment (Niles et al. 2008). Timber rattlesnakes were observed during the 2010 and 2011 vegetation surveys along a wetland area in the proposed ROW. There are several known timber rattlesnake den locations along the Kittatinny Ridge. However, no dens are located in the corridor of alternative 3; the closest den is located over 1,000 feet from the proposed corridor.

Generally, impacts on the special-status reptile and amphibian species would be similar to those under alternative 2. Species near construction areas during construction would be disturbed by the increased noise and activity in their vicinity. Some species could be restricted to certain habitats, which may alter basking, foraging, breeding, and nesting behaviors. For example, bog turtles typically spend most of their time in wetland areas, using upland areas as travel corridors only, and longtail salamanders sometimes travel in wetland areas and find cover under moist logs and leaves. Impacts on special-status reptile and amphibian species from disturbance, potential strikes from construction vehicles and equipment, and (for bog turtles and longtail salamanders) from restricted movement would occur and the risk of mortality would also occur. Additional impacts on special-status reptiles and amphibians would occur from habitat fragmentation, as described under alternative 2. Habitat fragmentation would specifically and adversely affect the longtail salamander because more open canopy scrub shrub habitat would be created, thus exposing salamanders to increased sun exposure and possibly drier conditions.

Under alternative 3, impacts on listed reptiles and amphibians from drilling are unknown because the locations of dens (timber rattlesnake and northern copperhead) and the locations of towers are currently unknown for alternative 3, and the extent of the underground den system at identified dens in DEWA is unknown. Surveys would be conducted for the timber rattlesnake prior to construction. To the extent possible, the placement of towers would avoid known locations of dens. The areal extent and intensity of vibrations caused by drilling depends on several factors, including rock type and techniques. Prior to construction, a detailed drilling plan would be developed that describes the areal extent of impact from drilling and proposes measures to minimize the impact of vibrations caused by drilling. The applicant would be required to develop a buffer zone, an area beyond which drilling activities would not impact the geology and the dens. Preconstruction surveys and seasonal restrictions (no drilling) between September and April, when timber rattlesnakes occupy dens, would also be implemented. Following construction, the dens would be monitored to determine whether dens were affected by construction activities. If impacts are documented during monitoring, additional mitigation could be required, including relocation of rattlesnakes, in consultation with the NPS. If empty dens are destroyed by drilling activities, it could result in eventual mortality for timber rattlesnakes or northern copperheads, because these species return to the same dens year after year and may be unable to find suitable overwintering areas if their original dens have been destroyed.

Annual vegetation maintenance would result in localized disturbance to any special-status reptile or amphibian species. Protection measures, including the use of handheld equipment instead of machinery and the implementation of seasonal restrictions during nesting and birthing seasons for turtle and snake

species (typically between March and September), could be implemented; however, inadvertent crushing of nests, turtles, or snakes by workers could still occur. Specifically for wood turtles, the use of barrier fencing along streams could also be implemented during construction to keep the turtles from entering construction sites.

Alternative 3 could result in direct and indirect adverse impacts on bog turtles within wetlands; however, avoidance of bog turtle habitat through the implementation of mitigation measures such as pre-construction surveys, avoidance, and time of year restrictions along with a NPS-approved vegetation management plan would minimize impacts to bog turtle and potential bog turtle habitat. Detailed conservation measures and bog turtle conservation zones have been identified, with the intent of protecting and recovering known bog turtle populations within the northern range of this species as described in the recovery plan for this species (USFWS 2001, appendix A) and in chapter 3. Therefore, alternative 3 *"**may affect, but is not likely to adversely affect**"* the bog turtle and bog turtle habitat.

Impacts could also include the destruction of turtle and lizard nests and snake dens used for hibernation during construction. During annual maintenance activities, impacts on special-status reptiles and amphibians would occur but only handheld equipment would be used; individuals of some species may be disturbed by noise and human activities.

Special-status Mammals: Four special-status mammal species, the bobcat and three bat species (Indiana bat, small-footed bat, and northern myotis), have the potential to be present in the corridor considered under alternative 3. Bobcats were observed in the alternative 3 corridor during the 2010 and 2011 vegetation surveys (NPS 2011b). Impacts on bobcats as a result of alternative 3 would be similar to those under alternative 2; bobcats that may occupy territory in or travel through the area would be affected by habitat disturbance during site preparation and construction activities. Daytime construction activities associated with vegetation clearing in the study area would be expected to have minimal impacts on the bobcat due to the crepuscular/nocturnal nature of the animal. Bobcats would continue to use the existing ROW as a corridor for movement and hunting and could be expected to maintain territories that may overlap with the ROW and the habitats along the transmission line.

It is likely that summer habitat for all three species of bats exists in the study area and would be affected through loss of trees and/or maternity colonies in trees. Suitable roosting and foraging habitat for the Indiana bat was determined to be present within and adjacent to alternative 3 during the 2012 habitat assessment (NPS 2012b, 13). The closest potential Indiana bat cave, known as Coppermine (upper and lower), is approximately 1.7 miles from the centerline of the proposed ROW of alternative 3 and would not be affected by this project. Both small-footed bats and northern myotis were caught during mist netting surveys in Monroe County, Pennsylvania; northern myotis were also captured during mist netting surveys in Warren County, Pennsylvania (Sanders 2009, 6). The Pennsylvania Game Commission has stated that alternative 3 is located outside the buffers (habitat that could support the bat) of the northern myotis (PGC 2010c). Seasonal restrictions would be implemented to reduce and avoid any unforeseen disturbance or injury to roosting Indiana bats (USFWS 2010b). Both the small-footed bat and the northern myotis could also benefit from the seasonal restrictions described above for the Indiana bat. The construction of the transmission line under alternative 3 would be unlikely to affect bat foraging habitat because activities associated with construction would take place during daytime hours and there would be no disturbance to foraging bats. Disturbance to summer roost and maternity colony habitat could result from forest clearing during construction. Impacts on bat hibernacula would not be expected because no known hibernacula are present inside the study area for alternative 3. Alternative 3 "***may affect, but is not likely to adversely affect***" the three species of bats inside the study area.

Special-status Plant Species: There are six special-status plant species that could be affected by alternative 3: the netted chainfern, prickly-pear cactus, marsh bedstraw, stiff club moss, American

bittercress, and shore aster. The netted chainfern is proposed for listing as a Pennsylvania threatened species and was observed in the corridor of alternative 3 during surveys conducted in 2010 and 2011 (NPS 2011b). The Pennsylvania Department of Conservation and National Resources (PADCNR) has suggested that the prickly-pear cactus, a Pennsylvania state rare species, has the potential to be present in alternative 3, although neither this plant nor potential habitat in the corridor was observed during the surveys conducted in 2010 and 2011 (NPS 2011b; PADCNR 2010f). NPS records have indicated that American bittercress and shore aster have been documented in the vicinity of alternative 3 and suitable habitat for both marsh bedstraw and stiff club moss was observed during vegetation surveys (NPS 2011b).

The netted chainfern could be affected under alternative 3 because the plant was observed in an area that would be cleared beyond the existing ROW and soil compaction resulting from construction activities could restrict the regeneration of the netted chainfern. The loss of mature tree species that provide a canopy for this understory fern would affect habitat for the fern by opening the canopy; however, following the initial clearing activities it is possible that netted chainfern could reestablish in the corridor.

Adverse impacts on prickly-pear cactus would be expected because suitable habitat may exist in areas that may be affected by clearing, construction activities, and vegetation maintenance; preconstruction surveys would avoid/minimize any unforeseen impacts from construction activities, including soil compaction and clearing. Because prickly-pear cactus is low growing, it would be compatible with the applicant's vegetation maintenance programs.

Habitat that supports American bittercress, marsh bedstraw, stiff club moss, or shore aster could be cleared beyond the ROW under alternative 3. For all listed plant species, mitigation as described in appendix F would be employed to minimize and avoid impacts. Such mitigation includes monitoring areas to be avoided during construction, as identified during preconstruction surveys, and minimizing fugitive dust and runoff from construction sites (reducing sedimentation), which would reduce the potential adverse impacts on special-status plant species. Although mitigation techniques would be employed, impacts on listed plants would still occur.

Cumulative Impacts

Cumulative impacts on special-status species inside the study area would be adverse, as described previously in the "Cumulative Impacts Common to All Alternatives" section. When the adverse impacts on special-status species as a result of alternative 3 are combined with other past, present, and reasonably foreseeable projects in the study area, an overall adverse cumulative impact would be expected. Alternative 3 would not alter the level of impact.

Conclusion

Alternative 3 is located in an area with less concentration of special-status species and suitable habitat than alternatives 2 and 2b. However, alternative 3, like all of the action alternatives, crosses the Kittatinny Ridge, which is a major flyway for bird migration and the combination of the ridge and Delaware River valley provides crucial resting and foraging habitat for a wide variety of migratory birds. As with all the action alternatives, the transmission line under alternative 3 would be oriented perpendicular to a major flyway for migratory birds, increasing the risk of bird collisions. It is not possible to predict what percentage of migrating birds might be killed or injured from colliding with the wires or towers but the height of the towers and number of wires are believed to greatly increase the potential for bird collisions and resulting mortality or injury. Bird diverters would be used to make the wires more visible but their effectiveness is not known.

Alternative 3 would have adverse impacts on federally endangered bog turtles including increased potential for illegal collection of individuals as a result of the establishment and maintenance of access roads and potential for direct mortality from contact with construction vehicles and equipment. Adverse impacts to bog turtles would be minimized through implementation of appropriate mitigation and conservation measures in consultation with the USFWS. It is unlikely that any mortality of bog turtles as a result of alternative 3 would rise to the level of jeopardizing the continued existence of the species. Therefore, alternative 3 "***may affect, but is not likely to adversely affect***" the bog turtle and bog turtle habitat.

Alternative 3 would also have potential for adverse impacts on federally endangered Indiana bats from tree clearing and construction activities that could interfere with bat foraging and could result in the removal of trees that may contain roost sites or maternity colonies. There is also some potential for adverse impacts on federally listed freshwater mussels from vegetation clearing and construction activities. These impacts would be minimized by implementing appropriate mitigation and conservation measures in consultation with the USFWS and are not likely to adversely affect Indiana bats or freshwater mussels.

Alternative 3 would have some adverse impacts on bald eagles, primarily disturbance of nesting and foraging eagles and some risk of injury through collision with wires during foraging activities. There are no known communal roosts in the vicinity of alternative 3, meaning that alternative 3 poses less risk of injury to bald eagles in the river valley than do alternatives 2 and 2b; however, the National Bald Eagle Management Guidelines recommend against siting transmission lines in proximity to bald eagle nests; thus, alternative 3 is not in keeping with the recommendations. Alternative 3 would have some beneficial impacts to bald eagles because of the removal of the existing B-K Line adjacent to the known communal roost. Although no known injuries to bald eagles have occurred from the existing line, the removal of the line would be furthering the recommendations of the National Bald Eagle Management Guidelines.

When considered in the context of the laws and policies that protect special-status species, alternative 3 is likely to have significant adverse impacts primarily because it would result in an aerial hazard in a major migratory flyway with a great deal of uncertainty about the number of migrants that may be killed or injured and how effective mitigation measures would be. This situation does not follow the purposes of the Migratory Bird Treaty Act, NPS conservation and protection mandates and policies, and the purposes for which the three units were established. Alternative 3 contributes to cumulative adverse impacts on migratory birds, as well as other special-status species, because development and reduced protection in the region surrounding the parks increases the importance of that protection inside the parks. Alternative 3 offers some benefits due to the removal of the existing line; however, these do not outweigh the potentially significant negative impacts.

Permitting the project would adversely affect multiple protected resources inside the parks, in some instances irreversibly. Allowing such adverse effects in order to facilitate private infrastructure expansion would be contrary to NPS practice and principle of protecting and improving these resources, and of removing incompatible infrastructure to do so. This could establish precedent that may invite similar proposals by other applicants in the future, and create an expectation of like treatment for those proposals; it may make it difficult to deny such proposals. DEWA and APPA both contain numerous other utility crossings, which makes the risk of such precedent particularly concerning for these parks. Furthermore, as units of the national park system, wherein all parks are entitled to equal protection, creating such a precedent could have ramifications for parks nationwide. However, it would also set a precedent for routing utilities around MDSR and to the edges of DEWA.

Alternative 4

Special-status Aquatic Species: Inside the study area, the proposed ROW under alternative 4 crosses Mountain Run, a first order intermittent stream (contains water seasonally). Because Mountain Run is not a perennial stream that would support aquatic special-status species, no federally or state-listed aquatic species are expected to be present in the study area.

Special-status Birds: The alternative 4 corridor provides potential habitat for ten resident and migratory special-status bird species due to the deciduous habitat and forested wetlands located along the ROW. These species include the bald eagle, Cooper's hawk, northern goshawk, red shouldered hawk, peregrine falcon, and barred owl. Additionally, the veery and three species of warblers (golden-winged warbler, black-throated green warbler, and cerulean warbler) could be migrants that would use suitable habitat in the alternative 4 alignment. No federally listed bird species have been identified or have the potential to be present in the corridor for alternative 4.

Because alternative 4 is located along the edge of DEWA, the forests are more fragmented by adjacent land use and infrastructure than those that border other alternatives. Tree removal and the expansion of successional habitat in the new ROW would further increase the fragmentation of habitat; however, it would not significantly increase the amount of forest edge because the configuration would follow the existing ROW edge. As stated above for alternatives 2 and 3, golden-winged warbler could benefit from the early successional stages of the revegetation process. Special-status raptor species that may hunt along the ROW would continue to use these areas. Mature forests are present in alternative 4 and could support Neotropical migrants (special-status warbler species) as well as summer resident special-status species. The use of forested habitat by special-status bird species for resting, foraging, or nesting could be adversely affected by the loss of forested habitat as a result of clearing to widen the existing ROW. No documented nests or roosts for special-status bird species are known to be present in the alternative 4 alignment; however, as forest-dwelling species, red shouldered hawk, Cooper's hawk, barred owl, and Neotropical migrant warblers could nest in the forested areas along the existing alignment, and the disturbance and clearing associated with alternative 4 could affect nest success and the viability of the young of these special-status bird species. Seasonal restrictions (March 1 to July 31) recommended by USFWS should protect the special-status bird nests, eggs, and young and prevent the unauthorized take of nests, eggs, and unfledged chicks protected under the Migratory Bird Treaty Act (USFWS 2010b). No direct mortality of eggs, young, or adults would occur as a result of clearing activities because trees would not be removed during the nesting season. The clearing of vegetation could benefit transient species such as American kestrel, short-eared owl, vesper sparrow, and horned lark by creating open area habitat.

The existing B-K Line from the Bushkill Substation to the eastern boundary of DEWA would be removed and restored, as described in chapter 2. Similar to the impacts described under alternatives 2 and 3, adverse impacts under alternative 4 would occur from the noise and human activity associated with construction activities. Helicopters could be used during construction activities to string the transmission line, as described in chapter 2. Noise and activity could alter bird behavior, including foraging, roosting, and breeding, in the ROW and adjacent habitats. Birds are highly mobile and can avoid or leave an area to forage elsewhere; however, additional expenditure of energy is involved. Nonetheless, because the disturbance would be localized and temporary and habitat for foraging is widely available, construction activities would not be expected to adversely affect special-status bird species. The majority of the special-status bird species would have the ability to return to the area when the construction activity has ended, resulting in only limited disturbance. In addition, impacts from maintenance activities (including annual vegetation maintenance) would occur throughout the period of analysis; localized disturbance from noise and activity would be expected to cause temporary disturbance to birds near the activity.

Bald Eagle: The alternative 4 alignment would not cross the Delaware River inside the study area and would not affect known winter roost, foraging, or nest areas for the bald eagle. Therefore, this alternative would be consistent with the Bald Eagle Guidelines (USFWS 2007a). If bald eagle nesting activity is observed before or during construction, additional protection of nest sites would be required according to the Bald Eagle Guidelines (USFWS 2007a, 12). Therefore, similar to the other birds described above, adverse impacts from habitat loss and from construction would occur as a result of alternative 4.

Electrocution: The potential for the electrocution of special-status bird species such as the bald eagle, barred owl, and red shouldered hawk under alternative 4 would be similar to the potential for electrocution described under alternatives 2 and 3. The potential for electrocution of special-status bird species as resident, seasonally present, or migrant species from perching on poles/wires would still exist, but the transmission line would be constructed to APLIC guidelines as described under alternative 2.

Power Line Collisions: The transmission line route proposed in alternative 4 would have a generally north–south trending orientation and as such would be unlikely to affect migrating birds because the lines are parallel to, rather than perpendicular to, the north–south line of flight for seasonal migrants. The alternative 4 alignment inside the study area does not cross the Delaware River where there are known bald eagle winter roost, nest, or foraging sites and is consistent with Bald Eagle Guidelines (USFWS 2007a). As a result, there would be less opportunity for bald eagles to collide with power lines. Migrating raptors could encounter transmission lines crossing their flight path along Kittatinny Ridge in the study area. Under alternative 4, there is less potential for collisions with transmission lines compared to alternatives 2 and 3 for the bald eagle, Cooper's hawk, northern goshawk, and barred owl.

Electrocution and collision with the line would be possible but unlikely for the bald eagle, barred owl, Cooper's hawk, northern goshawk, peregrine falcon, and red shouldered hawk due to the north–south orientation of the transmission line, which would be parallel (not perpendicular) to the flight path of most migrating birds.

Special-status Reptiles and Amphibians: Inside the study area of alternative 4, only two special-status reptiles and amphibians are considered for analysis because the proposed line would be in Pennsylvania only. These species include the northern fence lizard and timber rattlesnake. The impacts on and presence of the New Jersey state-listed reptile and amphibian species, including wood turtle, eastern box turtle, northern copperhead, and longtail salamander, along alternative 4 are generally discussed under reptiles and amphibians in the "Landscape Connectivity and Wildlife" section because the study area for the transmission line proposed under alternative 4 is not in New Jersey.

Northern fence lizards were observed along alternative 4 during the 2010 and 2011 vegetation surveys (NPS 2011b). PFBC identified the timber rattlesnake as having the potential to be present within the boundaries of NPS lands in appropriate habitat crossed by alternative 4; however, no dens are known to be present inside the study area (PFBC 2010a). Surveys would be conducted for the timber rattlesnake prior to construction. Wetland habitat along the proposed ROW could contain preferred habitat for the bog turtle. Surveys would be conducted to confirm the presence of the species prior to construction.

During construction activities, similar to alternatives 2, 2b, and 3, adverse impacts on the northern fence lizard and timber rattlesnake could occur from the implementation of alternative 4. Impacts would result from the direct mortality of individuals in habitats undergoing clearing and construction due to the use of construction vehicles and equipment that could inadvertently crush individuals. Additional impacts on the northern fence lizard would occur from the destruction of nests resulting from soil excavation.

To the extent possible, the placement of towers would avoid known locations of timber rattlesnake dens. All mitigation and monitoring measures described for alternatives 2, 2b, and 3 would be implemented

under alternative 4. If impacts are documented during monitoring, additional mitigation could be required, including the relocation of rattlesnakes, in consultation with the NPS.

Following construction, the operation and maintenance of the transmission line would include the maintenance of vegetation at least annually at regular intervals. Maintenance activities would include the trimming of vegetation using hand tools such as chainsaws and pruners. Temporary localized disturbance from maintenance activities and human presence would occur on special-status reptiles and amphibians; however, inadvertent crushing of nests, reptiles, or amphibians by workers could still occur.

Special-status Mammals: Four special-status mammals have the potential to be present in the study area for alternative 4: the bobcat and three species of bats (Indiana bat, small-footed bat, and northern myotis). Of these four mammal species, only the northern myotis has been documented in the vicinity of the alternative 4 alignment. Impacts on bobcat under alternative 4 would result from temporary noise disturbance associated with construction and human activities. If bobcat dens are in the vicinity of new areas being cleared, bobcats may temporarily or permanently leave their territories to avoid construction activity. This could lead to perceptible or measurable changes in the behavior of bobcats and changes to bobcat dens or habitat but would not be expected to reduce the populations in or adjacent to the project area below self-sustaining levels.

Northern myotis were caught during mist netting surveys in Monroe County, Pennsylvania; however, the survey did not include Northampton County (Sanders 2009, 6). The closest potential Indiana bat cave, known as Cold Air Cave, is located approximately 2.4 miles from the centerline of the proposed ROW of alternative 4 and would not be affected by this project. (Previous surveys also identified a male small-footed bat at the Cold Air Cave). The Pennsylvania Game Commission has stated that the alternative 4 corridor is located within the buffer of the northern myotis (PGC 2010c), and northern myotis have been captured in the study area for alternative 4. A deep mine portal was located in the vicinity of alternative 4; however; this portal was assessed and deemed not suitable for winter populations of Indiana bats. Suitable roosting and foraging habitat for the Indiana bat was determined present within and adjacent to alternative 4 during 2012 habitat assessment surveys.

Transmission line construction at stream crossings under alternative 4 would be unlikely to affect bat foraging habitat because activities associated with construction would occur during daytime hours and no disturbance to foraging bats would occur. Disturbance to summer roost and maternity colony habitat could occur as a result of forest clearing during construction. Impacts on bat hibernacula would not be expected because no known hibernacula are present inside the study area for alternative 4. Alternative 4 is not likely to adversely affect the Indiana bat inside the study area. Detailed mitigation measures for bats under alternative 4 have not yet been determined, but would likely include seasonal restrictions for tree clearing because summer roost and maternity colony habitat could exist in forested areas.

Special-status Plants: There are seven special-status plant species that could be affected by alternative 4 in the study area: pasture rose, American holly, Susquehanna sand cherry, marsh bedstraw, stiff club moss, willow oak, and swamp dog-hobble. Pasture rose, observed in the ROW in DEWA during seasonal surveys conducted in 2010 (NPS 2011b), currently has an undetermined status in Pennsylvania, as this species is believed to be in danger of decline in Pennsylvania. Marsh bedstraw and willow oak were observed during vegetation surveys (NPS 2011b); stiff club moss was not identified during surveys but potential habitat exists along alternative 4. The remaining three special-status plant species were not observed in the study area but have the potential to be present at Totts Gap Natural Heritage Site (part of which is in the ROW for alternative 4).

Pasture rose, marsh bedstraw, and willow oak could be affected under alternative 4 during clearing to widen the existing ROW. If areas where these species have been observed (or where there is suitable

habitat for stiff club moss) cannot be avoided or if soil compaction occurs that could affect a species' ability to recover after construction, adverse impacts to these plants are possible.

The western portion of Totts Gap Natural Heritage Site could be affected under alternative 4 because vegetation in this area would be cleared beyond the ROW. Totts Gap, composed of Totts Gap Natural Heritage Site and Totts Gap Swamp and it supports the Pennsylvania threatened American holly and the proposed Pennsylvania threatened Susquehanna sand cherry and swamp dog-hobble (Totts Swamp) (PATNC 2005a, 131). Although American holly, Susquehanna sand cherry, and swamp dog-hobble were not observed during vegetation surveys conducted in 2010 and 2011 (NPS 2011b), these special-status plant species do have the potential to be present in the alternative 4 ROW at Totts Gap and could be adversely affected by clearing and construction activities. Following the initial clearing activities it may be possible for these species to be reestablished in the ROW if present at Totts Gap Natural Heritage Site and if soil compaction does not occur. However, some specimens of these species may be subject to vegetation maintenance (cutting and trimming) because of their growth pattern as small shrubs and/or trees. The impacts as a result of clearing and construction activities as well as the maintenance and presence of the transmission line could be elevated if an entire listed plant population is lost during clearing activities because they may be subject to vegetation maintenance (cutting and trimming).

Cumulative Impacts

Cumulative impacts on special-status species inside the study area would be adverse, as described previously in the "Cumulative Impacts Common to All Alternatives" section. When the beneficial and adverse impacts on special-status species as a result of alternative 4 are combined with other past, present, and reasonably foreseeable projects in the study area, an overall adverse cumulative impact would be expected. Alternative 4 would not alter the level of impact.

Conclusion

Alternative 4 would have adverse impacts to special-status species, including crushing of individuals by heavy equipment; destruction of foraging habitat, roosts, nests, and hibernacula; electrocution and collision with conductors; habitat degradation from fragmentation and introduction of exotic and invasive species; soil compaction; and disturbance from noise or to habitat resulting in reduced nesting success and viability of young. For the most part, the adverse impacts would be limited to the period of construction and to a lesser degree, during periodic maintenance activities. Mitigation measures such as seasonal restrictions would be implemented to avoid and minimize adverse impacts on special-status species.

Alternative 4 would have potential for migratory birds to collide with power lines; this is dependent on the visibility of the lines. The effectiveness of mitigation measures to reduce long-term impacts from collisions to raptors and other migratory birds using the Kittatinny flyway is uncertain. The alternative 4 alignment would not affect known winter roost, foraging, or nest areas for the bald eagle. Therefore, alternative 4 would have less potential for eagle collisions than alternatives 2, 2b, or 3, and would be in keeping with the recommendations of the National Bald Eagle Management Guidelines (USFWS 2007a).

Alternative 4 would offer the same benefits as alternative 3 through removal of the existing B-K Line. These benefits may balance the adverse effects of construction, operation and maintenance of alternative 4. When considered in the context of the laws and policies for protection of special-status species, the adverse impacts of alternative 4 would not likely be significant; the adverse impacts would be of limited duration and could be mitigated by seasonal restrictions and other measures implemented in consultation with the USFWS; and the adverse impacts could be offset by the beneficial impacts of removing the intrusion of the existing B-K Line in an area of high-quality habitat that supports a higher concentration of special-status species.

Permitting the project would adversely affect multiple protected resources inside the parks, in some instances irreversibly. Allowing such adverse effects in order to facilitate private infrastructure expansion would be contrary to NPS practice and principle of protecting and improving these resources, and of removing incompatible infrastructure to do so. This could establish precedent that may invite similar proposals by other applicants in the future, and create an expectation of like treatment for those proposals; it may make it difficult to deny such proposals. DEWA and APPA both contain numerous other utility crossings, which makes the risk of such precedent particularly concerning for these parks. Furthermore, as units of the national park system, wherein all parks are entitled to equal protection, creating such a precedent could have ramifications for parks nationwide. However, it would also set a precedent for routing utilities around MDSR and to the edges of DEWA.

Alternative 5

Alternative 5 would follow the same route through DEWA and APPA as alternative 4; however, alternative 5 does not include the portion of the B-K Line from the Bushkill Substation to the western boundary of DEWA. This portion of the B-K Line does not have specific presence of special-status species and would have the same impacts as alternative 4. Therefore, impacts on special-status species under alternative 5 would be the same as those described above for alternative 4.

Cumulative Impacts

Cumulative impacts on special-status species inside the study area would be adverse, as described previously in the “Cumulative Impacts Common to All Alternatives” section. When the beneficial and adverse impacts on special-status species as a result of alternative 5 are combined with other past, present, and reasonably foreseeable projects in the study area, an overall adverse cumulative impact would be expected. Alternative 5 would not alter the level of impact.

Conclusion

The impacts on special-status species under alternative 5 would be the same as those for alternative 4; therefore, the adverse impacts of alternative 5 would also not likely be significant for the same reasons as outlined for alternative 4.

Permitting the project would adversely affect multiple protected resources inside the parks, in some instances irreversibly. Allowing such adverse effects in order to facilitate private infrastructure expansion would be contrary to NPS practice and principle of protecting and improving these resources, and of removing incompatible infrastructure to do so. This could establish precedent that may invite similar proposals by other applicants in the future, and create an expectation of like treatment for those proposals; it may make it difficult to deny such proposals. DEWA and APPA both contain numerous other utility crossings, which makes the risk of such precedent particularly concerning for these parks. Furthermore, as units of the national park system, wherein all parks are entitled to equal protection, creating such a precedent could have ramifications for parks nationwide. However, it would also set a precedent for routing utilities around MDSR and to the edges of DEWA.

RARE AND UNIQUE COMMUNITIES

In this section, impacts on rare and unique communities are evaluated. A rare or unique community is a subset of an ecosystem that is recognized for its contribution to biological diversity—locally, regionally, or globally. Rare and unique communities include sites identified by the DEWA GMP (NPS 1987), county natural areas inventories, and state natural heritage programs. Rare and unique communities often support more than one rare species.

A rare or unique natural community results from a combination of physical and biotic features that create a distinct site. The geology and hydrology of a site determine the vegetation that grows there, which in turn influences the wildlife that use the habitat. Because all the components of a rare or unique community are interconnected, impacts on one resource, such as geology, would affect the entire community and change its composition and viability. The elimination of any rare or unique community would represent a considerable loss with far-reaching consequences.

METHODOLOGIES

Rare and unique communities were identified through various resources, including the DEWA GMP (NPS 1987), NJDEP GIS layers for natural heritage priority sites (NJDEP 2007), and natural area inventories for Monroe, Northampton, and Pike counties, Pennsylvania (PATNC 1990, 1991a, 1999, 2005a). An impact on any one resource of a community has the potential to create a chain reaction and affect other resources in the community. Therefore, rare and unique communities were assessed from the ground up. This means that impacts on the resources that create or influence the characteristics of the community were analyzed first. The effects of these impacts were then used to assess the impacts on other resources in the community. Because rare and unique communities can encompass nearly all types of natural resources, the evaluation of impacts on rare and unique communities considered potential effects on natural resources, such as the interruption of geologic processes, the loss of vegetation, the spread of invasive plant and animal species, changes in ecological integrity, the loss of or changes in wetland functions, and changes in population integrity. Specific impacts on individual resources may be found in the appropriate sections of this chapter. Impacts on rare and unique communities reflect impacts on applicable resources found in a specific rare or unique community.

Topic-specific context for assessing impacts on rare and unique communities includes the following:

- The parks encompass a variety of unique ecosystems and geographic sites, resulting in an unusual concentration of resources with varying scope of importance.
- Contiguous habitat between the parks and with surrounding lands results in a nexus with other individual resources.
- Rare and unique communities are subject to special management treatment needed to maintain their viability; this is recognized by multiple agencies and is important to broad interests.
- Areas designated as state natural heritage sites contribute to biodiversity which warrants this special recognition.

STUDY AREA

The study area for rare and unique communities includes the ROW for each alternative and any area outside the ROWs where necessary pulling and splicing sites and access road development are proposed or would be expected. Because the location of the S-R Line outside the study area cannot be determined at this time, the indirect impacts on rare and unique communities cannot be evaluated per alternative. The potential impacts outside the study area are generally addressed; however, further surveys would be required prior to construction of the S-R Line.

CUMULATIVE IMPACTS COMMON TO ALL ALTERNATIVES

The rare and unique communities in NPS lands are protected from major development and are maintained through NPS programs. However, existing ROWs, roads, and trails fragment the habitats, thereby reducing the quality of the habitat. Although the B-K Line predates the establishment of DEWA, the

stricter vegetation maintenance standards put forth by NERC have increased the impact on vegetation from the maintenance of the ROW. Additionally, rare and unique communities are currently under pressure from a number of stressors, including habitat loss and degradation, development, pollution, toxic chemicals, invasive species, pests, disease outbreaks, habitat fragmentation, and wildfires, making them highly vulnerable to additional impacts such as climate change (NABCI 2010, 44). Actions and activities in the foreseeable future contribute to the decline of rare and unique communities through ground disturbance, the temporary and permanent removal of vegetation, the disturbance and mortality of wildlife, and the potential colonization by invasive species. Past, present, and reasonably foreseeable activities that would have beneficial or adverse impacts on rare and unique communities inside and outside the study area are listed below and discussed under each alternative as applicable. Projects with the potential to have cumulative impacts both inside and outside the study area are described in detail in appendix H.

Projects Inside the Study Area

Because rare and unique communities are individual, distinct microhabitats within larger habitats, cumulative impacts are analyzed based on the projects that have affected, are affecting, or would affect the rare and unique communities directly. Several projects, described below, could affect one or more of the rare and unique communities inside the study area, because these projects are parkwide. Additionally, adverse impacts on rare and unique communities could result from illegal activities such as ORV use, plant and wildlife collection, hunting/poaching, and woodcutting. These activities could create ground disturbance, the direct loss or mortality of plants and wildlife, and the loss of habitat. Beneficial impacts would result from parkwide invasive species control programs, the DEWA prescribed burn program, and the Wildlife Habitat Incentive Program. These programs work to control invasive species and improve or restore wildlife habitat.

Arnott Fen: The present parkwide activities and programs inside the study area would result in adverse cumulative impacts on Arnott Fen. No other past, present, or reasonably foreseeable projects in the study area have affected, are affecting, or would affect Arnott Fen.

Delaware River Riparian Corridor: Current parkwide activities and programs and the past, present, and reasonably foreseeable recreational improvement, development, and utility projects listed below would result in adverse cumulative impacts in the Delaware River riparian corridor inside the study area.

- Delaware River bridge projects would improve the Delaware Water Gap Toll Bridge and would create beneficial impacts on water resources through erosion control measures.
- The I-80 weigh station would upgrade the weigh station, resulting in the disturbance of wetland areas for construction and long-term stormwater management and erosion control measures.
- The Metropolitan Edison removal of unused power poles and transformers would benefit the Delaware River riparian corridor by allowing previously cleared and maintained areas to revegetate and succeed naturally, which would reduce habitat fragmentation and increase interior habitat.
- Metropolitan Edison vegetation management and tree removal would maintain utility ROWs, which would resist the natural process of succession, reduce available interior habitat, alter natural habitat, and aid in the colonization of invasive plant species.

- The construction of facilities for Turtle Beach produced adverse impacts on soils, vegetation, and water quality. This project would reduce, but would not eliminate, impacts to special-status species.
- The restoration of flood damaged river campsites would prevent soil erosion and compaction and restore habitat, resulting in beneficial impacts.

Eastern Hemlock Stands: Current parkwide activities and programs and the following current habitat preservation project would result in adverse cumulative impacts on eastern hemlock stands inside the study area.

- The management of hemlock stands in DEWA works to control invasive plant species and control infestations of invasive insect species, resulting in beneficial impacts on eastern hemlock stands.

Hogback Ridge: Current parkwide activities and programs and the following past recreational improvement project would result in adverse cumulative impacts on Hogback Ridge inside the study area.

- The McDade Trail realignment dismissed the alternative of routing the McDade Trail over Hogback Ridge. An alternate alignment was chosen to avoid the Hogback's sensitive wildlife and vegetation, and parking areas and social trails were eliminated to reduce visitor use that would adversely impact these resources.

Kittatinny Ridge: Current parkwide activities and programs and the following past and present utility and habitat protection projects would result in adverse cumulative impacts on the Kittatinny Ridge inside the study area.

- The relocation of the Appalachian Trail near the Columbia Gas Transmission Company pipeline crossing resulted in vegetation clearing, which fragmented habitat and disturbed wildlife.
- The Columbia Gas Transmission Company pipeline upgraded an existing natural gas pipeline that traverses DEWA, affecting natural resources through ground disturbance, vegetation loss, habitat fragmentation, the alteration of habitat, the disturbance of wildlife, and potential colonization by invasive plant species.
- Current IBA and IMA programs are working to protect critical habitat, benefiting wildlife and reducing loss of vegetation and habitat fragmentation.

Minsi Lake / Bear Swamp: Current parkwide activities and programs inside the study area would result in adverse cumulative impacts. No projects in the study area have affected, are affecting, or would affect Minsi Lake / Bear Swamp.

Totts Gap Natural Heritage Site: Current parkwide activities and programs and the following past utility project would result in adverse cumulative impacts on Totts Gap Natural Heritage Site inside the study area.

- The Columbia Gas Transmission Company pipeline upgraded an existing natural gas pipeline that traverses DEWA, affecting natural resources through ground disturbance, vegetation loss, habitat fragmentation, the alteration of habitat, the disturbance of wildlife, and potential colonization by invasive plant species.

Van Campen Brook Riparian Area: Current parkwide activities and programs and the following reasonably foreseeable development projects would result in adverse cumulative impacts on the Delaware River riparian corridor inside the study area.

- The Old Mine Road South rehabilitation would repair pavement along Old Mine Road and would improve sediment and erosion control.
- The repair of failing Watergate Dam #10 would rehabilitate the dam and would decrease impacts on water and aquatic resources through sediment and erosion control.

Overall, the effects of past, present, and reasonably foreseeable projects would result in overall adverse cumulative impacts on rare and unique communities inside the study area.

Projects Outside the Study Area

Outside the study area, projects that would result in adverse cumulative impacts on rare and unique communities could include any that would have impacts on any of the elements of these communities, such as geology, vegetation, hydrology, and connectivity. Cumulative projects that could adversely affect rare and unique communities outside the study area include the following road and utility projects: the Marcellus shale natural gas drilling; the Columbia Gas Transmission Company pipeline (replacement of an existing gas pipeline); the Tennessee Gas Line Proposal (addition to an existing gas pipeline); the FERC relicensing of Yards Creek Generating Station (relicensing power plant); the Marshalls Creek traffic relief project (new bypass route); the PFBC natural gas leasing and water access programs; the PPL proposal for a 138/12 kV substation (opens up additional areas to electric transmission); the US Route 209 rehabilitation and replacement of Toms Creek Bridge (road and bridge repair); Martins Creek Power Plant (contaminated water spill); wind turbines in northeastern Pennsylvania; and transportation improvement and replacement projects in Pennsylvania and New Jersey.

Proposed residential and commercial developments in New Jersey and Pennsylvania would also cause adverse impacts on rare and unique communities. Beneficial impacts would result from the following projects: the DEWA prescribed burn program; Pennsylvania's weed eradication program; the Wildlife Habitat Incentive Program; and IBA/IMA programs. Nongovernmental organizations such as TNC work toward identifying and preserving land that contains rare or unique features or key habitat for plants and wildlife. The beneficial effects of many of the listed programs are dependent on the availability of funding for specific projects, which could vary throughout the period of analysis; therefore, the level of benefit resulting from implementation of any project is also variable. Despite land protection and conservation outside the study area, land in the 10 counties of New Jersey and Pennsylvania that are part of this analysis is subject to continued development that would result in further loss, alteration, and fragmentation of habitat, including rare and unique communities. Cumulative impacts on rare and unique communities outside the study area would be adverse.

IMPACTS OF THE ALTERNATIVES ON RARE AND UNIQUE COMMUNITIES

Common to All Alternatives

Vegetation Maintenance: PPL and PSE&G have separate vegetation management plans because they are distinct utility companies working in two states; however, vegetation maintenance would occur annually at a minimum. Vegetation maintenance sustains habitat in the existing ROW as scrub shrub using selective clearing. Additionally, vegetation maintenance would include removal of danger trees that could interfere with the transmission lines. The details of the vegetation management plans as well as clearing

techniques are explained in chapter 2. The impacts of vegetation maintenance are discussed under each alternative.

Invasive Species: Under all action alternatives, invasive plant and wildlife species have the potential to spread and colonize as a result of vegetation removal, disturbance, and the spread of cleared vegetation through mulching. Monitoring programs for invasive plant species and mitigation for invasive wildlife species are described in the "Vegetation" section of this chapter.

Natural Heritage Programs: New Jersey Natural Heritage Program (NJNHP) and Pennsylvania Natural Heritage Program (PNHP) were created to identify critically important areas to support the conservation of biological diversity. These programs are based on the occurrence and locations of native plant and animal, natural community, and geologic resources, with a focus on rare and endangered species. While natural heritage sites do not cover the entire known habitat for endangered and threatened species, they work to conserve critical habitat (NJDEP 2008e; PNHP n.d.)

Mitigation Measures: Mitigation measures would help reduce impacts from construction, operation, and maintenance activities both inside and outside the study area. Mitigation measures for rare and unique communities include those measures that would protect the resources within the community. The complete list of mitigation measures for physical and natural resources are discussed in chapter 2 and appendix F.

Outside the Study Area: Outside the study area, regardless of which alternative is selected, the transmission line could pass through Carbon, Lackawanna, Luzerne, Monroe, Northampton, Pike, and Wayne counties in Pennsylvania and Morris, Sussex, and Warren counties in New Jersey. These counties are largely undeveloped and contain a variety of rare and unique communities. The counties in Pennsylvania contain 58 types of communities that range from vulnerable to critically imperiled, and the counties in New Jersey contain 22. The rare and unique communities are presented in appendix C. Additionally, TNC protects eight preserves in Pennsylvania and eight in New Jersey. TNC restricts the activities that are allowed on the preserves, which adds to the conservation of rare and unique communities outside the study area.

The clearing, construction, and vegetation maintenance activities outside the study area would be consistent with those described for inside the study area; however, the direct impacts outside the study area cannot be determined, as described in the introduction of this chapter. In addition, specific resource impacts outside the study area cannot be identified until the route is chosen by the applicant. Once this decision is reached, additional surveys would be required to determine the impacts of the selected route on rare and unique communities.

Outside the study area, indirect adverse impacts on rare and unique communities from vegetation clearing, the construction of the transmission line, the operation and maintenance of the transmission line, vegetation maintenance, and the potential spread of invasive species would be adverse.

Cumulative impacts on rare and unique communities outside the study area would be adverse, as described previously in the "Cumulative Impacts Common to All Alternatives" section. When the adverse impacts on rare and unique communities outside the study area are combined with other past, present, and reasonably foreseeable projects outside the study area, an overall adverse cumulative impact would be expected.

Alternative 1: No Action

Rare and unique communities that exist along the alternative 1 alignment include Arnott Fen, Delaware River riparian corridor, eastern hemlock forests, Hogback Ridge, Kittatinny Ridge (including talus slope), and Van Campen Brook riparian area. These communities are discussed in the following sections. To arrive at an overall impact and an overall cumulative impact for all the communities in each alternative, the impact on each community as well as the diversity and extent of rare and unique community types along each alternative was considered.

Arnott Fen: As stated in the "Rare and Unique Communities" section of chapter 3, Arnott Fen is a globally imperiled community that is unique in part due to the underlying limestone bedrock. Because no construction activities would be included under alternative 1, there would be no impacts on the geologic features and the groundwater associated with Arnott Fen.

In the existing ROW, Arnott Fen and the surrounding wetland complex area contain a diverse vegetation community including species of conservation concern. Most of the plant species in the ROW are herbaceous and are compatible with the applicant's specifications for vegetation clearing and control (PPL 2010a, 12). Vegetation control measures such as mowing and herbicide use are not currently employed in Arnott Fen and would not be necessary for maintenance under alternative 1. However, incompatible shrubs and small trees such as red maple are also present in the fen and would be hand cleared as part of vegetation management. This maintenance would affect Arnott Fen both beneficially (by keeping the fen open and controlling succession into a wooded wetland) and adversely (by damaging plant species, facilitating the spread of invasive species, and affecting wildlife species through disturbance or direct mortality). Conservation measures would be employed to protect the rare species, such as seasonal restrictions, herbicide restrictions, and the implementation of the invasive species guidelines from the vegetation maintenance plans.

Under alternative 1, the Arnott Fen community would continue to provide suitable habitat for a range of wildlife, including several wildlife species of conservation concern, because the habitat would be maintained by the applicant through NPS-approved vegetation maintenance and would not be altered by construction activities. Mobile wildlife species may be adversely affected by noise and human activity during vegetation management in adjacent areas. Mobile species could be driven out of the habitat, but it is expected that individuals of these species would return to the fen and the surrounding habitats when maintenance is complete. Additionally, nests and eggs of wildlife could be damaged or destroyed during maintenance activities; however, these impacts could be mitigated through seasonal restrictions, as described in appendix F.

Impacts on the Arnott Fen community would result from vegetation maintenance and indirect adverse impacts on wildlife under alternative 1, the no-action alternative.

Delaware River Riparian Corridor: The Delaware River riparian corridor extends approximately 0.25 mile on either side of MDSR. For alternative 1, the Delaware River riparian corridor includes a buffer along the western shore of the Delaware River in Pennsylvania at the base of Hogback Ridge. Because steep slopes occur on either side of the Delaware River, the existing towers are positioned on the tops of the ridges and the transmission lines span the river. The Delaware River riparian corridor is recognized as critical habitat for breeding, wintering, and/or migrating songbirds, waterfowl, and wading birds (NPS 2009g, 5). The riparian corridor contains an active bald eagle communal winter roost and provides important foraging habitat for bald eagles (NPS 2009g, 6).

Vegetation would be maintained throughout this area, except for a 100-foot buffer adjacent to the river on both sides (PPL and PSE&G 2008, 7), resulting in adverse impacts to floodplain forest. Vegetation

maintenance would halt the natural succession of the vegetation communities in the ROW, resulting in adverse impacts. Additionally, noise and human activity in adjacent areas during maintenance could disturb wildlife. Mobile wildlife species may be displaced from the Delaware River riparian corridor during vegetation management activities, but it is expected that individuals of these species would return to the area when maintenance is complete.

Due to impacts on wildlife, adverse impacts would be expected on the Delaware River riparian corridor community under alternative 1.

Eastern Hemlock Forests: Along the alternative 1 alignment, eastern hemlocks grow in habitats designated as eastern hemlock forests, eastern hemlock / northern hardwood forests, and dry eastern hemlock / oak forests; occasionally, eastern hemlock trees are found in eastern white pine forests. Because of current vegetation management along the alternative 1 alignment, eastern hemlocks only grow in the forests that border the ROW, not in the ROW itself. Vegetation management would continue under alternative 1, preventing the trees from growing in the ROW. Continued vegetation management would occasionally remove trees from the ROW and remove of danger trees from outside the ROW, adversely affecting hemlock forests. While certain species of plants are associated with hemlock forests, the removal of an occasional tree would not affect population viability. Ground disturbance sustained during vegetation maintenance, especially removal of danger trees, would facilitate the spread of invasive plant species, such as Japanese barberry. Under the applicant's current vegetation management plans, invasive species are not controlled and their spread is not monitored. Additionally, if the pruning of mature eastern hemlocks is done incorrectly, it would cause damage to the trees, potentially allowing the hemlock woolly adelgid and elongate hemlock scale to establish in pruned trees and damage them. Despite monitoring programs, the invasive hemlock woolly adelgid has caused damage to the eastern hemlocks of DEWA and infestation levels were high in 2007 and 2008, causing decline, mortality, and low growth levels (NPS 2008g, IV-83).

Direct mortality and disturbance to wildlife associated with eastern hemlocks would result from the occasional removal of these trees during vegetation management, but the impact would not be great enough to threaten the viability of a population. Indirect impacts on wildlife species that use eastern hemlock forests would result during vegetation maintenance from human disturbance and noise.

Adverse impacts on the eastern hemlock forest community under alternative 1 would result from effects on vegetation and wildlife.

Hogback Ridge: The woodlands of Hogback Ridge encompass 216 acres of forest that are bisected by the existing 230-kV transmission line. The uniqueness of the Hogback results from a combination of limestone bedrock, topographic features, and landscape setting overlooking the Delaware River. Hogback Ridge supports a diversity of vegetation, including eastern hemlock / northern hardwood forest and rare lichens, which are uncommon in DEWA. The Hogback was considered such an important area for the park, that the NPS relocated the McDade Trail at large cost to protect it from increased intrusion. Under alternative 1, the vegetation in the existing ROW through Hogback Ridge is currently, and would continue to be, maintained as scrub shrub habitat, which is not the natural condition for this unique natural community. Therefore, the vegetation in Hogback Ridge would remain bisected by the existing ROW, and periodic maintenance would keep the ROW in an early successional stage. Historically, very little maintenance has taken place and the existing ROW is surrounded by forested areas limiting the impact of the cleared ROW especially in Pennsylvania.

Hogback Ridge contains priority hemlock stands that are treated under an NPS program to suppress invasive plant species (NPS 2007e, I-10–I-11). Under the applicant's current vegetation management plans, the spread of invasive species is not monitored; without further control, invasive species would

continue to grow and spread. Vegetation maintenance would create some disturbance in the ROW, which could facilitate the spread of invasive species.

The woodlands of Hogback Ridge support an abundance of wildlife, including red-headed woodpecker, spotted turtle, northern ringneck snake, wood frog, upland chorus frog, and several species of conservation concern (NPS 2009g, 3; NPS 2011c; NPS 2005e). Wildlife that use Hogback Ridge would be affected by vegetation maintenance as described in the "Landscape Connectivity, Wildlife Habitat, and Wildlife" section of this chapter: increased predation following maintenance activities when the ROW is cleared of vegetation; mortality of less mobile species; increased nest predation; and disturbance from human activity and noise. These impacts on wildlife and migratory birds from continued operation and vegetation management under alternative 1 would be adverse. Conversely, some species prefer edge and scrub shrub habitats and would benefit from the continued maintenance of the ROW as scrub shrub habitat.

Alternative 1 would adversely impact the Hogback Ridge community through the continued operation and maintenance of the transmission line, which would affect the geology, vegetation, and wildlife resources in the community.

Kittatinny Ridge: Under alternative 1, the existing ROW cuts through Kittatinny Ridge perpendicularly along the alternative 1 alignment; the vegetation in the existing ROW is currently, and would continue to be, maintained as scrub shrub habitat that bisects mature forest habitat, which is not the natural condition for this unique community. Without maintenance, the existing ROW would succeed to one continuous forest. Continued periodic maintenance of the existing ROW under alternative 1 would continue to result in a linear scrub shrub community bisecting the forested area of Kittatinny Ridge.

Periodic vegetation maintenance would not likely be necessary in the talus slope community during the period of analysis due to the sparseness of vegetation growth. However, the applicant would have the right to maintain vegetation in the ROW if necessary for the safety of the line. Vegetation maintenance in talus slope communities would adversely affect the vegetation through disturbance and displacement of soils and plants during clearing activities. Talus slope habitat by nature is unstable and the vegetation communities in talus slope communities are easily disturbed and delicate due to the thin and dry soils.

While vegetation maintenance would create disturbance in the ROW, impacts from further colonization by invasive species would be minimized when the mitigation measures discussed in appendix F are employed.

Wildlife species observed in the talus slope community include reptiles such as common garter snake, five-lined skink, and one species of conservation concern (NPS 2005e). A variety of small mammals, birds, and invertebrates are also expected to use the habitat. Wildlife that use the habitat of Kittatinny Ridge and talus slope communities would be affected by vegetation maintenance as described for Hogback Ridge: increased predation following maintenance activities when the ROW is cleared of vegetation; mortality of less mobile species; increased nest predation; and disturbance from human activity and noise. Conversely, some species prefer edge and scrub shrub habitats and would benefit from continued maintenance of the ROW as scrub shrub habitat. Detailed descriptions of impacts on wildlife are described in the "Landscape Connectivity, Wildlife Habitat, and Wildlife" section of this chapter.

The existing transmission lines present the potential of bird collisions for migrating raptors. Raptors may also collide with wires when foraging along the ROW. Additionally, large birds of prey attempting to perch on poles can be electrocuted by wire-to-wire or conductor-to-ground connections.

As a result of the continued periodic maintenance of the existing ROW, the soils, vegetation, and wildlife of Kittatinny Ridge, and therefore the talus slope community, would be adversely affected under the continued operation and maintenance of alternative 1.

Van Campen Brook Riparian Area: Van Campen Brook riparian area, like Hogback Ridge, is an outstanding natural feature of DEWA. The ROW for alternative 1 intersects floodplain forest and associated wetlands that support special status wildlife. Some of the plant species in the Van Campen wetland complex and surrounding the stream are compatible with the applicant's specifications for vegetation clearing and control; however, incompatible shrub and any small tree species would be removed by hand clearing. Periodic maintenance in the wetland complex would be required to maintain compliance with the NERC standards for vegetation maintenance. Land disturbance would result from vegetation maintenance; therefore, there would be potential impacts from further colonization by invasive plant species. Impacts would be minimized by mitigation measures described in appendix F.

The Van Campen Brook riparian area would continue to support animal species such as wild trout, Baltimore checkerspot butterfly, and three reptile and amphibian species of concern, because the habitat would not be altered by vegetation maintenance or construction activities. As described for Arnott Fen, these mobile wildlife species may be affected indirectly and adversely by human disturbance and noise during vegetation management in adjacent areas; however, it is expected that individuals of these species would return to the riparian area once maintenance is complete.

Under alternative 1, adverse impacts on the Van Campen Brook riparian area community would result due to indirect impacts on wildlife.

Cumulative Impacts

Cumulative impacts on rare and unique communities inside the study area would be adverse. When the overall adverse impacts on rare and unique communities as a result of alternative 1 are combined with other past, present, and reasonably foreseeable projects in the study area, an overall adverse cumulative impact would be expected. Alternative 1 would not alter the level of impact.

Conclusion

When considering the diversity of communities along the alternative 1 alignment as a whole, overall adverse impacts on the rare and unique communities under the no-action alternative would result. These adverse impacts would result from artificially maintaining scrub shrub habitat in the parks, which is not consistent with NPS protection of natural, scenic, and recreational resources. Additionally, there would be adverse effects on soils and wildlife. When the adverse impacts on rare and unique communities as a result of alternative 1 are combined with other past, present, and reasonably foreseeable projects in the study area, an overall adverse cumulative impact would be expected.

Alternative 1 would cross a number of unique ecosystems that comprise priority sites at the parks and regionally for their contributions to biodiversity. Alternative 1 would have adverse impacts on these sites but the impacts would be confined to the limits of the present ROW and none of the adverse impacts change existing conditions with regard to the overall functions and values of the affected resources. Alternative 1 would not change any of the unique characteristics of these areas and in some cases, would benefit rare and unique communities, such as the Arnott Fen, by keeping these areas open and controlling succession into woodlands. In conclusion, the actions under alternative 1 would be in keeping with the parks' enabling legislations, NPS *Management Policies 2006*, and all other applicable federal and state laws. Any cumulative impacts to resources would remain adverse primarily from other actions taken outside the study area. Thus, while alternative 1 would have some adverse impacts associated with the

continued operation and maintenance of the existing B-K Line, the impacts would not be considered significant.

Common to All Action Alternatives

Removal of Existing Structures: All action alternatives would involve the removal of all or a portion of the B-K Line, as discussed in chapter 2. For all action alternatives, the B-K Line structures would be removed but the foundations for these structures would remain in place. For alternatives 2 and 2b, the S-R Line would be constructed along the same alignment. The removal of the structures would require constructing access roads (either permanent or temporary, depending on the alternative). The removal of the B-K Line would require constructing access roads, wire pull sites, and the removal of the line as described in chapter 2. Because access roads would also be required for the construction and long-term maintenance of the new line, adverse impacts from removing the line would be the same as (or less than) the impacts discussed for construction of the S-R Line.

Vegetation Clearing: For the analysis of impacts on rare and unique communities, it was assumed that a 350-foot corridor would be cleared of vegetation for the construction of the new double 500-kV transmission line for alternatives 2, 3, 4, and 5. For alternatives 2, 3, 4, and 5, the corridor would be cleared 175 feet from the centerline of the existing ROW to either side. Under alternative 2b, the applicant proposes to operate the S-R Line within the existing ROW. The NPS anticipates that the applicant would require additional area for construction; therefore, it is estimated that under alternative 2b, the applicant would expand the ROW to the extent of their deeded property rights, which ranges from 100 feet to 380 feet. For alternative 2b, the ROW would be cleared on either side of the centerline to an appropriate width based on the deeded property rights.

In addition to vegetation clearing inside the ROW, areas outside of the ROW would also need to be cleared for all action alternatives to construct the access roads, spur roads, and pulling and splicing sites. Areas cleared for access roads (inside and outside the ROW) and tower foundations (inside the ROW) would be maintained permanently and would result in a permanent loss of vegetation. All other cleared areas would be seeded after construction with an NPS-approved conservation seed mixture appropriate to the local conditions. The area within the ROW maintained for operation is less than that which would be cleared for constructions. Areas both inside and outside the ROW that do not need to be maintained for operation of the S-R Line would be allowed to succeed to forested area over time. Because mature forest removed for construction would not be replaced within the 15-year analysis period covered by this EIS the impacts would be considered permanent.

The impacts from vegetation clearing are discussed for each alternative because the amount of clearing for each is different.

Construction Components: Construction activities are described in detail in chapter 2; the activities that would affect rare and unique communities include the construction of access roads, tower foundations, crane pads, wire pull locations, pulling and splicing sites, and staging areas. Construction of these components would result in temporary or permanent loss of vegetation, as described above in “Vegetation Clearing.” All action alternatives would require drilling as part of the construction process, but because drilling is unlikely to affect groundwater (see discussion in “Geologic Resources”) it would not affect rare and unique communities in the vicinity and is not discussed further.

Alternative 2

Impacts on rare and unique communities in the study area would result from clearing and construction activities along the alternative 2 alignment such as drilling, excavation and grading, soil compaction,

noise, and the physical removal of vegetation. Because alternative 2 would use the existing ROW discussed in alternative 1, the rare and unique communities that exist along the alternative 2 alignment are the same: Arnott Fen, Delaware River riparian corridor, eastern hemlock forests, Hogback Ridge, Kittatinny Ridge (including talus slope), and Van Campen Brook riparian area (see figure 43 in chapter 3). These communities encompass approximately 52% of the route in the study area are discussed in the following sections relative to alternative 2.

Arnott Fen: Approximately 4.1 acres of the 10.5-acre Arnott Fen would lie in the 350-foot corridor that would be cleared for construction under alternative 2. As described previously, the existing compatible plant species in the fen and a 50-foot buffer surrounding the fen would not be cleared to prepare for construction activities. However, some incompatible shrubs / small trees, such as red maple, exist in the fen and would be hand cleared for construction and as part of the vegetation maintenance programs. Under alternative 2, new towers would be placed in uplands on either side of the fen and an access road would travel south of the fen outside of the ROW. One of these towers would be placed in the ROW approximately 120 feet from the perimeter of the fen. In order to install tower foundations, which may extend below grade 15 to 30 feet or more with a diameter of 6 to 9 feet, extensive excavation and drilling would be necessary. Because Arnott Fen exists as a distinct combination of physical and biotic features, if groundwater flow to the fen or function of the fen is altered, it would affect habitat supporting the unique vegetation and special-status plants and wildlife using this wetland. In turn, this shift in the vegetation would reduce the available resources for wildlife species that depend on the conditions currently found in the fen, including species of conservation concern.

Wildlife species that inhabit Arnott Fen may be adversely affected by noise and human activity associated with clearing, construction, and periodic vegetation management; however, disturbance from noise would be temporary, and direct mortality would be avoided by employing the mitigation measures described in appendix F.

Under alternative 2, adverse impacts on the Arnott Fen community would result from clearing, construction, and maintenance activities. Geology, wetland functions and values, vegetation, and wildlife would be affected.

Delaware River Riparian Corridor: Under alternative 2, new transmission towers would be placed atop the ridges on either side of the Delaware River and the lines would span the river. However, the riparian corridor extends approximately 0.25 mile on either side of MDSR, and two towers would be constructed in the riparian corridor. A 100-foot buffer on either side of the Delaware River would not be cleared in preparation for construction; however, the majority of the riparian corridor in the proposed ROW (approximately 19.6 acres) would require vegetation clearing.

Construction activities for the towers, access roads, and crane pads in the riparian corridor would result in impacts on geology, as described previously in this chapter. Construction on the Pennsylvania side of MDSR would take place in the fragile limestone bedrock of Hogback Ridge; impacts from construction in this area are discussed in detail for Hogback Ridge below.

During the operation of the transmission line, vegetation maintenance would be required in the new ROW. Under alternative 2, approximately 4.5 acres of previously mature forest would be maintained by mechanical and chemical means as scrub shrub habitat. Construction activities and vegetation maintenance would also create an avenue for the spread of invasive species; however, mitigation measures should minimize the impacts of invasive species. The portions of the ROW that required clearing only for construction would be restored; however, the restoration would not be complete within the analysis period of this EIS and would be hindered by soil compaction sustained during construction activities, as described in the “Vegetation” section.

Generally, wildlife would be affected by clearing and construction activities and vegetation maintenance through mortality, increased predation, and disturbance where wildlife inhabits the Delaware River riparian corridor. The details of impacts on wildlife are discussed in the "Landscape Connectivity, Wildlife Habitat, and Wildlife" section of this chapter.

The Delaware River riparian corridor along the alternative 2 alignment includes portions of a communal winter roost and foraging area for bald eagle. Bald eagles have recently built two new nests near the alternative 2 alignment; however, the alignment is located outside of the required nest buffers. Disturbance from clearing and construction activities and maintenance activities would deter eagles from using the roosting site and the foraging area, but following the end of the disturbance, the eagles would likely return to the area. The S-R Line would contain more conductors and would be directly in the flight line used by eagles flying between the roost site and foraging area. Additionally, the transmission lines would bisect a winter roost. The removal of roost trees would result in displacement of bald eagles that could be permanent, depending on the amount of disturbance. See the "Special-status Species" section of this chapter for details on the effects of disturbance to bald eagles during clearing and construction activities and for potential mitigation measures.

Adverse impacts on the Delaware River riparian corridor community under alternative 2 would be expected, because geology, soils, vegetation, aquatic resources, water resources, wildlife, and special-status species in the riparian corridor would be affected.

Eastern Hemlock Forests: Approximately 19.1 acres of forest containing eastern hemlocks would be removed during the clearing of the 350-foot construction corridor under alternative 2. Most of the eastern hemlock forests are found along Hogback Ridge in eastern hemlock / northern hardwood forests that border the existing ROW. Along the alternative 2 alignment, eastern hemlock forests span the ROW in Hogback Ridge and the Van Campen Brook riparian area. The proposed ROW would further fragment these forests. The "Landscape Connectivity, Wildlife Habitat, and Wildlife" section of this chapter details the impacts of fragmentation from clearing for the proposed ROW. The development of access roads would cause a loss of vegetation and although the applicant's proposed access roads would remain mostly in the proposed ROW, approximately 0.23 mile of access road would cut through undisturbed forest, resulting in an additional loss of approximately 0.45 acre of eastern hemlock forest.

After the double 500-kV transmission line is constructed, approximately 15.3 acres of mature eastern hemlock forest would be permanently altered and maintained as scrub shrub habitat. Cleared areas needed for construction but not for operation would be seeded with an NPS-approved conservation seed mixture and allowed to revegetate naturally; however, the restoration would not be complete within the analysis period of this EIS and would be hindered by soil compaction sustained during construction activities, as described in the "Vegetation" section.

Once the transmission line is operational, vegetation maintenance would be required in the new ROW, as previously described. This maintenance program would result in adverse impacts on the vegetation in the ROW because a permanently maintained scrub shrub habitat would continue.

All activities under alternative 2 would facilitate the spread of invasive plant species throughout eastern hemlock forests, especially clearing and construction because these activities would result in a significant amount of ground disturbance. However, with the mitigation measures described in appendix F, impacts would be limited. The invasive hemlock woolly adelgid and elongate hemlock scale are also a concern in hemlock forests. These insects could be inadvertently spread through mulching, the transport of mulch for use in other areas, and the transport of equipment used during vegetation removal. Trees that remain in place but are injured during construction activity would become more susceptible to new infestations.

Monitoring and treatment (as part of the applicant's vegetation management plans) would minimize the damage from infestations and would reduce the adverse affects of invasive insect species.

Any decline in the stability of hemlock forests would indirectly impact the aquatic resources of the parks. Eastern hemlock forests that border the ROW of alternative 2 extend to the edges of water bodies — eastern hemlock forests border Big Bushkill Creek for approximately 0.35 mile and Van Campen Brook for approximately 0.18 mile, and hemlocks also surround the wetlands of Hogback Ridge. If hemlock stand vitality decreases from the effects of invasive insect species, these water bodies would be indirectly affected by factors such as changes in temperature and a decline in the diversity of species.

Clearing and construction activities would directly and indirectly impact wildlife species through mortality, increased predation, and disturbance where wildlife inhabits eastern hemlock forests. Vegetation maintenance activities have the potential to disturb and temporarily displace wildlife species. Additionally, the removal of pure hemlock forests decreases the amount of habitat available to those wildlife species that prefer hemlocks. Competition for territory in areas of reduced hemlock-dominated habitat may permanently displace individuals of some wildlife species to other areas.

Under alternative 2, the construction, operation, and maintenance of the proposed double 500-kV transmission line would result in adverse impacts on the eastern hemlock forest community along the ROW, including impacts on geology, vegetation, aquatic resources, and wildlife resources in the community.

Hogback Ridge: Approximately 17.6 acres of Hogback Ridge would be encompassed by the 350-foot corridor for the construction of the proposed ROW under alternative 2, and nearly all of this acreage would initially be cleared in preparation for construction activities. Approximately 11.8 acres of mature forest would be cleared, the majority of which is eastern hemlock / northern hardwood forest, which is rare in DEWA. This clearing would further fragment Hogback Ridge. The Hogback Ridge woodlands cover approximately 216 acres but are part of a larger expanse of forested habitat that encompasses approximately 893 acres. The proposed ROW and continual vegetation maintenance would completely bisect the habitat in the Hogback Ridge woodlands, creating two sections of woodlands and reducing interior forest habitat. This fragmentation would affect forest interior–dwelling species such as wood thrush and scarlet tanager. Further details of fragmentation are discussed in the "Landscape Connectivity, Wildlife Habitat, and Wildlife" section of this chapter. The development of access roads would cause a permanent loss of vegetation along the linear routes of the roads. The applicant's proposed access roads would remain mostly in the proposed ROW; however, 0.3 mile of access road would cut through undisturbed forest, resulting in an additional loss of approximately 0.7 acre of forest. This central location within the parks could essentially create a divided park into a north and south section.

Construction activities would include the installation of temporary features, such as crane pads and pulling and splicing sites, and permanent features, such as tower foundations and access roads. The placement of new tower foundations would require drilling and excavation, which would damage the underlying limestone bedrock of Hogback Ridge. Two towers are planned in the existing ROW on Hogback Ridge. The drilling and excavation of the limestone-based formations that underlie Hogback Ridge could cause the limestone to fracture from ground vibrations and the removal of rocks and minerals, which can ultimately lead to landform destruction. The effects of the construction activities of new towers on these formations are described in detail in the "Geology" section of this chapter. Although the impacts would be localized, soils would be permanently excavated and removed and the natural function of the soils would be lost in the selected areas.

The installation of temporary features such as crane pads and pulling and splicing sites would not require drilling; therefore, no impacts on the geologic formations of Hogback Ridge would be expected from the

construction of these components. These features, as well as the construction of access roads and spur roads, would require excavation, grading, the placement of geotextile fabric, and installing and compacting gravel. Impacts would include soil compaction, the loss of some soil function, and an increase in soil erosion from grading, placing compacted gravel over the soil, and using heavy equipment and large vehicles on the access roads. After the double 500-kV transmission line is constructed, the proposed transmission line would require a 200-foot ROW to operate; therefore, approximately 4.9 acres of mature forest, including eastern hemlock forest, would be permanently altered and maintained as scrub shrub habitat. Impacts on eastern hemlock stands from alternative 2 activities are discussed in the previous section.

Following construction, all temporary sites disturbed during construction would be returned to preconstruction conditions and would be seeded with an NPS-approved conservation seed mixture and allowed to succeed back to forested habitat over time. However, the mature forest that would be removed for construction would not be replaced within the 15-year analysis period covered by this EIS and would be hindered by soil compaction sustained during construction activities, as described in the "Vegetation" section.

Once the transmission line is operational, vegetation maintenance would be required in the new ROW. Vegetation maintenance procedures would include pruning, herbicide application (with prior NPS approval), and occasional tree removal. This maintenance program would result in the permanent alteration of vegetation in the ROW and would permanently bisect forested areas on Hogback Ridge, contributing to the fragmentation of the wooded areas and the maintenance of an unnatural linear scrub shrub habitat along Hogback Ridge.

Vegetation maintenance would create some disturbance in the ROW, but impacts from further colonization by invasive species would be minimal because the mitigation measures described in appendix F would be implemented.

Clearing and construction activities would directly and indirectly impact wildlife species, including one amphibian and two bird species of conservation concern, through mortality, increased predation, and disturbance in the clearing and construction area in Hogback Ridge. The clearing of vegetation for construction and during maintenance activities has the potential to disturb and temporarily displace wildlife species. It is expected that mobile species would return to the area after activities have ceased and habitat has returned to the preferred condition. Impacts on wildlife would be minimized by mitigation measures such as seasonal restrictions and others discussed in appendix F.

The natural resources (geology, soils, vegetation, and wildlife) of Hogback Ridge would be adversely impacted with the implementation of alternative 2.

Kittatinny Ridge: Under alternative 2, mature forest would be cleared to prepare for construction, increasing fragmentation. Access roads would remain in the corridor in this area and would not require the removal of additional vegetation. The "Landscape Connectivity, Wildlife Habitat, and Wildlife" section of this chapter details the impacts of fragmentation from clearing for the proposed ROW.

Impacts on geology from constructing features such as tower foundations and wire pull sites would be minimal because the underlying geologic formations are stable. Impacts on soils would be localized; however, the drilling required for installation of this tower could indirectly affect the talus slope community. Disturbances to areas above talus slopes may change hydrologic regimes and increase sedimentation on the slopes (UMass 2000, 33). Adverse impacts to the talus community would also adversely affect special-status species and other wildlife that depend upon the specialized habitat afforded by this community.

The talus slope community on Kittatinny Ridge along alternative 2 would likely not require clearing because the transmission line would span the community. If vegetation maintenance were needed in talus slope communities, it would adversely affect the vegetation through disturbance and displacement of soils and plants during clearing activities. Additionally, access roads would not be constructed in the talus slope community.

Vegetation maintenance would result in a permanently maintained scrub shrub habitat where mature forest currently stands. Due to the sparse vegetation growing in the talus and the steep topography, vegetation maintenance likely would not be needed in the talus slope community during the period of analysis. Maintenance would facilitate the spread of invasive species in and adjacent to the ROW along Kittatinny Ridge; however, this spread would be minimized if the mitigation measures outlined in appendix F are followed.

Each year, migratory Neotropical birds, especially raptors, use the air currents that form above Kittatinny Ridge for migration and use the habitats on the ridge for breeding, as described in the "Landscape Connectivity, Wildlife Habitat, and Wildlife" section of this chapter. The disturbance from construction and maintenance activities would deter birds from using Kittatinny Ridge for resting, feeding, and nesting; however, following the end of the disturbance the birds would likely return to the area. Migratory birds would be affected by the loss of habitat and disturbance from construction and maintenance activities. The modification to taller transmission structures with an increased number of conductors under alternative 2 has the potential to affect migrating raptors by increasing the risk of injury or mortality from collisions or electrocutions; however, the transmission line is proposed to be constructed using APLIC standards and would use the best available deterrence technology to minimize impacts.

Clearing and construction activities would directly and indirectly impact the wide variety of wildlife species that may use habitats along Kittatinny Ridge (including talus slope) through direct mortality, increased predation, loss of habitat, and disturbance, as previously discussed. In addition, periodic vegetation maintenance activities have the potential to disturb and temporarily displace wildlife species. It is expected that most individuals would return to the area after disturbance ceases and the appropriate habitat returns.

The Kittatinny Ridge community would be adversely impacted by the implementation of alternative 2 because geology, soils, vegetation, and wildlife would be affected.

Van Campen Brook Riparian Area: Approximately 9.6 acres of Van Campen Brook riparian area and wetland complex lie in the 350-foot construction corridor under alternative 2. Some of the plant species in the wetland are incompatible shrub / small tree species that would be removed by hand clearing for construction and maintenance activities and the construction of a new tower foundation and crane pad would result in the clearing of 0.3 acre of wetland vegetation. Van Campen Brook riparian area is underlain by Bloomsburg red beds, which is rated good for foundation stability; therefore, impacts on the geology of Van Campen Brook riparian area from drilling would be expected to be minimal. Additionally, as proposed, an access road would be built through the wetland. The road would result in 0.56 acre of permanent wetland impacts resulting from the placement of fill in order to construct the access road. A permanent loss in wetland functions or hydrology is expected.

In addition to the access road through the wetland complex in the ROW, another access road would be placed south of the ROW corridor, connecting Old Mine Road to the corridor; this road would require a crossing over Van Campen Brook. An existing bridge would need to be reinforced and widened to accommodate larger construction vehicles. The construction of new access roads would include grading, placing geotextile fabric, installing and compacting gravel, and using heavy machinery. Impacts would include soil compaction, the loss of some soil function, and an increase in soil erosion from grading,

placing compacted gravel over the soil, and using heavy equipment and large vehicles on the access roads. Vegetation, including vegetation in the riparian corridor and the wetlands complex associated with Van Campen Brook, would be cleared to construct the road, resulting in a permanent loss of vegetation. Water quality and aquatic resources in Van Campen Brook, a wild trout spawning stream, would be indirectly affected by the removal of the vegetation buffering the brook, which would result in higher water temperatures and increased sedimentation.

Once the transmission line is operational, periodic vegetation maintenance would be required in the newly expanded ROW. Vegetation maintenance would require periodic cutting of non-compatible vegetation and danger trees, which would adversely affect special-status species (as discussed in that section). Effects would be reduced through implementation of an NPS-approved vegetation management plan.

Access road construction activities under alternative 2 and periodic maintenance activities upon completion of construction would facilitate the potential spread of invasive species throughout Van Campen Brook riparian area, especially clearing and construction because these activities would result in a significant amount of ground disturbance. Impacts would be minimized if the mitigation measures outlined in appendix F are followed.

Clearing and construction activities would impact wildlife, including special-status species, through mortality, increased predation, and disturbance. Vegetation maintenance activities have the potential to disturb and temporarily displace wildlife species. Individuals would be expected to return to the area as disturbance ceases and appropriate habitat returns.

Alternative 2 would result in adverse impacts on the Van Campen Brook riparian area community, with impacts on geology, vegetation, wetland functions and values, and wildlife resources in the community.

Cumulative Impacts

Cumulative impacts on rare and unique communities inside the study area would be adverse. Alternative 2 would impact resources, such as rare and unique communities, inside the park that are also under pressure in the surrounding region. Multiple types of development outside of DEWA and APPA are quickly diminishing rare and unique ecosystems on a broader scale. The reduction of these resources in the region surrounding the parks would increase their scarcity and sensitivity inside the parks, where they are afforded special protections. Alternative 2 would contribute to the cumulative adverse impact on rare and unique ecosystems. When the overall adverse impacts on rare and unique communities as a result of alternative 2 are combined with other past, present, and reasonably foreseeable projects in the study area, an overall adverse cumulative impact would be expected. Alternative 2 would not alter the level of impact.

Conclusion

Alternative 2, the applicant’s proposed route, would create adverse impacts on rare and unique communities inside the study area. These adverse impacts would result from vegetation clearing, the construction of the proposed 500-kV transmission line, the deconstruction of the existing transmission line, the potential spread of invasive species, and vegetation management for operation of the S-R Line. Additionally, adverse impacts would result from artificially maintaining scrub shrub habitat by means of mechanical equipment and herbicides in the parks, which is not consistent with NPS protection of natural, scenic, and recreational resources. When the adverse impacts on rare and unique communities as a result of alternative 2 are combined with other past, present, and reasonably foreseeable projects in the study area, an overall adverse cumulative impact would be expected.

Alternative 2 would cross in the center part of DEWA, including the MDSR. This part of the park is a particularly sensitive area because it contains a high concentration of many important and unique natural features. Several resources on this alignment are recognized for their superlative biodiversity (e.g., Hogback Ridge and Arnott Fen) and are significant in both park and regional contexts, making any impacts in these locations even more acute. The long-term effects of construction activities in the areas where rare and unique communities are located are difficult to predict accurately because of the nature of these communities (e.g., Arnott Fen exists as a distinct combination of physical and biotic features and seemingly small changes in hydrology, such as placing fill material to construct a permanent access road), may result in disproportionately, unpredictably large changes in the fen system from alterations in the composition of fen vegetation which, in turn, impacts the associated wildlife. The risks are heightened further for this crossing because of the unique characteristics at stake in this location.

When considered in the context of protection of rare and unique communities, alternative 2 would likely result in significant adverse impacts because of the particularly resource-rich area through which the alternative crosses, and the potential to inflict harm to those resources because of the magnitude and duration of the adverse impacts. Although it is true that not all impacts can be predicted with great certainty, in the context of the purpose and significance for which DEWA, APPA, and MDSR were established and NPS mandates to specifically preserve the natural, cultural, and scenic resources within them, additional precautions are warranted when considering risks to rare and unique communities, many of which are of regional or national importance. Similarly, these resources are non-renewable, which makes any impacts to them all the more serious as they cannot be replaced if lost. Further, rare and unique communities such as those found in the parks are under threat by other actions and outside pressure, which in the context of the function of the parks as an “oasis” or refuge within the highly developed east coast, elevates the need to preserve and protect these scarce, sensitive resources. For these reasons, the adverse impacts of alternative 2 would likely be significant.

Public attention surrounding this project is high. There is likely to be a high degree of controversy over any effects on park resources that are particularly popular with the public, such as scenery, visitor use and experience, rare and unique communities, cultural landscapes, and historic structures, for any of the alternatives. The inherent uncertain nature of predicting the true degree of some of these impacts would likely heighten this controversy. Additionally, construction at this particular location in DEWA is likely to accentuate the controversy due to the unique characteristics presented here and high visitor traffic to the area.

Permitting the project would adversely affect multiple protected resources inside the parks, in some instances irreversibly. Allowing such adverse effects in order to facilitate private infrastructure expansion would be contrary to NPS practice and principle of protecting and improving these resources, and of removing incompatible infrastructure to do so. This could establish precedent that may invite similar proposals by other applicants in the future, and create an expectation of like treatment for those proposals; it may make it difficult to deny such proposals. DEWA and APPA both contain numerous other utility crossings, which makes the risk of such precedent particularly concerning for these parks. Furthermore, as units of the national park system, wherein all parks are entitled to equal protection, creating such a precedent could have ramifications for parks nationwide. The location of this particular crossing through the center of DEWA could make such a precedent even more potent. Installing the S-R Line on this alignment may invite future utilities proposing to follow the same route.

Alternative 2b

Inside the study area, alternative 2b, the applicant’s alternate route, would follow the same alignment as alternative 2. As with alternative 2, rare and unique communities encompass approximately 52% of the route in the study area and include Arnott Fen, Delaware River riparian corridor, eastern hemlock forests,

Hogback Ridge, Kittatinny Ridge (including talus slope), and Van Campen Brook riparian area (see figure 44 in chapter 3). The impacts on these rare and unique communities under alternative 2b would result from the same activities as those described for alternative 2; however, alternative 2b would require less vegetation clearing and the construction of two additional tower foundations and the access road locations are slightly different (see figure 6 in chapter 2). The additional towers and continued dispute over ROW rights could lead to more severe adverse impacts from this alternative. The impacts on rare and unique communities from alternative 2b are discussed in the following sections.

Arnott Fen: Approximately 1.5 acres of the 10.5-acre Arnott Fen complex would lie in the existing ROW under alternative 2b. As described previously, only the incompatible shrubs / small trees (e.g., red maple) in Arnott Fen would be cleared for construction; all compatible herbaceous species would be retained in the fen and the surrounding 50-foot buffer. Under alternative 2b, new towers would be placed in uplands on either side of the fen. One of the two additional tower foundations would be placed approximately 156 feet west of Arnott Fen; to the east, a tower would be constructed approximately 207 feet from the perimeter of the fen. As described for alternative 2, the drilling required for the installation of the tower foundations could affect groundwater availability and quality, which would indirectly and adversely affect the wetland functions and values of Arnott Fen. This, however, is considered unlikely, as described in the "Geologic Resources" section. Access roads were designed to avoid impacts on Arnott Fen under alternative 2b; therefore, no impacts from sedimentation during access road construction are expected. The impacts on vegetation and wildlife would be the same as those described for alternative 2.

Alternative 2b is expected to have adverse impacts on the Arnott Fen community from clearing, construction, and maintenance activities. Geology, wetland functions and values, vegetation, and wildlife would be affected.

Delaware River Riparian Corridor: Under alternative 2b, clearing for construction would remove approximately 14.7 acres of riparian corridor vegetation, including floodplain forest. The placement of the tower foundations, crane pads, and access roads in the Delaware River riparian corridor and their impacts would be the same as those described for alternative 2.

During the operation of the S-R Line, vegetation maintenance would be required in the new ROW. Under alternative 2b, approximately 3.1 to 5.2 acres of previously mature forest would be maintained by mechanical and chemical means as scrub shrub habitat. The removal of danger trees is a part of the applicant's vegetation maintenance plans. This portion of the vegetation maintenance could involve the removal of individual trees or larger patches of trees if they are determined to be a threat to the transmission line. The applicant's deeded property rights are limited to 100-feet wide for one-tenth of a mile within the Delaware River riparian corridor. It is anticipated that trees adjacent to the ROW in this area would be removed; however, the amount, and thus, the impact on the riparian corridor from this clearing cannot be determined at this time.

Construction activities and vegetation maintenance would also create an avenue for the spread of invasive species; however, mitigation measures should minimize the impacts of invasive species. The portions of the ROW that required clearing only for construction would be restored; however, the restoration would not be complete within the analysis period of this EIS and would be hindered by soil compaction sustained during construction activities, as described in the "Vegetation" section.

Generally, wildlife would be affected by clearing and construction activities and vegetation maintenance through mortality, increased predation, and disturbance where wildlife inhabits the Delaware River riparian corridor. The details of impacts on wildlife are discussed in the "Landscape Connectivity, Wildlife Habitat, and Wildlife" section of this chapter.

Impacts on wildlife (including roosting and foraging bald eagles) from construction, vegetation maintenance, and the number and configuration of the new lines would also be the same as alternative 2.

Under alternative 2b, adverse impacts on resources in the Delaware River riparian corridor would be expected. Geology, soils, vegetation, aquatic resources, water resources, wildlife, and special-status species in the riparian corridor would be affected.

Eastern Hemlock Forests: Under alternative 2b, the locations of the forests containing eastern hemlocks are the same as those described for alternative 2; approximately 5.0 acres of forest containing eastern hemlocks would be removed during the clearing in preparation for construction. The proposed access roads under alternative 2b would not require the removal of additional eastern hemlocks.

After the double 500-kV transmission line is constructed, approximately 1.1 to 2.5 acres of mature eastern hemlock forest would be permanently altered and maintained as scrub shrub habitat. Cleared areas needed for construction but not for operation would be seeded with an NPS-approved conservation seed mixture and allowed to revegetate naturally; however, the restoration would not be complete within the analysis period of this EIS and would be hindered by soil compaction sustained during construction activities, as described in the "Vegetation" section. The impacts on eastern hemlock forests from vegetation maintenance and the potential spread of invasive species would be the same as those described for alternative 2. The indirect adverse effects on aquatic resources and wildlife from removal of eastern hemlock forests would also be the same as previously described.

Any decline in the stability of hemlock forests would indirectly impact the aquatic resources of the parks. Eastern hemlock forests that border the ROW of alternative 2 extend to the edges of water bodies — eastern hemlock forests border Big Bushkill Creek for approximately 0.35 mile and Van Campen Brook for approximately 0.18 mile, and hemlocks also surround the wetlands of Hogback Ridge. If hemlock stand vitality decreases from the effects of invasive insect species, these water bodies would be indirectly affected by factors such as changes in temperature and a decline in the diversity of species.

Under alternative 2b, the construction, operation, and maintenance of the proposed double 500-kV transmission line would result in adverse impacts on the eastern hemlock forest community along the ROW, including impacts on geology, vegetation, aquatic resources, and wildlife resources in the community.

Hogback Ridge: Approximately 6.5 acres of Hogback Ridge would be encompassed by the existing ROW, which would be cleared of vegetation for construction activities under alternative 2b. The ROW is 100-feet wide along most of the length of Hogback Ridge, except where is widens near the Delaware River. Approximately 1.0 acre of mature forest would be removed during clearing activities under alternative 2b. The features of the transmission line under alternative 2b would differ from alternative 2 in Hogback Ridge; there would be an additional tower foundation and the access road locations would be different. The impacts from the construction, operation, and maintenance of the transmission line and vegetation maintenance would be the same as those described for alternative 2. The two alternatives would differ in the amount of area affected. The applicant's proposed access roads under alternative 2b would remain mostly in the proposed ROW; however, 0.1 mile of access road would cut through undisturbed forest, resulting in an additional loss of approximately 0.2 acre of mature forest. Additionally, danger tree maintenance could result in the removal of a considerable number of trees along the edge of the ROW through Hogback Ridge where the ROW is 100 feet wide. The impact from removal of danger trees in this area cannot be determined at this time.

The implementation of alternative 2b would result in adverse impacts on natural resources (geology, soils, vegetation, and wildlife) of Hogback Ridge.

Kittatinny Ridge: Alternative 2b would require the clearing of vegetation along Kittatinny Ridge in the existing corridor for construction; however, less than an acre of mature forest would be cleared during this phase of the project. The features of the transmission line under alternative 2b would be the same as those described for alternative 2. The impacts would also be same. However, the removal of danger trees could affect a considerable number of trees, as the ROW through Kittatinny Ridge is limited to 150-feet wide.

The talus slope community on Kittatinny Ridge along alternative 2b would likely not require clearing because the transmission line would span the community. If vegetation maintenance were needed in talus slope communities, it would adversely affect approximately 5.8 acres of the vegetation through disturbance and displacement of soils and plants during clearing activities. Additionally, the impacts to wildlife, including migratory birds, would be the same as those described for alternative 2.

Adverse impacts on the Kittatinny Ridge community would result from the implementation of alternative 2b because geology, soils, vegetation, and wildlife would be affected.

Van Campen Brook Riparian Area: Approximately 6.7 acres of Van Campen Brook riparian area and wetland complex lie in the corridor under alternative 2b. The impacts from alternative 2b would be the same as those described for alternative 2, as the tower placements and the location of the access roads are the same in this area.

Adverse impacts on Van Campen Brook riparian area would be expected, with impacts on geology, vegetation, and wildlife resources in the community.

Cumulative Impacts

Cumulative impacts on rare and unique communities inside the study area would be adverse. Alternative 2b would impact resources, such as rare and unique communities, inside the park that are also under pressure in the surrounding region. Multiple types of development outside of DEWA and APPA are quickly diminishing rare and unique ecosystems on a broader scale. The reduction of these resources in the region surrounding the parks would increase their scarcity and sensitivity inside the parks, where they are afforded special protections. Alternative 2b would contribute to the cumulative adverse impact on rare and unique ecosystems. When the overall adverse impacts on rare and unique communities as a result of alternative 2b are combined with other past, present, and reasonably foreseeable projects in the study area, an overall adverse cumulative impact would be expected. Alternative 2b would not alter the level of impact.

Conclusion

Under alternative 2b, adverse impacts on individual rare and unique communities would result from vegetation clearing, the construction of the proposed 500-kV transmission line, the deconstruction of the existing transmission line, the potential spread of invasive species, and vegetation management for the operation of the S-R Line. Additionally, adverse impacts would result from artificially maintaining scrub shrub habitat by means of mechanical equipment and herbicides in the parks, which is not consistent with NPS protection of natural, scenic, and recreational resources. When the adverse impacts on rare and unique communities as a result of alternative 2b are combined with other past, present, and reasonably foreseeable projects in the study area, an overall adverse cumulative impact would be expected.

Alternative 2b follows the existing alignment of the B-K Line and would cross the same rare and unique communities as alternative 2. The adverse impacts of alternative 2b would be similar to those of alternative 2b with somewhat less clearing within the ROW but more disturbance near Arnott Fen for

tower construction and the ongoing dispute over cutting of danger trees outside of the ROW. Thus, the adverse impacts of alternative 2b would also likely be significant for the same reasons outlined for alternative 2.

Permitting the project would adversely affect multiple protected resources inside the parks, in some instances irreversibly. Allowing such adverse effects in order to facilitate private infrastructure expansion would be contrary to NPS practice and principle of protecting and improving these resources, and of removing incompatible infrastructure to do so. This could establish precedent that may invite similar proposals by other applicants in the future, and create an expectation of like treatment for those proposals; it may make it difficult to deny such proposals. DEWA and APPA both contain numerous other utility crossings, which makes the risk of such precedent particularly concerning for these parks. Furthermore, as units of the national park system, wherein all parks are entitled to equal protection, creating such a precedent could have ramifications for parks nationwide. The location of this particular crossing through the center of DEWA could make such a precedent even more potent. Installing the S-R Line on this alignment may invite future utilities proposing to follow the same route.

Public attention surrounding this project is high. There is likely to be a high degree of controversy over any effects on park resources that are particularly popular with the public, such as scenery, visitor use and experience, rare and unique communities, cultural landscapes, and historic structures, for any of the alternatives. The inherent uncertain nature of predicting the true degree of some of these impacts would likely heighten this controversy. Additionally, construction at this particular location in DEWA is likely to accentuate the controversy due to the unique characteristics presented here and high visitor traffic to the area.

Overall, the significance of the impact of alternative 2b is a result of two considerations: the particularly resource-rich area through which the alternative crosses and the potential to inflict harm to those resources because of the magnitude and duration of the adverse impacts. Although it is true that not all impacts can be predicted with great certainty, in the context of the purpose and significance for which DEWA, APPA, and MDSR were established and NPS mandates to specifically preserve the natural, cultural, and scenic resources within them, additional precautions are warranted when considering risks to these resources, many of which are of national importance. Similarly, certain resources are non-renewable, which makes any impacts to them all the more serious because they cannot be replaced if lost. And some resources are under threat by other actions and outside pressure, which in the context of the function of the parks as an “oasis” or refuge within the highly developed east coast, elevates the need to preserve and protect these scarce, sensitive resources. For these reasons, the environmental consequences of alternative 2b would be significant.

Common to Alternatives 3, 4, and 5

Restoration of the B-K Line: Alternatives 3, 4, and 5 would require the removal of the portion of the B-K Line between the Bushkill Substation and the eastern boundary of DEWA. This portion of the line would be permanently removed and the ROW would be restored. The details of the removal and disposal of the existing conductors and structures are discussed in chapter 2. Vegetation in the existing ROW would be cleared and spur roads would be constructed for the removal process. In the existing ROW, approximately 53 acres of land within NPS boundaries would be cleared of vegetation. An additional 1.1 to 1.5 acres of vegetation in NPS lands but outside the ROW would be cleared to construct the access roads. The removal of the conductors and structures and chipping the foundations below the ground surface would cause ground disturbance. The use of heavy machinery during all these activities would cause further ground disturbance and soil compaction.

Following the deconstruction of the B-K Line, approximately 53 acres of land disturbed by clearing and construction of the spur roads and the ROW would be restored to original conditions to the greatest extent possible. Rare and unique communities that occur along the B-K Line corridor would benefit from this restoration, including Arnott Fen, Delaware River riparian corridor, eastern hemlock forests, Hogback Ridge, Kittatinny Ridge, and Van Campen Brook riparian area. The B-K Line currently bisects Hogback Ridge, eastern hemlock forests, Delaware River riparian corridor, talus slope communities, and Van Campen Brook riparian area; these communities would benefit most from the removal of the B-K Line. Additionally, a tower would be removed from the Van Campen Brook riparian area.

The areas targeted for restoration would be prepared by disking or tilling as needed to mitigate soil compaction. Following soil preparation, the areas would be seeded with an NPS-approved conservation seed mixture containing native species appropriate to the region and allowed to succeed naturally into forested habitat over the long term; however, soil compaction could hinder the restoration process and complete restoration of the ROW into mature forest would not occur within the period of analysis of this EIS. Although the natural communities would not return to mature conditions in the period of analysis of this EIS, the process would begin over 53 acres of previously disturbed area and would counteract the effects of clearing and construction under alternatives 3, 4, and 5.

Alternative 3

Rare and unique communities that exist along the alternative 3 alignment include the Delaware River riparian corridor, eastern hemlock forests, and Kittatinny Ridge (including talus slope) (see figure 45 in chapter 3). These communities are discussed in the following sections.

Delaware River Riparian Corridor: The alternative 3 alignment would cross the Delaware River approximately 5.3 miles south of the alternative 2 alignment and would affect the riparian area. The riparian corridor extends approximately 0.25 mile on either side of MDSR. Because of the route alternative 3 would follow, the Delaware River riparian corridor encompasses approximately 1.1 miles of the alignment.

A 100-foot buffer on either side of the Delaware River would not be cleared to prepare for construction; however, approximately 26.5 acres of mature forest would be cleared in the riparian area, including eastern hemlock forest (described in the following section). Construction activities would affect geology and soils through drilling, excavation, grading, and compaction. The Pennsylvania side of MDSR would include construction on fragile limestone bedrock. The details of impacts on geology are discussed earlier in this chapter.

Once the transmission line is operational, vegetation maintenance would be required in the new ROW, as described previously. Approximately 12.2 to 21.6 acres of mature forest would be maintained as scrub shrub habitat, halting natural succession. Generally, wildlife would be affected by clearing and construction activities and vegetation maintenance through mortality, increased predation, and disturbance where wildlife inhabits the Delaware River riparian corridor. The details of impacts on wildlife are discussed in the "Landscape Connectivity, Wildlife Habitat, and Wildlife" section of this chapter.

The Delaware River riparian corridor along the alternative 3 alignment includes bald eagle foraging areas. The disturbance from construction activities and maintenance activities would deter eagles from using the foraging areas, although following the end of the disturbance the eagles would likely return to the area. Approximately 0.83 mile of the proposed ROW in New Jersey parallels the Delaware River within 0.28 mile of the river. Activities in this portion of the ROW would further affect the bald eagles' use of foraging habitat. The new, taller transmission lines bisect eagle foraging areas along the river, increasing

the potential for mortality or injury from collisions. Although federal guidelines for bald eagles would be followed, all aspects of alternative 3 would result in adverse impacts on the population of bald eagles that use the Delaware River riparian corridor. See the "Special-status Species" section of this chapter for federal guideline details. The impacts on the bald eagle under alternative 3 differ from those under alternatives 2 and 2b because alternative 3 is not located adjacent to a bald eagle winter communal roost.

Adverse impacts on the Delaware River riparian corridor community under alternative 3 would occur because vegetation, aquatic resources, water resources, wildlife, and special-status species in the riparian corridor would be affected.

Eastern Hemlock Forests: Approximately 13.4 acres of eastern hemlock forests would be removed during the clearing of the 350-foot corridor under alternative 3. The applicant's proposed access roads would remain mostly in the proposed ROW; however, 0.1 mile of access road would cut through undisturbed eastern hemlock forest, resulting in an additional loss of approximately 0.02 acre.

Impacts on eastern hemlock forests would be the same as those described for alternative 2. These forest communities would be affected by maintaining previously mature forest as scrub shrub; approximately 6.7 to 11.1 acres of mature eastern hemlock forest would be lost under alternative 3, which could adversely affect wildlife that use the habitat, including aquatic wildlife. Impacts would also result from the potential spread of invasive species and continued disturbance.

Under alternative 3, the construction, operation, and maintenance of the proposed double 500-kV transmission line would result in adverse impacts on the eastern hemlock forest community in the parks.

Kittatinny Ridge: The alternative 3 alignment would cross Kittatinny Ridge and talus slope habitat perpendicularly near APPA in Worthington State Forest and travel parallel to APPA along the portion of the alignment that borders DEWA on the east side of the park (see figure 45 in chapter 3). The talus slope habitats along the alternative 3 alignment contain mature forest with a nearly complete canopy. Approximately 17.8 acres of forested talus slope habitat would be cleared as part of the 350-foot corridor.

The impacts under alternative 3 would be similar to those for alternative 2. Localized adverse impacts on geology and soils would result from tower foundation and crane pad installation. However, talus slope communities may be permanently affected by drilling and the use of heavy equipment in this delicate habitat, especially in the portion of the alignment that runs along the border of DEWA in New Jersey. Indirect impacts on vegetation resulting from changes in soils would occur in the talus slope forests, but not in the remainder of Kittatinny Ridge. Direct adverse impacts on vegetation would result from clearing the 350-foot corridor, the construction of temporary and permanent transmission line features, vegetation maintenance, and the threat of invasive species. Mature forest in the corridor through Kittatinny Ridge, including talus forests, would be permanently altered and would be maintained as scrub shrub habitat after the construction of the transmission line.

The alternative 3 alignment would pass just south of the Hawk Watch site at Raccoon Ridge. Migratory birds would be affected by the loss of habitat during migration and the breeding season, especially by disturbance from construction and maintenance activities, and increased potential for collisions with the transmission line; however, the transmission line would be constructed according to APLIC standards and the best available deterrence technology would be used. Other wildlife that use Kittatinny Ridge would be directly and indirectly affected through mortality, increased predation, and disturbance, as described for alternative 2.

Alternative 3 would adversely affect the soils, geology, vegetation, and wildlife of Kittatinny Ridge and talus slope communities.

Cumulative Impacts

Cumulative impacts on rare and unique communities inside the study area would be adverse. When the overall adverse impacts on rare and unique communities as a result of alternative 3 are combined with other past, present, and reasonably foreseeable projects in the study area, an overall adverse cumulative impact would be expected. Alternative 3 would not alter the level of impact.

Conclusion

Under alternative 3, adverse impacts on rare and unique communities would be expected and would result from vegetation clearing, the construction of the proposed 500-kV transmission line, the deconstruction of the existing transmission line, the potential spread of invasive species, and vegetation management for the operation of the S-R Line. Additionally, adverse impacts would result from artificially maintaining scrub shrub habitat by means of mechanical equipment and herbicides in the parks, which is not consistent with NPS protection of natural, scenic, and recreational resources. When the impacts on rare and unique communities as a result of alternative 3 are combined with other past, present, and reasonably foreseeable projects in the study area, an overall adverse cumulative impact would be expected.

Alternative 3 crosses fewer rare and unique communities that alternatives 2 and 2b; however, the unique topography and geology of Kittatinny Ridge, Delaware River Riparian Corridor, and the mature undisturbed eastern hemlock forests are the cornerstones of the geography in this region, providing a unique scenic setting through which alternative 3 would cross. The talus slopes of Kittatinny Ridge provide prime habitat for state-listed timber rattlesnakes and many other wildlife species. The largely intact Delaware River riparian corridor within DEWA, rare in the highly developed east, contributes to a functioning floodplain that helps protect the qualities of the river that contribute to its designation as the MDSR. This large, undisturbed area of high quality riparian habitat provides crucial habitat for migratory birds, as noted above, as well as important breeding and foraging habitat for a wide variety of wildlife. The eastern hemlock forests are a unique ecosystem, found in specific locations along the slopes adjacent to the Delaware River, that support plant and animal communities not found anywhere else because of the specific combination of shading, temperature and soil characteristics created by the dense hemlock growth. There are uncertainties in predicting the extent of the adverse impacts to these communities due to the instability of the underlying geologic formations that support them and are critical to their character. For many of the same reasons outlined for alternatives 2 and 2b, alternative 3 would likely have significant adverse impacts to rare and unique communities. Conversely, alternative 3 would result in significant beneficial impacts to rare and unique communities by removing and restoring the area of the existing B-K Line which crosses a particularly high concentration of these resources. However, these benefits do not entirely outweigh the adverse impacts to the rare and unique communities along the alternative 3 alignment; thus, the adverse impacts are considered to be potentially significant.

Public attention surrounding this project is high. There is likely to be a high degree of controversy over any effects on park resources that are particularly popular with the public, such as scenery, visitor use and experience, rare and unique communities, cultural landscapes, and historic structures, for any of the alternatives. The inherent uncertain nature of predicting the true degree of some of these impacts would likely heighten this controversy.

Permitting the project would adversely affect multiple protected resources inside the parks, in some instances irreversibly. Allowing such adverse effects in order to facilitate private infrastructure expansion would be contrary to NPS practice and principle of protecting and improving these resources, and of removing incompatible infrastructure to do so. This could establish precedent that may invite similar proposals by other applicants in the future, and create an expectation of like treatment for those proposals; it may make it difficult to deny such proposals. DEWA and APPA both contain numerous other utility

crossings, which makes the risk of such precedent particularly concerning for these parks. Furthermore, as units of the national park system, wherein all parks are entitled to equal protection, creating such a precedent could have ramifications for parks nationwide. However, it would also set a precedent for routing utilities around MDSR and to the edges of DEWA.

Alternative 4

Rare and unique communities that exist along the alternative 4 alignment include eastern hemlock forests, Kittatinny Ridge (including talus slope), Minsi Lake / Bear Swamp, Totts Gap Natural Heritage Site, and Totts Gap Swamp (see figure 46 in chapter 3). These communities are discussed in the following sections.

Eastern Hemlock Forests: There are eastern hemlock forests along the B-K Line from the Bushkill Substation to the western boundary of DEWA under alternative 4. Approximately 1.9 acres of this forest would be cleared in preparation for construction activities. This eastern hemlock forest would not be affected by access roads, tower foundations, crane pads, wire pulls, or pulling and splicing sites.

The eastern hemlock forest borders Big Bushkill Creek for approximately 0.35 miles in the expanded ROW under alternative 4. Approximately 1.3 acres of hemlock forest would be removed during the initial clearing, and approximately 0.32 to 1.0 acre of mature eastern hemlock forests would be permanently altered and maintained as scrub shrub habitat after the construction of the transmission line. Impacts on the hemlock forests in this portion of alternative 4 would result from the initial clearing and annual vegetation maintenance and would be similar to those discussed for alternative 2. However, a smaller area would be affected and construction activities would not be performed in the immediate area of the eastern hemlock forests.

Under alternative 4, the construction, operation, and maintenance of the proposed double 500-kV transmission line would result in adverse impacts on the eastern hemlock forest community along the ROW, including impacts on vegetation and wildlife resources in the community.

Kittatinny Ridge: The alternative 4 alignment would cross Kittatinny Ridge and talus slope perpendicularly near APPA. The impacts would be similar to those for alternative 2. Localized adverse impacts on geology and soils would result from tower foundation and crane pad installation. Due to the instability of the talus slope soils, any activity that disturbs the talus slope communities would potentially damage the soils and alter the vegetation community. Direct adverse impacts on vegetation would result from clearing the 350-foot corridor, the construction of temporary and permanent transmission line features, vegetation maintenance, and the colonization by or spread of invasive species. Mature forest in the ROW through Kittatinny Ridge would be permanently altered and maintained as scrub shrub habitat after the construction of the transmission line. Migratory birds would be affected by the loss of habitat during migration and the breeding season, especially by disturbance from construction and maintenance activities, and increased potential for collisions with the transmission line; however, the transmission line would be constructed according to APLIC standards, and the best available deterrence technology would be used. Other wildlife that uses Kittatinny Ridge would be directly and indirectly affected through mortality, increased predation, and disturbance (see the “Landscape Connectivity, Wildlife Habitat, and Wildlife” section of this chapter for details on impacts on wildlife).

The Kittatinny Ridge and talus slope communities would experience adverse impacts with the implementation of alternative 4 because the geology, soils, vegetation, and wildlife in the communities would be affected.

Minsi Lake / Bear Swamp: Inside the study area, the alternative 4 alignment would cross through two portions of Minsi Lake / Bear Swamp along the boundary. These two natural areas of statewide

significance encompass 4,099 acres and make up a corridor that contains valuable wildlife habitat. The alternative 4 alignment would traverse approximately 0.74 mile of Minsi Lake / Bear Swamp, resulting in the clearing of approximately 19.5 acres of forest in this community in preparation for construction activities.

Geology and soils would be affected during construction activities; these impacts have been described in the respective sections of this chapter. Vegetation would be affected through clearing and construction activities as well as vegetation maintenance activities. Approximately 8.51 to 15.9 acres of mature forest would be permanently altered and maintained as scrub shrub habitat after the construction of the transmission line. Cleared areas needed for construction but not operation would be seeded with an NPS-approved conservation seed mixture and allowed to revegetate naturally; however, the restoration would not be complete within the analysis period of this EIS.

All clearing, construction, and vegetation maintenance activities would directly and indirectly impact wildlife species through mortality, increased predation, and disturbance in Minsi Lake / Bear Swamp. The impacts on wildlife are described in detail in the "Landscape Connectivity, Wildlife Habitat, and Wildlife" section of this chapter. Minsi Lake / Bear Swamp provides excellent breeding habitat for amphibians in and around the vernal pools. Due to the increase in sun exposure and reduced forest canopy after clearing and construction, preferable amphibian habitat would be reduced. The vegetation clearing could also prevent amphibians from migrating to breeding locations. Because the alternative 4 alignment would traverse Minsi Lake / Bear Swamp near the outer edges of the community, the impacts on amphibian habitat would be expected to be minimal. However, forest fragmentation would cause degradation of the habitat.

The natural resources (vegetation, landscape connectivity, and wildlife) of Minsi Lake / Bear Swamp would experience adverse impacts with the implementation of alternative 4.

Totts Gap: Totts Gap is composed of Totts Gap Natural Heritage Site and Totts Gap Swamp in Northampton County, Pennsylvania (PATNC 2005a, 43), and encompasses approximately 893 acres. Approximately 10.9 acres of this would be cleared as part of the proposed ROW. Under alternative 4 Totts Gap Road, which runs through Totts Gap, would be used to gain access to the ROW, and widening of the road would not be necessary. No impacts from the use of the road would be expected. Approximately 0.31 mile of new access roads would extend into Totts Gap, resulting in 0.58 acre of permanent vegetation loss.

The construction of temporary and permanent transmission line features would adversely affect Totts Gap. Impacts on geology from constructing features such as tower foundations and wire pull sites would be minimal because the underlying geologic formation, Shawangunk formation, is stable. Excavation impacts on soils would be localized. The proposed transmission line would require a 200- to 300-foot ROW to operate; therefore, approximately 5.7 to 9.7 acres of the Totts Gap forest would be permanently altered and maintained as scrub shrub habitat by mechanical and chemical means after construction of the double 500-kV transmission line.

Following construction, all temporary sites disturbed during construction, as well as unnecessary portions of the access roads, would be returned to preconstruction conditions, revegetated with an NPS-approved conservation seed mixture, and allowed succeed back to the forested habitat over time. However, the mature forest that would be removed for construction would not be replaced within the 15-year analysis period covered by this EIS and would be hindered by soil compaction sustained during construction activities, as described in the "Vegetation" section.

During the operation of the S-R Line, periodic vegetation maintenance would be required in the new ROW, as previously described. This maintenance program would result in adverse impacts on the vegetation in the ROW because the maintenance would continue to contribute to the unnatural condition of a permanently maintained scrub shrub habitat.

No invasive species have been recorded in Totts Gap in the proposed 350-foot ROW. The implementation of the mitigation measures outlined in appendix F would reduce the potential for invasive species to colonize the area.

Wildlife species observed in Totts Gap in the proposed ROW of alternative 4 include various birds, raptors, amphibians, reptiles, and invertebrates (NPS 2011b). Clearing and construction activities would directly and indirectly affect wildlife species through mortality, increased predation, and disturbance throughout Totts Gap. Vegetation maintenance activities have the potential to disturb and temporarily displace wildlife species.

Under alternative 4, the construction, operation, and maintenance of the proposed double 500-kV transmission line would adversely impact Totts Gap Natural Heritage Site and Totts Gap Swamp.

Cumulative Impacts

Cumulative impacts on rare and unique communities inside the study area would be adverse. When the overall adverse impacts on rare and unique communities as a result of alternative 4 are combined with other past, present, and reasonably foreseeable projects in the study area, an overall adverse cumulative impact would be expected. Alternative 4 would not alter the level of impact.

Conclusion

Under alternative 4, adverse impacts on the individual rare and unique communities inside the study area would be expected from vegetation clearing, the construction of the proposed double 500-kV transmission line, the deconstruction of the existing transmission line, the potential spread of invasive species, and vegetation management for the operation of the S-R Line. Additionally, adverse impacts would result from artificially maintaining scrub shrub habitat by means of mechanical equipment and herbicides in the parks, which is not consistent with NPS protection of natural, scenic, and recreational resources. When the adverse impacts on rare and unique communities as a result of alternative 4 are combined with other past, present, and reasonably foreseeable projects in the study area, an overall adverse cumulative impact would be expected.

Actions associated with alternative 4 would adversely affect Kittatinny Ridge and Minsi Lake Corridor – two unique ecosystems intersected by the study area. Alternative 4 would have adverse impacts on key resources contributing to the uniqueness of these ecosystems. Kittatinny Ridge is an important bird migratory corridor and provides breeding habitat for forest-dependent wildlife. Minsi Lake Corridor provides over 1,000 acres of high quality habitat for vernal pool dependent wildlife and a special-status plant. These rare and unique communities affected by clearing, habitat fragmentation, loss of wetlands and floodplains, and potential spread of invasive exotics. There is less uncertainty associated with these impacts because alternative 4 would be built in areas where the stability of the underlying geology is rated good and the slopes are relatively flat. Alternative 4 would include the restoration of the existing B-K Line which would have a long-term beneficial impact on the region by restoring a large forested block through a natural and wild area of the Middle Delaware River Valley. This benefit could potentially balance the adverse impacts of construction, operation, and maintenance of alternative 4; however, the adverse impacts of alternative 4 would likely be considered significant because the adverse impacts would

occur immediately or within the life of the project whereas the benefit of removing the existing B-K Line would not likely be realized until sometime after the period of analysis.

Public attention surrounding this project is high. There is likely to be a high degree of controversy over any effects on park resources that are particularly popular with the public, such as scenery, visitor use and experience, rare and unique communities, cultural landscapes, and historic structures, for any of the alternatives. The inherent uncertain nature of predicting the true degree of some of these impacts would likely heighten this controversy.

Permitting the project would adversely affect multiple protected resources inside the parks, in some instances irreversibly. Allowing such adverse effects in order to facilitate private infrastructure expansion would be contrary to NPS practice and principle of protecting and improving these resources, and of removing incompatible infrastructure to do so. This could establish precedent that may invite similar proposals by other applicants in the future, and create an expectation of like treatment for those proposals; it may make it difficult to deny such proposals. DEWA and APPA both contain numerous other utility crossings, which makes the risk of such precedent particularly concerning for these parks. Furthermore, as units of the national park system, wherein all parks are entitled to equal protection, creating such a precedent could have ramifications for parks nationwide. However, it would also set a precedent for routing utilities around MDSR and to the edges of DEWA.

Alternative 5

Alternatives 4 and 5 would follow the same route through DEWA and APPA, with the exception of the 0.89-mile section from Bushkill Substation to the western boundary of DEWA; therefore, alternative 5 would not affect eastern hemlock forests. The alternative 5 alignment would cross Kittatinny Ridge (including talus slope), Minsi Lake / Bear Swamp, Totts Gap Natural Heritage Site, and Totts Gap Swamp, and the impacts would be the same as those described for alternative 4, adverse.

Cumulative Impacts

Cumulative impacts on rare and unique communities inside the study area would be adverse. When the overall adverse impacts on rare and unique communities as a result of alternative 5 are combined with other past, present, and reasonably foreseeable projects in the study area, an overall adverse cumulative impact would be expected. Alternative 5 would not alter the level of impact.

Conclusion

Under alternative 5, adverse impacts on the individual rare and unique communities inside the study area would be expected from vegetation clearing, the construction of the proposed 500-kV transmission line, the deconstruction of the existing transmission line, the potential spread of invasive species, and vegetation management for operation of the S-R Line. Additionally, adverse impacts would result from artificially maintaining scrub shrub habitat by means of mechanical equipment and herbicides in the parks, which is not consistent with NPS protection of natural, scenic, and recreational resources. When the impacts on rare and unique communities as a result of alternative 5 are combined with other past, present, and reasonably foreseeable projects in the study area, an overall adverse cumulative impact would be expected.

For the same reasons outlined for alternative 4, alternative 5 would likely result in significant adverse impacts to rare and unique communities although these adverse impacts could eventually be balanced by the significant benefit of restoring the corridor along the existing B-K Line.

Public attention surrounding this project is high. There is likely to be a high degree of controversy over any effects on park resources that are particularly popular with the public, such as scenery, visitor use and experience, rare and unique communities, cultural landscapes, and historic structures, for any of the alternatives. The inherent uncertain nature of predicting the true degree of some of these impacts would likely heighten this controversy.

Permitting the project would adversely affect multiple protected resources inside the parks, in some instances irreversibly. Allowing such adverse effects in order to facilitate private infrastructure expansion would be contrary to NPS practice and principle of protecting and improving these resources, and of removing incompatible infrastructure to do so. This could establish precedent that may invite similar proposals by other applicants in the future, and create an expectation of like treatment for those proposals; it may make it difficult to deny such proposals. DEWA and APPA both contain numerous other utility crossings, which makes the risk of such precedent particularly concerning for these parks. Furthermore, as units of the national park system, wherein all parks are entitled to equal protection, creating such a precedent could have ramifications for parks nationwide. However, it would also set a precedent for routing utilities around MDSR and to the edges of DEWA.

CULTURAL RESOURCES

This section discusses the impacts from the alternatives on the cultural resources in the study area, including archeological resources, historic structures, and cultural landscapes. Impacts on cultural resources are analyzed under NEPA; in addition, this section also analyzes the project's effects on historic properties under the NHPA.

Federal actions that have the potential to affect cultural resources are subject to a variety of laws. The NHPA is the principal legislative authority for managing cultural resources associated with federal projects. Generally, section 110 of the act requires federal agencies to establish preservation programs for the identification, evaluation, and nomination of historic properties to the National Register. Section 106 of the act requires all federal agencies to consider the effects of their actions on cultural resources listed on or determined eligible for listing on the National Register. Such resources are termed historic properties. Federal agencies must seek to avoid, minimize, or mitigate harm to historic properties that would be adversely affected by a federal undertaking. Agreement on how to resolve adverse effects on historic properties is reached through consultation with the State Historic Preservation Officer (SHPO), the Tribal Historic Preservation Officer, if applicable, the Advisory Council on Historic Preservation (ACHP) as necessary, and other consulting parties.

Section 110 of the NHPA charges the NPS to manage historic properties in its custody in a way that considers the preservation and protection of such resources (16 USC §§ 470h-2(a)(1)-(2)). This is further implemented through Director's Order 28: Cultural Resource Management and its supplement, Director's Order 28A, Archeology (NPS 1998b); NPS *Management Policies 2006* (NPS 2006a); and the 2008 "Servicewide Programmatic Agreement among the NPS, the Advisory Council, and the National Conference of State Historic Preservation Officers." These documents charge NPS managers with avoiding, or minimizing to the greatest degree practicable, adverse impacts on park resources and values. Although the NPS has the discretion to allow certain impacts in parks, that discretion is limited by the statutory requirement that park resources and values remain unimpaired, unless a specific law directly provides otherwise. Because the NPS has elected to integrate compliance with Section 106 of the NHPA into the NEPA process and documentation pursuant to 36 CFR § 800.8(c), this impact analysis is designed to meet both statutory requirements. See 36 CFR § 800.8(c)(1)(ii)-(iii).

ACHP regulations for implementing section 106 require that effects on historic properties be identified and evaluated by determining the area of potential effects (APEs), or the area of geographic study;

identifying cultural resources present in the APE that are either listed on or eligible for listing on the National Register; applying the criteria of adverse effect on these historic properties; and considering ways to avoid, minimize, or mitigate adverse effects on them. Identification of historic resources and assessment of effect is being completed in accordance with 36 CFR §§ 800.4 and 800.5.

Under the ACHP regulations a determination of no effect, no adverse effect, or adverse effect must be made for National Register-listed or National Register-eligible historic properties located in the APE. A determination of no effect is made when it is found that no historic properties are present or there are historic properties present but the undertaking would have no effect upon them. A determination of no adverse effect results when there is an effect on a resource but it would not diminish the characteristics of the historic property that qualify it for inclusion in the National Register. An adverse effect occurs when an impact alters any characteristic of an historic property that qualifies it for inclusion in the National Register in a manner that would diminish the integrity of its location, design, setting, materials, workmanship, feeling, or association. (36 CFR § 800.5(a)(1)). Adverse effects also include reasonably foreseeable effects caused by the proposal that would occur later, be farther removed in distance, or be cumulative (36 CFR Part 800).

In addition to the analysis under NHPA, the NPS is required to analyze impacts to cultural resources under NEPA. Under NEPA, impacts to cultural resources are assessed as either adverse or beneficial. Section 106 of the NHPA requires assessments of effects as either adverse or not adverse (see above discussion). Under both laws, adverse effects are those that negatively affect the integrity of elements important to the significance of a cultural resource. An impact on a cultural resource under NEPA is not necessarily equivalent to an effect on a historic property under the NHPA. In this section, discussion of *impacts* is specific to NEPA, while that of *effects* is specific to Section 106 of the NHPA.

CEQ regulations and Director's Order 12 call for a discussion of the appropriateness of mitigation, as well as an analysis of how effective the mitigation would be in reducing the intensity of a potential impact. Any resultant reduction in the intensity of an impact due to mitigation, however, is an estimate of the effectiveness of mitigation under NEPA only. Cultural resources are nonrenewable resources, and adverse effects generally consume, diminish, or destroy the original historic materials or form, resulting in a loss if integrity of the resource that can never be recovered. Through consultation with identified consulting parties, the NPS will develop measures that may avoid, minimize, or mitigate adverse effects to historic properties. The NPS will describe the identified proposed measures associated with the alternatives in this EIS. The NPS will incorporate such measures in further detail in the Record of Decision, assuming there is a decision other than the no action alternative, and the measures will be included as a binding commitment in any permit that might be granted. Therefore, although actions determined to have an adverse effect under section 106 of the NHPA may be mitigated, the effect remains adverse.

A section 106 summary is included in the impact analysis section for archeological resources, historic structures and cultural landscapes. The section 106 summary is an assessment of the effect of the undertaking (implementation of the alternative) only on cultural resources listed on or eligible for the National Register, based on the criteria of effect and criteria of adverse effect found in the regulations of the Advisory Council. For further information on the section 106 consultation, please see appendix M.

Federally recognized Indian tribes hold the bald eagle to be important culturally, and bald eagles are considered a cultural resource. However, effects to bald eagles are discussed within the "Special-status Species" section of this chapter.

ARCHEOLOGICAL RESOURCES

METHODOLOGIES

Information on potential archeological resources was obtained in two ways, through background research and field survey. The former involved the study of existing reports, site files, and other relevant available data. Information was gathered from DEWA facilities, the Pennsylvania SHPO and New Jersey Historic Preservation Office (NJ HPO), and from reports and data supplied by the applicant. A Phase IB archeological field survey included surface reconnaissance and the excavation of shovel test units placed along measured transects across the project alternatives. Per guidelines established by DEWA for the project, a 7.5-meter shovel test interval was employed, with a single transect following the approximate centerline of the corridors for each alternative. Slopes in excess of 15% were not shovel tested but were surface inspected for artifacts and aboveground features (e.g., rock shelters and building foundations). This approach may be considered standard procedure for linear project areas.

Resource-specific context for assessing the significance of impacts in accordance with NEPA and the CEQ regulations includes the following:

- DEWA is identified in the congressional record for archeological significance.
- The archeological record in DEWA is unusually complete and contiguous because of the unique geography and the pre-Columbian settlers that it attracted, and because the area has been protected from disturbance.
- The unusually complete archeological record makes this area an important destination for archeological research.
- Archeological resources have been extensively lost elsewhere and are under continuing threat of loss due to development pressures.

STUDY AREA

The APE is determined as the geographic area in which an undertaking may directly or indirectly cause an alteration in the character or use of historic properties (36 CFR § 800.16[d]). The section 106 definition of an APE and the APE for archeological resources are both described in the “Archeological Resources” section of chapter 3.

CUMULATIVE IMPACTS COMMON TO ALL ALTERNATIVES

An assessment of cumulative impacts on cultural resources is required by both the CEQ and NHPA. Cumulative impacts on archeological resources would include the disturbance or destruction of potential archeological resources, which would lead to the further depletion of the archeological record and knowledge base in DEWA, MDSR, and APPA. Archeological sites are nonrenewable resources and are therefore finite in number. Past, present, and reasonably foreseeable activities that could have beneficial or adverse impacts on archeological resources in the parks and inside and outside the study area are discussed in following sections and summarized under each alternative as applicable.

Projects Inside the Study Area

Inside the study area, projects that could result in adverse cumulative impacts on archeological resources include the following road, development, and utility projects: I-80 weigh station (facility upgrade), sustainable comfort stations, New Jersey Swim Beach (Turtle Beach), McDade Trail realignment, the

Tennessee Gas Line Proposal (addition to an existing gas pipeline), and Northeast Supply Link Expansion – Palmerton Loop. These projects have involved or could involve ground disturbance, which could permanently alter or destroy archeological resources. Additionally, illegal activities such as the collection of artifacts and illegal ORV use could result in the loss of archeological resources. Other park activities could also result in adverse impacts on archeological resources: the issuance of special use permits related to visitor use, incidental business permits / commercial visitor services, agricultural leases, and parkwide invasive species control programs. The PADOT SR 2001 road project could have adverse impacts on archeological resources. Projects that have created or could create beneficial impacts on archeological resources include the rehabilitation of Childs Park, the regrading of six historic buildings, hazardous structure demolition/deconstruction, and the stabilization and repair of damaged structures. These projects could preserve and/or rehabilitate historical structures with associated archeological deposits or significant landscape features that support archeological sites inside the study area and protect architectural resources through BMPs. Because the presence, extent, and location of archeological resources are largely unknown, cumulative impacts inside the study area could be adverse.

Projects Outside the Study Area

Outside the study area, projects including utility projects and other development projects have the potential to adversely affect archeological resources. Projects that could have adverse impacts include local residential development adjacent to the parks, the Appalachian Trail relocation near the Columbia Gas Transmission Company pipeline crossing, the Dominion/Allegheny Power 500-kV transmission line project, the Northeast Supply Link Expansion – Palmerton Loop, the Federal Energy Regulatory Commission relicensing of Yards Creek Generating Station, Marcellus shale natural gas drilling, PFBC natural gas leasing and water access programs, and residential development. These projects have caused or could cause a substantial change in the significance of archeological resources outside the study area. Projects outside the study area are somewhat mitigated by a variety of conservation and open space plans that could lessen the impacts on archeological resources. Cumulative impacts on archeological resources outside the study area could be adverse because the presence and extent of archeological resources are largely unknown.

IMPACTS OF THE ALTERNATIVES ON ARCHEOLOGICAL RESOURCES

Due to the nature of archeological projects, the presence or absence of all archeological sites in any region cannot be known before initiating an archeological field investigation. Potential archeological sites can be identified through research, and can be confirmed through field investigation. Accordingly, the impacts on potential archeological resources cannot be fully known beforehand. If an adverse effect on an archeological resource is identified, all efforts would be made to avoid the adverse effect before proceeding with ground-disturbing activities.

Common to All Alternatives

Mitigation Measures: Mitigation measures would reduce impacts from construction, operation, and maintenance activities for all action alternatives and are described in chapter 2 and appendix F. In project areas where archeological resources are located, mitigation could include preserving the sites in place by avoiding the disturbance or destruction of potential resources. Site areas might be cordoned off and deliberately avoided by construction activities, thereby preserving the potential resource for future scientific study.

Outside the Study Area: Outside the study area, regardless of which alternative is selected, the transmission line could pass through Carbon, Lackawanna, Luzerne, Monroe, Northampton, Pike, and Wayne counties in Pennsylvania and Morris, Sussex, and Warren counties in New Jersey.

The clearing, construction, and vegetation maintenance activities outside the study area would be consistent with those described for inside the study area; however, the impacts outside the study area would be indirect. The direct impacts from the construction of the transmission line outside the study area generally cannot be determined, as described in the introduction of this chapter. Additionally, the specific resources that would be affected by the transmission line outside the study area cannot be identified until the route is chosen by the applicant. Upon this decision, additional surveys would be required to determine whether archeological resources would be affected along the selected route.

Outside the study area, systematic archeological surveys have not been undertaken. Accordingly, the nature and number of potential archeological resources are not known for these areas. However, the S-R Line could affect potential resources. Outside the study area, indirect adverse impacts on archeological resources could result from vegetation clearing and maintenance associated with the no-action alternative. Under all action alternatives, indirect impacts on potential archeological resources cannot be determined yet; however, impacts are expected to be adverse. Cumulative impacts on archeological resources outside the study area could be adverse, as described previously in the "Cumulative Impacts Common to All Alternatives" section. When the indirect adverse impacts on archeological resources as a result of activities outside the study area are combined with other past, present, and reasonably foreseeable projects outside the study area, an overall adverse cumulative impact could be expected.

Alternative 1: No Action

Under the no-action alternative, the existing ROW currently crosses known archeological sites. The ROW would not be widened under alternative 1; however, the continued operation of the existing transmission line would require periodic vegetation maintenance including pruning and removal of vegetation in the ROW. These ongoing activities could create impacts on archeological sites from soil disturbance, artifact displacement and movement, artifact breakage (e.g., ceramic vessels, glass), disturbance of cultural features such as firepits and foundation remnants, and the exposure of the newly denuded landscape to potential erosion. Although impacts on potential archeological resources would continue in the existing ROW, the undertaking would not result in additional impacts under the no-action alternative.

Cumulative Impacts

Past, present, and reasonably foreseeable projects inside the study area would have adverse cumulative impacts on archeological resources, as described previously in the "Cumulative Impacts Common to All Alternatives" section. However, Alternative 1 would not alter the level of impact.

Conclusion

Alternative 1, the no-action alternative, would result in the continued operation of the existing transmission line with regular vegetation maintenance. There would be adverse impacts on the archeological sites in alternative 1 due to physical impacts from the maintenance of vegetation along the existing ROW. When analyzed together with past, present, and future projects, the cumulative impacts under this alternative would be expected to be adverse.

The adverse impacts of alternative 1 would be confined to the limits of the present ROW and none of the adverse impacts would change existing conditions. After applying the Advisory Council criteria for adverse effects, the NPS determined that implementation of alternative 1 would result in a finding of no adverse effects to archeological resources, since the impacts would not result directly from the undertaking. Therefore, the actions under alternative 1 would be in keeping with the parks' enabling legislations, NPS *Management Policies 2006,* and all other applicable federal and state laws. Although

there are adverse impacts associated with the continued operation and maintenance of the B-K Line, the intensity of the adverse impacts would not change as a result of the undertaking.

Alternative 2

Inside the study area, a Phase IB archeological survey conducted by The Louis Berger Group, Inc. on behalf of the applicant identified 2 archeological sites within the bounds of the alternative 2 corridor that could be directly affected by construction activities; 23 additional sites were identified but these would not be affected by construction (Berger 2010b). One affected site has components that date to the prehistoric period and the historic period. Phase II archeological investigations at this site resulted in a recommendation of National Register eligibility for the prehistoric component only. The second site dates to the prehistoric period; Phase II archeological investigations also resulted in a recommendation of National Register eligibility.

If transmission line construction and/or maintenance activities impinge on the site of an archeological resource and disturbance to the site landscape is unavoidable, then the effect would be considered adverse. The degree to which the effect is adverse would depend on the nature, extent, and location of the construction disturbance. The amount of soil disturbance (surface disturbance, actual earth-moving or excavation) is a key factor in the analysis.

Specific kinds of adverse effects that may be anticipated for alternative 2 would include the removal and clearing of vegetation along the proposed ROW. These activities on the site surface could create adverse effects on archeological resources, if present. In order to install the transmission towers, excavation would be needed to a depth of 15 to 30 feet. Drilling would be used to excavate the ground material to the required depth. If an archeological site were located in the area of excavation, adverse effects could include full physical removal or destruction.

Significant archeological resources would be avoided to the greatest extent possible. If archeological resources could not be avoided, an appropriate mitigation strategy would be developed in consultation with the appropriate SHPO and, as necessary, American Indian tribes. If during construction previously unknown archeological resources are discovered, all work in the immediate vicinity of the discovery would be halted until the resources could be identified and documented and, if the resources cannot be preserved in situ, an appropriate mitigation strategy developed. In the unlikely event that human remains, funerary objects, sacred objects, or objects of cultural patrimony are discovered during construction, provisions outlined in the Native American Graves Protection and Repatriation Act (25 USC § 3001) of 1990 would be followed.

The construction of access roads would include the removal of vegetation, the placement of gravel, and grading. Impacts on archeological resources would occur due to the earthmoving activities at the site. The operation of the existing transmission line would require periodic vegetation maintenance including the pruning and removal of vegetation in the ROW. These ongoing activities could create adverse impacts on archeological sites. Types of impacts could include soil disturbance, artifact displacement and movement, artifact breakage (e.g., ceramic vessels, glass), disturbance to cultural features such as firepits and foundation remnants, and the exposure of the newly denuded landscape to erosion.

Adverse effects could occur at the site containing only prehistoric components, primarily in a portion of the site with few artifacts. It is yet to be determined what mitigation measures under Section 106 this would require. Engineering controls could be used to eliminate disturbance to the remainder of the site.

Section 106 Summary

Based on surveys conducted by the applicant, it was recommended that the prehistoric components of both sites were National Register eligible, and therefore, met the definition of a historic property. The application of the Advisory Council criteria of adverse effects (36 CFR § 800.5, "Assessment of Adverse Effects") resulted in the finding that the site with both prehistoric and historic period components would not be disturbed. However, protection through engineering controls was recommended as a precaution against inadvertent ground-disturbing activities. Likewise, it was found that the site containing only prehistoric period components would be adversely affected. Nonetheless, it was recommended that engineering controls could mitigate ground-disturbing activities to the most significant portions of the site. See appendix M for a complete summary of the section 106 process for this final EIS.

Cumulative Impacts

Past, present, and reasonably foreseeable projects inside the study area would have adverse cumulative impacts on archeological resources, as described previously in the "Cumulative Impacts Common to All Alternatives" section. When the impacts on archeological resources as a result of alternative 2 are combined with the other projects inside the study area, an overall adverse cumulative impact would be expected. Alternative 2 would not alter the level of impact.

Conclusion

The implementation of alternative 2 could have adverse impacts on potential historic properties, and those recommended as historic properties. As discussed, adverse effects to archeological sites could be mitigated through avoidance and engineering controls, with the exception of a portion of the site containing only prehistoric components. Appropriate mitigation measures would be required to address the adverse effects under Section 106 to this site. The cumulative effects of activities under alternative 2, coupled with other past, present, and future projects noted, could constitute adverse cumulative effects.

After applying the Advisory Council criteria for adverse effects, the NPS made a preliminary determination that alternative 2 would have an adverse effect on archeological resources based on the potential for discovering significant archeological sites. However, the effect will not be known until pre-construction surveys are completed and the determination may change, depending on the nature of the archeological sites found. Because the nature and extent of archeological resources along any of the action alternatives is not known, for the purposes of analysis in this EIS, the unknown archeological resources along any of the action alternative alignments are assumed to be significant; therefore, the adverse impacts of any of the action alternatives would also be assumed to be significant.

Permitting the project would adversely affect multiple protected resources inside the parks, in some instances irreversibly. Allowing such adverse effects in order to facilitate private infrastructure expansion would be contrary to NPS practice and principle of protecting and improving these resources, and of removing incompatible infrastructure to do so. This could establish precedent that may invite similar proposals by other applicants in the future, and create an expectation of like treatment for those proposals; it may make it difficult to deny such proposals. DEWA and APPA both contain numerous other utility crossings, which makes the risk of such precedent particularly concerning for these parks. Furthermore, as units of the national park system, wherein all parks are entitled to equal protection, creating such a precedent could have ramifications for parks nationwide. The location of this particular crossing through the center of DEWA could make such a precedent even more potent. Installing the S-R Line on this alignment may invite future utilities proposing to follow the same route.

Alternative 2b

Inside the study area, the alternative 2b alignment would follow the same route as described for alternative 2; however, under alternative 2b, the ROW would only be cleared to the extent of the applicant's deeded property rights.

Inside the study area, a Phase IB archeological survey conducted by The Louis Berger Group, Inc., on behalf of the applicant identified 2 archeological sites within the bounds of the alternative 2 corridor that would be directly affected by construction activities; 23 additional sites were identified but these would not be affected by construction (Berger 2010b). One affected site has components that date to the prehistoric period and the historic period. Phase II archeological investigations at this site resulted in a recommendation of National Register eligibility for the prehistoric component only. The second site dates to the prehistoric period; Phase II archeological investigations also resulted in a recommendation of National Register eligibility.

Under alternative 2b, the potential for impacts from clearing, construction, operation, and vegetation maintenance activities, as well as the assessment of impact levels, would be the same as those described for alternative 2.

No adverse effect was assumed for the archeological site with both historic and prehistoric components since the site sits 12 feet (3.7 meters) from an access road; nonetheless, it was recommended that protection could be ensured through engineering controls (timber-matting). Adverse effects would occur at the site containing only prehistoric components; however, only in an area with scant resources. It was anticipated that the adverse effect would not change the National Register eligibility of the site. Engineering controls could be used to eliminate disturbance to the remainder of the site. Therefore, it was recommended that no additional archeological investigation is needed at either site.

Section 106 Summary

Based on surveys conducted by the applicant, it was recommended that the prehistoric components of both sites were National Register eligible, and therefore, met the definition of a historic property. The application of the Advisory Council criteria of adverse effects (36 CFR § 800.5, "Assessment of Adverse Effects") resulted in the finding that the site with both prehistoric and historic period components would not be disturbed. However, protection through engineering controls was recommended as a precaution against inadvertent ground-disturbing activities. Likewise, it was found that the site containing only prehistoric period components would be adversely affected. Nonetheless, it was recommended that engineering controls could mitigate ground-disturbing activities to the most significant portions of the site. See appendix M for a complete summary of the section 106 process for this final EIS.

Cumulative Impacts

Past, present, and reasonably foreseeable projects inside the study area would have adverse cumulative impacts on archeological resources, as described previously in the "Cumulative Impacts Common to All Alternatives" section. When the impacts on archeological resources as a result of alternative 2b are combined with the other projects inside the study area, an overall adverse cumulative impact would be expected. Alternative 2b would not alter the level of impact.

Conclusion

The implementation of alternative 2b could have adverse effects on potential historic properties and those recommended as being historic properties. As discussed, direct impacts to archeological sites could be

mitigated through avoidance and engineering controls, with the exception of a portion of the site containing only prehistoric remains. For the portion of this prehistoric site subject to disturbance, it was recommended that no additional work was needed because the site would retain National Register eligibility. The cumulative effects of activities under alternative 2b, coupled with other past, present, and future projects noted, could constitute adverse cumulative effects.

After applying the Advisory Council criteria for adverse effects, the NPS has a preliminary determination that alternative 2b would have an adverse effect on archeological resources based on the potential for discovering significant archeological sites. However, the effect will not be known until pre-construction surveys are completed and the determination may change, depending on the nature of the archeological sites found. As stated for alternative 2, the impacts on archeological resources from the action alternatives is assumed to be significant for the purposes of analysis in this EIS because the nature and extent of archeological resources along any of the action alternatives is not known. Alternative 2b has potential for significant impacts associated with the precedent set by permitting a proposed transmission line that would adversely affect multiple protected resources inside the parks. The results of this action would be contrary to NPS practice and principle of protecting and improving these resources and would potentially establish a precedent that may invite similar proposals by others and make it difficult for the NPS to deny such proposals.

Alternative 3

Due to access limitations, archeological surveys were not conducted within the boundaries of Worthington State Forest, which represents approximately 1.7 miles of the alternative 3 alignment within NPS boundaries.

Inside the study area, a Phase IB archeological survey conducted by John Milner Associates identified one archeological site within the bounds of the alternative 3 corridor (JMA 2011). The site dates to the historic period and appears to be a farmstead. The site contained a cellar hole measuring 23 feet by 14 feet (7 meters by 4.3 meters) and a related surface feature, located 75 feet (23 meters) north of River Road. A total of 273 artifacts were recovered, including a variety of whitewares and redwares, nails, and window glass; no brick was recovered. For all datable artifacts the mean date is 1896.

The site has not been evaluated for significance and possible eligibility for listing in the National Register (i.e., a Phase II evaluation). Thus, because it is yet unknown whether the site constitutes a historic property, an assessment of possible effects on this site must be made under the assumption that the site is indeed a significant archeological resource.

The potential for impacts from clearing, construction, operation, and vegetation maintenance activities, as well as the assessment of impact levels, under alternative 3 are the same as those described for alternative 2. Overall, the potential for adverse impacts from alternative 3 activities exists; however it is unknown whether the site identified during the Phase IB archeological survey is significant.

Section 106 Summary

The application of the Advisory Council criteria of adverse effects (36 CFR § 800.5, “Assessment of Adverse Effects”) has not been fully completed; however, it is apparent that adverse effects would occur on archaeological resources. At this time it has been determined that alternative 3 would have an adverse effect on one archaeological resource within the APE. The assessment of effect for archaeological resources is ongoing as final design of the transmission continues. See appendix M for a complete summary of the section 106 process for this final EIS.

Cumulative Impacts

Past, present, and reasonably foreseeable projects inside the study area would have adverse cumulative impacts on archeological resources, as described previously in the "Cumulative Impacts Common to All Alternatives" section. When the impacts on archeological resources as a result of alternative 3 are combined with the other projects inside the study area, an overall adverse cumulative impact would be expected. Alternative 3 would not alter the level of impact.

Conclusion

The implementation of alternative 3 could have adverse impacts on potential historic properties. As discussed, the nature and severity of the impact would depend on the nature and extent of physical disturbance to the archeological resources in the alternative alignment. The cumulative effects of alternative 3, coupled with other past, present, and future projects noted earlier, could constitute adverse cumulative impacts.

After applying the Advisory Council criteria for adverse effects, the NPS made a preliminary determination that alternative 3 would have an adverse effect on archeological resources based on the potential for discovering significant archeological sites. However, the effect will not be known until pre-construction surveys are completed and the determination may change, depending on the nature of the archeological sites found. Although the nature and extent of archeological resources along any of the action alternatives is largely known from surveys, there is still a risk that some archeological resources have not been identified. For the purposes of analysis in this EIS, the potential unknown archeological resources along any of the action alternative alignments are assumed to be significant; therefore, the adverse impacts of any of the action alternatives would also be assumed to be significant. Mitigation would be implemented to avoid and minimize adverse impacts to archeological resources; however, in the absence of site-specific information, it is reasonable to assume that not all adverse impacts can be completely avoided or minimized sufficiently to reduce the intensity below that which would be potentially significant. Therefore, at this time, all of the action alternatives are assumed to have the potential to result in significant adverse impacts on archeological resources. However, if site-specific surveys showed that adverse impacts could be effectively avoided and reduced through mitigation measures, it is also possible that one or more of the action alternatives would not result in significant impacts on archeological resources.

Alternative 3 would contribute to the cumulative adverse impacts on archeological resources in the region surrounding the parks and would increase their scarcity and sensitivity inside the parks, where they are afforded special protection. As stated for alternative 2, permitting this project would reverse the trend of preserving resources by removing non-conforming features and it may establish precedent for future actions. The construction of a transmission line with taller towers would adversely impact the historic structures within the parks, which is counter to their enabling legislation and mandates.

Alternative 4

Inside the study area, a Phase IB archeological survey conducted by John Milner Associates identified one archeological site within the bounds of the alternative 4 corridor (JMA 2011). The site dates to the prehistoric period but cannot be more precisely dated yet. The site has not been evaluated for significance and possible eligibility for listing in the National Register (i.e., a Phase II evaluation). Thus, it is yet unknown whether the site constitutes a historic property, and an assessment of possible effects on this site must be made under the assumption that the site is indeed a significant archeological resource.

The potential for impacts from clearing, construction, operation, and vegetation maintenance activities, as well as the assessment of impact levels, under alternative 4 are the same as those described for alternative 2. Overall, the potential for adverse impacts on archeological resources from alternative 4 activities exists; however, it is unknown whether the site identified during the Phase IB archeological survey is significant.

Section 106 Summary

The application of the Advisory Council criteria of adverse effects (36 CFR § 800.5, "Assessment of Adverse Effects") has not been fully completed; however, it is apparent that adverse effects would occur on archaeological resources. At this time it has been determined that alternative 4 would have an adverse effect on one archaeological site within the APE. The assessment of effect for archaeological resources is ongoing as final design of the transmission continues. See appendix M for a complete summary of the section 106 process for this final EIS.

Cumulative Impacts

Past, present, and reasonably foreseeable projects inside the study area would have adverse cumulative impacts on archeological resources, as described previously in the "Cumulative Impacts Common to All Alternatives" section. When the impacts on archeological resources as a result of alternative 4 are combined with the other projects inside the study area, an overall adverse cumulative impact would be expected. Alternative 4 would not alter the level of impact.

Conclusion

The implementation of alternative 4 could have adverse impacts on a potential historic property. As discussed, the nature and severity of the impact would depend on the nature and extent of physical disturbance to the potential archeological resource in the alternative alignment. The cumulative effects of alternative 4, coupled with other past, present, and future projects noted earlier, could constitute adverse cumulative impacts.

After applying the Advisory Council criteria for adverse effects, the NPS has made a preliminary determination that alternative 4 would have an adverse effect on archeological resources based on the potential for discovering significant archeological sites. However, the effect will not be known until pre-construction surveys are completed and the determination may change, depending on the nature of the archeological sites found. Although the nature and extent of archeological resources along any of the action alternatives is largely known from surveys, there is still a risk that some archeological resources have not been identified. For the purposes of analysis in this EIS, the potential unknown archeological resources along any of the action alternative alignments are assumed to be significant; therefore, the adverse impacts of any of the action alternatives would also be assumed to be significant. Mitigation would be implemented to avoid and minimize adverse impacts to archeological resources; however, in the absence of site-specific information, it is reasonable to assume that not all adverse impacts can be completely avoided or minimized sufficiently to reduce the intensity below that which would be potentially significant. Therefore, at this time, all of the action alternatives are assumed to have the potential to result in significant adverse impacts on archeological resources. However, if site-specific surveys showed that adverse impacts could be effectively avoided and reduced through mitigation measures, it is also possible that one or more of the action alternatives would not result in significant impacts on archeological resources.

As with the other action alternatives, alternative 4 also has potential for significant adverse impacts associated with the precedent set by permitting a proposed transmission line that would adversely affect multiple protected resources inside the parks, contrary to NPS practice and principle of protecting and

improving these resources and potentially establishing a precedent that may invite similar proposals by others and make it difficult for the NPS to deny such proposals. As previously noted, DEWA and APPA both contain numerous other utility crossings, which makes the risk of such precedent particularly concerning for these parks and which could have ramifications for parks nationwide. The precedent potentially set by alternative 4 may include more consideration of moving infrastructure to the edges of NPS units; however, this does not offset the adverse impacts caused by the presence of such infrastructure. Alternative 4 would persist as a non-conforming feature in the parks landscape and would remain for the life of the line.

Alternative 5

Inside the study area, alternative 5 would follow the same route as alternative 4 through DEWA and APPA, except for a portion of the B-K Line from the Bushkill Substation to the western boundary of DEWA. The Phase IB archeological survey (Berger 2010b) did not identify archeological resources in this portion of the B-K Line ROW; therefore, the adverse impacts inside the study area for alternative 5 would be the same as those described for alternative 4.

Section 106 Summary

The application of the Advisory Council criteria of adverse effects (36 CFR § 800.5, "Assessment of Adverse Effects") has not been fully completed; however, it is apparent that adverse effects would occur on archaeological resources. At this time it has been determined that alternative 5 would have an adverse effect on one archaeological resource within the APE. The assessment of effect for archaeological resources is ongoing as final design of the transmission continues. See appendix M for a complete summary of the section 106 process for this final EIS.

Cumulative Impacts

Past, present, and reasonably foreseeable projects inside the study area would have adverse cumulative impacts on archeological resources, as described previously in the "Cumulative Impacts Common to All Alternatives" section. When the impacts on archeological resources as a result of alternative 5 are combined with other projects inside the study area, an overall adverse cumulative impact would be expected. Alternative 5 would not alter the level of impact.

Conclusion

The implementation of alternative 5 could have adverse impacts on a potential historic property. As discussed, the nature and severity of the impact would depend on the nature and extent of physical disturbance to the potential archeological resources in the alternative alignment. The cumulative effects of alternative 5, coupled with other past, present, and future projects noted earlier, could constitute adverse cumulative impacts.

After applying the Advisory Council criteria for adverse effects, the NPS made a preliminary determination that alternative 5 would have an adverse effect on archeological resources based on the potential for discovering significant archeological sites. However, the effect will not be known until pre-construction surveys are completed and the determination may change, depending on the nature of the archeological sites found. Because the nature and extent of archeological resources along any of the action alternatives is not known, for the purposes of analysis in this EIS, the unknown archeological resources along any of the action alternative alignments are assumed to be significant; therefore, the adverse impacts of any of the action alternatives would also be assumed to be significant. Mitigation would be implemented to avoid and minimize adverse impacts to archeological resources; however, in the

absence of site-specific information, it is reasonable to assume that not all adverse impacts can be completely avoided or minimized sufficiently to reduce the intensity below that which would be potentially significant. Therefore, at this time, all of the action alternatives are assumed to have potential to result in significant adverse impacts on archeological resources. However, if site-specific surveys showed that adverse impacts could be effectively avoided and reduced through mitigation measures, it is also possible that one or more of the action alternatives would not result in significant impacts on archeological resources.

As stated for alternative 2, the impacts on archeological resources from the action alternatives is assumed to be significant for the purposes of analysis in this EIS because the nature and extent of archeological resources along any of the action alternatives is not known. Alternative 5 has potential for significant impacts associated with the precedent set by permitting a proposed transmission line that would adversely affect multiple protected resources inside the parks. The results of this action would be contrary to NPS practice and principle of protecting and improving these resources and would potentially establish a precedent that may invite similar proposals by others and make it difficult for the NPS to deny such proposals.

HISTORIC STRUCTURES

METHODOLOGIES

The methodologies for analyzing impacts to and treatment of historic structures considers the objectives of both NEPA and NHPA because the NPS has elected to integrate its compliance with Section 106 of the NHPA into the NEPA process and documentation pursuant to 36 CFR § 800.8(c). NEPA and NHPA are separate statutes with similar objectives regarding the treatment of historic structures. NEPA is very generalized, requiring federal agencies "to use all practicable means….to improve and coordinate federal plans….to preserve important historic [and] cultural aspects of our national heritage" and prepare "a detailed statement" on "the environmental impact of the proposed action" and "any adverse environmental effects which cannot be avoided" (Pub. L. 91-190, 42 USC §§ 4331-4332). These historic and cultural aspects are not defined in the statute, and there is no explicit guidance on how to achieve these objective. Section 106 of NHPA, on the other hand, is very specific about which structures are considered "historic" and thus subject to assessments for possible adverse effects. Therefore, the implementing regulations for NHPA (36 CFR Part 800) are normally employed to meet the compliance requirements of both NEPA and NHPA. Under NHPA, an *adverse effect* is recognized through a consideration of its ability to diminish or destroy the character-defining features of the historic structure, those features that convey the structure's significance. The ability of a structure to convey significance is known as integrity. As defined by the NPS, there are seven aspects of integrity: location, design, setting, materials, workmanship, feeling, and association. Five of these aspects (location, design, materials, workmanship, and association) relate mainly to physical effects, such as alteration or demolition of historic structures. With the exception of demolition of the historic B-K Line, physical effects on historic structures are not anticipated under any of the proposed alternatives. Two of these aspects of integrity (setting and feeling) relate mainly to visual impacts or effects.

Setting is the physical environment of a historic structure, and *feeling* is a structure's expression of the aesthetic or historic sense of a particular period of time (NPS 1991b: 44–49). For many historic structures in village or farmstead contexts, the idyllic rural setting commonly associated with these resource types is a character-defining feature. Feeling, while closely associated with setting, is more subjective still and is discerned entirely through field investigation. While the aesthetic sense of a particular period can be fairly easily recognized on site by a trained professional, the historic sense of a particular period requires some imagination, especially if the period of significance of the historic structure predates one's life experience. While proximity and sight lines to proposed alignments necessarily factor into assessments of visual

effects, the more subjective aspects of integrity are the driving considerations: whether the proposed undertaking would diminish the integrity of setting and feeling of identified historic structures, thus diminishing or destroying their character-defining features.

Existing Data Review: Historic structures were identified in several ways depending on their locations. For the portions of the APE associated with alternatives 1, 2, and 2b, information was drawn from the results of the cultural landscape investigation (JMA 2011) and historic architecture eligibility and effects report (Berger 2012). For the portions of the APE associated with alternatives 3, 4, and 5 within the parks' boundaries, where extensive previous investigation had occurred, the DEWA inventory of historic structures was consulted. This inventory included a GIS layer containing points identifying the location of each identified resource, and a database containing standardized information about the identity, location, status, type, and age of each resource. Information was extracted from the GIS layer and database to create field maps and structure lists. For the portions of the APE associated with alternatives 3, 4, and 5 outside the parks' boundaries, where little or no previous investigation had occurred, a reconnaissance survey was conducted to determine the presence of structures that met the 50-year age consideration (pre-1961) and integrity requirements of the National Register (NPS 1991b). The Pennsylvania SHPO Cultural Resources Geographic Information System website and NJ HPO survey files were also reviewed to determine the presence and location of previously identified structures (Clark et al. 2011).

Field Investigation: Each identified historic structure was field checked to determine its presence or absence (standing or demolished), its state of integrity, and whether its landscape setting appeared to contribute to its historical and/or architectural significance. These notations were correlated with the findings of the cultural landscape study and historic architecture eligibility and effects report to identify structures that also contributed to one or more identified cultural landscapes. Structures were photographed using a Nikon D90 digital SLR (single lens reflex) camera with a NIKKOR 18–105 mm lens and a Nikon GP-1 Global Positioning System (GPS) adapter. The GPS adapter allowed for a determination of precise locations and the precise measurement of distances between structures and alignments. In addition, photographs were taken from the vicinity of each structure toward the relevant alignment. A lens setting of 32 mm (equivalent to 50 mm on a standard 35 mm camera) allowed for an approximation of normal human eyesight relative to scale.

Effect Assessment: Possible effects were assessed through thoughtful consideration of proximity and probable sight lines from the historic structures to the alternatives, and the importance of the integrity of setting and feeling relative to appropriate NHPA section 106 effect definitions.

Resource-specific context for assessing the significance of effects in accordance with NEPA and the CEQ regulations includes the following:

- Historic preservation is specifically identified in DEWA's enabling legislation.
- DEWA preserves the theme of the initial westward expansion of coastal colonies.
- DEWA contains some of earliest examples of historical structures in the region; many of these sites retain their original appearance and orientation in largely intact surroundings (e.g., Old Mine Road is the earliest commercial road in the county).
- Historic structures are major draw for visitation (approximately 44% visitors identified these as important).

STUDY AREA

The designated APE for historic structures is described in the "Historic Structures" section of chapter 3.

CUMULATIVE EFFECTS COMMON TO ALL ALTERNATIVES

An assessment of cumulative effects on cultural resources is required by both the CEQ and NHPA. Existing and anticipated future projects at DEWA, MDSR, and APPA were identified to determine the potential cumulative effects. Past, present, and reasonably foreseeable activities that have beneficial or adverse effects on historic structures in the parks and inside and outside the study area are listed here and discussed under each alternative as applicable.

Projects Inside the Study Area

Inside the study area, the following projects could cause adverse changes to character-defining features of historic structures: PADOT SR 2001 (road reconstruction), the rehabilitation of road bridges throughout the parks in New Jersey and Pennsylvania, the repair of Watergate Dam #10, and hazardous structure demolition and deconstruction. Other projects or activities with adverse effects include the PPL Electric Utilities Northeast Pocono reliability project, the PPL proposal for a 138/12-kV substation, existing utility towers within 5 miles, illegal ORV use, trespassing, vandalism, and arson. The proposed projects near APPA and other historic structures could have adverse effects on such structures. Projects that could have a beneficial effect on historic structures include Delaware River bridge projects, the repair of historic stone culverts on Mountain Road, the rehabilitation of Childs Park, and the regrading of six historic building sites.

Inside the study area several past, present, and reasonably foreseeable actions analyzed are specific to historic structures. The proposed projects that preserve and/or rehabilitate historic buildings, structures, or landscape features inside the study area could have beneficial effects on historic structures. For example, in the study area, the proposed stabilization and repair of B.B. Van Campen House, Broadhead Farm, and Miller House could have beneficial effects on these structures, provided the improvements are made in accordance with the Secretary of the Interior's Standards. Beneficial effects could also result from comprehensive planning and management documents through BMPs to protect historic structures.

The combined beneficial and adverse effects of the past, present, and reasonably foreseeable projects that could affect historic structures could result in an adverse cumulative effect on historic structures.

Projects Outside the Study Area

Outside the study area, utility projects and other development projects have the potential to cause adverse changes to character-defining features of historic structures, including PADOT SR 2001 (road reconstruction), the PPL Electric Utilities Northeast Pocono reliability project, the PPL proposal for a 138/12-kV substation; and existing utility towers within 5 miles. Several utility projects have the potential to cause adverse changes to character-defining features of historic structures; however, the effects are unknown: the Northeast Supply Link Expansion – Palmerton Loop, and the Dominion/Allegheny Power Transmission Line Project. Projects that could have a beneficial effect include Pike County agricultural security areas. In addition, projects outside the study area are somewhat mitigated by a variety of conservation and open space plans that could have beneficial effects on historic structures.

The effects on historic structures from these projects outside the study area would be the same as those described for projects inside the study area, although the route is unknown outside the study area. Therefore, projects outside the study area could result in adverse cumulative effects on historic structures, depending on the presence and extent of historic structures found along the route outside the study area.

EFFECTS OF THE ALTERNATIVES ON HISTORIC STRUCTURES

Section 106 effects are summarized by identified historic structure and alternative in tables 48 through 50 in the following sections. The identification numbers are taken from two sources, depending on how the information was collected. Historic structures located inside the park's boundary that were included in the DEWA historic structure inventory are listed by their assigned DEWA identification numbers. Historic structures located inside the park's boundary that were not included in the DEWA historic structure inventory or historic structures outside the park's boundary that were field surveyed are listed by arbitrarily assigned Pennsylvania or New Jersey numbers.

Common to All Alternatives

Mitigation Measures: Mitigation measures would reduce effects on historic structures from construction, operation, and maintenance activities for all action alternatives and are described in chapter 2 and appendix F.

Outside the Study Area: Outside the study area, regardless of which alternative is selected, the transmission line could pass through Carbon, Lackawanna, Luzerne, Monroe, Northampton, Pike, and Wayne counties in Pennsylvania and Morris, Sussex, and Warren counties in New Jersey.

Clearing, construction, and vegetation maintenance activities outside the study area would be consistent with those described for inside the study area; however, the effects outside the study area would be indirect. The direct effects from the construction of the transmission line outside the study area cannot be determined, as described in the introduction of this chapter. Additionally, the specific historic structures that would be affected by the transmission line outside the study area cannot be identified until the route is chosen by the applicant. Upon this decision, additional surveys would be required to determine whether historic structures would be affected along the selected route.

Outside the study area, the proposed transmission line could pass through the Pocono environmental heritage region, Delaware and Lehigh National Heritage Corridor, and Lackawanna Heritage Valley state and national heritage area. Because the location of the line outside the study area is not known, the presence and number of historic structures in visual proximity to any of the alternatives is undocumented.

Outside the study area, indirect adverse effects on historic structures would result from vegetation clearing and maintenance associated with the no-action alternative. Under all action alternatives, indirect adverse effects on historic structures would result from clearing, construction, and vegetation maintenance outside the study area. Cumulative effects outside the study area would result in adverse effects on historic structures, as described previously in the "Cumulative Effects Common to All Alternatives" section. When the adverse indirect effects on historic structures as a result of activities outside the study area are combined with other past, present, and reasonably foreseeable projects in the study area, an overall adverse cumulative effect would be expected. The S-R Line project would not alter the level of effect.

Alternative 1: No Action

Inside the study area, under the no-action alternative the widening of the existing transmission line ROW would not occur. Currently, historic structures, including APPA, are located near the existing line, and the existing line has a direct visual effect. Annual vegetation maintenance as described in the applicant's vegetation management plans would result in the removal or loss of existing vegetation and would negate any visual mitigation to existing historic structures. Therefore, adverse effects on historic structures would occur under alternative 1.

Cumulative Effects

Cumulative effects on historic structures from past, present, and reasonably foreseeable projects inside the study area would be adverse, as described previously in the "Cumulative Effects Common to All Alternatives" section. When the effects on historic structures as a result of alternative 1 are combined with the other projects inside the study area, an overall adverse cumulative effect would be expected. Alternative 1 would not alter the level of effect.

Conclusion

Alternative 1, the no-action alternative, would result in the continued operation and maintenance of the existing transmission line. There would be adverse effects on historic structures; the effects from alternative 1 are based on visual effects from the removal of vegetation during maintenance activities. The effects of past, present, and reasonably foreseeable projects, when combined with the effects on historic structures under alternative 1, would result in adverse cumulative effects on historic structures inside the study area.

The adverse effects of alternative 1 would be confined to the limits of the present ROW and none of the adverse effects would change existing conditions. After applying the Advisory Council criteria for adverse effects, the NPS determined that implementation of alternative 1 would result in a finding of no adverse effects to historic structures. Therefore, the actions under alternative 1 would be in keeping with the parks' enabling legislations, NPS *Management Policies 2006*, and all other applicable federal and state laws. Although there are adverse effects associated with the continued operation and maintenance of the B-K Line, the intensity of the adverse effects in the context of historic structures in the parks would not be considered significant.

Common to All Action Alternatives

Removal of Existing Structures: All action alternatives (2, 2b, 3, 4, and 5) would involve the removal of all or a portion of the B-K Line, as described in chapter 2. During the removal and disposal of existing structures, visual effects on historic structures would occur from dust production, the removal of the crane pads and equipment at wire pulling sites, the disassembly and removal of lattice towers, the creation of access roads, and the transportation of construction equipment to and from the decommissioning sites. Similar effects would occur related to the construction of the new facilities. The removal of the existing structures would have an effect on the B-K Line, which is eligible for listing. Access roads and spur roads would require clearing and grading and would affect historic structures in the immediate vicinity of the roads. After the completion of the transmission lines, access roads with gravel surfacing would continue to be maintained. Such actions would have adverse effects on historic structures in DEWA and on APPA.

Vegetation Clearing: The ROWs would be cleared of vegetation for the construction of the new double 500-kV transmission line for alternatives 2 through 5. Alternatives 2, 3, 4, and 5 include clearing up to 350 feet; the ROW would be extended up to 175 feet from either side of the centerline of the existing ROW. Under alternative 2b, the applicant proposes to operate the S-R Line within the existing ROW. The NPS anticipates that the applicant would require additional area for construction; therefore, it is estimated that under alternative 2b, the applicant would expand the ROW to the extent of their deeded property rights, which ranges from 100 feet to 380 feet. For alternative 2b, the ROW would be cleared on either side of the centerline to an appropriate width based on the deeded property rights. Clearing would be complete for all action alternatives, with the exception of the 50-foot buffer near intermittent streams/wetlands and the 100-foot buffer near perennial waterways such as the Delaware River (PPL and PSE&G 2008, 7).

Section 106 Summary: NHPA section 106 regulations apply only to structures that meet the eligibility requirements of the National Register. Therefore, the assessment of NHPA section 106 effects applies only to those historic structures that are listed in the National Register or those that meet National Register criteria for listing. Tables 48 through 50 list all of the historic structures identified in DEWA. The section 106 effects are presented in these tables for the structures that are listed in the National Register or are considered eligible for listing.

Alternative 2

Alternative 2 would result in possible effects on 36 identified structures, all known to meet National Register eligibility requirements. With the exception of demolition of the historic B-K Line, none of the effects would be direct physical effects, but would be visual and would vary depending on how the viewshed of the historic structure is affected by clearing or construction of alternative 2. Visual effects would result from removal or loss of vegetation and from sight of the larger transmission towers and more numerous conductors within the viewshed of the historic structures. The presence of the large towers and lines would diminish the integrity of setting, feeling, and association of numerous historic structures. Under alternative 2, the overall assessment of effect for section 106 would be an adverse effect to historic structures.

Section 106 Summary

The application of the Advisory Council criteria of adverse effects (36 CFR § 800.5, "Assessment of Adverse Effects") has not been fully completed; however, it is apparent that adverse effects would occur on historic structures. There were 36 identified historic structures within the APE. At this time it has been determined that alternative 2 would have an adverse effect on at least 17 historic structures within the APE. Alternative 2 would have no adverse effect on 19 historic structures (table 48). The assessment of effect for historic structures is ongoing as final design of the transmission line progresses and section 106 consultation continues. See appendix M for a complete summary of the section 106 process for this final EIS.

Cumulative Effects

Cumulative effects on historic structures from past, present, and reasonably foreseeable projects inside the study area would be adverse, as described previously in the "Cumulative Effects Common to All Alternatives" section. Within the study area, non-historic elements of two historic structures and four non-historic structures (the non-historic components of the Copper Mine Inn Complex, John Michael Farm, and the Cornelius Gunn House [outbuildings], and the non-historic structures Oakley Stoll House, Sadie Van Campen House, and John P. House Farmstead/Romaine Warner House) are planned for demolition or have already been removed under the hazardous structures removal program. When the effects on historic structures as a result of alternative 2 are combined with the other projects inside the study area, an overall adverse cumulative effect would be expected. Alternative 2 would not alter the level of effect.

Conclusion

Alternative 2 would have an adverse effect on 1 historic structure through physical destruction and at least 16 historic structures through visual effects. The visual effects would be somewhat mitigated by the beneficial effects associated with the planned improvements to several historic structures in the study area. When the effects from alternative 2 are considered with the effects of other past, present, and future projects inside the study area, the cumulative effects would be adverse.

Alternative 2 would have adverse effects on historic structures that would be significant. After applying the Advisory Council criteria for adverse effects, the NPS determined that implementation of alternative 2 would have an adverse effect on at least 17 historic structures. The adverse visual effect would result from the visual intrusion of the higher transmission line towers and lines and a larger ROW that cannot be effectively avoided or minimized and would diminish the integrity of the setting, feeling, and association. These effects would be further exacerbated by the function of the national parks specifically to protect such resources. In the context of the purpose and significance for which DEWA, APPA, and MDSR were established and NPS mandates to specifically preserve the natural, cultural, and scenic resources within them, the adverse effects of alternative 2 on historic structures would likely be considered significant.

Permitting the project would adversely affect multiple protected resources inside the parks, in some instances irreversibly. Allowing such adverse effects in order to facilitate private infrastructure expansion would be contrary to NPS practice and principle of protecting and improving these resources, and of removing incompatible infrastructure to do so. This could establish a precedent that may invite similar proposals by other applicants in the future, and create an expectation of like treatment for those proposals; it may make it difficult to deny such proposals. DEWA and APPA both contain numerous other utility crossings, which makes the risk of such precedent particularly concerning for these parks. Furthermore, as units of the national park system, wherein all parks are entitled to equal protection, creating such a precedent could have ramifications for parks nationwide. The location of this particular crossing through the center of DEWA could make such a precedent even more potent. Installing the S-R Line on this alignment may invite future utilities proposing to follow the same route.

Public attention surrounding this project is high. There is likely to be a high degree of controversy over any effects on park resources that are particularly popular with the public, such as scenery, visitor use and experience, rare and unique communities, cultural landscapes, and historic structures, for any of the alternatives. The inherent uncertain nature of predicting the true degree of some of these impacts would likely heighten this controversy. Additionally, construction at this particular location in DEWA is likely to accentuate the controversy due to the unique characteristics presented here and high visitor traffic to the area.

The applicant’s project would impact portions of several resources inside the park that are also under pressure in the surrounding region. This project is one component of a larger regional plan by the Regional Transmission Operator (RTO) to enhance systems reliability. Other component projects of this plan have already and would continue to affect APPA, especially in the areas of scenic resources and visitor use and experience, as well as other national parks in their paths. The overall experience of the APPA visitor would be degraded because this project would contribute cumulatively to the adverse impacts cause by the infrastructure projects along the entirety of the trail. Additionally, multiple types of development outside of DEWA and APPA are quickly diminishing several of the resources analyzed at a broader scale. The reduction of these resources in the region surrounding the parks increases the scarcity and sensitivity of them inside the parks where they are afforded special protection. Alternative 2 would contribute to the cumulative adverse impact on these resources.

Alternative 2b

The alternative 2b alignment would require two additional transmission towers within NPS boundaries; however, the visual effects on historic structures would be considered the same. Therefore, the adverse effects for alternative 2b would be the same as those described for alternative 2 and would be caused by the visual effects of the new transmission line on the historic structures inside the study area.

Section 106 Summary

The application of the Advisory Council criteria of adverse effects (36 CFR § 800.5, "Assessment of Adverse Effects") has not been fully completed; however, it is apparent that adverse effects would occur on historic structures. There were 36 identified historic structures within the APE. At this time it has been determined that alternative 2b would have an adverse effect on at least 17 historic structures within the APE. Alternative 2b would have no adverse effect on 19 historic structures (table 48). The assessment of effect for historic structures is ongoing as final design of the transmission line progresses and Section 106 consultation continues. See appendix M for a complete summary of the section 106 process for this final EIS.

Cumulative Effects

Cumulative effects on historic structures from past, present, and reasonably foreseeable projects inside the study area would be adverse, as described previously in the "Cumulative Effects Common to All Alternatives" section. Within the study area, non-historic elements of two historic structures and four non-historic structures (the non-historic components of the Copper Mine Inn Complex, John Michael Farm, and the Cornelius Gunn House [outbuildings], and the non-historic structures Oakley Stoll House, Sadie Van Campen House, and John P. House Farmstead/Romaine Warner House) are planned for demolition or have already been removed under the hazardous structures removal program. When the effects on historic structures as a result of alternative 2b are combined with the other projects inside the study area, an overall adverse cumulative effect would be expected. Alternative 2b would not alter the level of effect.

Conclusion

Alternative 2b would have adverse effects on at least 17 historic structures. The presence of the large towers and lines would diminish the integrity of setting, feeling, and association of numerous historic structures. The effects would be somewhat mitigated by the beneficial effects associated with the planned improvements to several historic structures in the study area. When considered with the adverse effects of other past, present, and future projects inside the study area, the overall cumulative effects from alternative 2b would be adverse.

Alternative 2b would contribute to the cumulative adverse impacts on historic structures in the region surrounding the parks and would increase their scarcity and sensitivity inside the parks where they are afforded special protection. As stated for alternative 2, permitting this project would reverse the trend of preserving resources by removing non-conforming features and it may establish precedent for future actions. The construction of a transmission line with taller towers would adversely impact the historic structures within the parks, which is counter to their enabling legislation and mandates. The adverse effects of alternative 2b would be the same as alternative 2; therefore, for the same reasons outlined for alternative 2, alternative 2b may potentially result in significant adverse effects on historic structures.

Public attention surrounding this project is high. There is likely to be a high degree of controversy over any effects on park resources that are particularly popular with the public, such as scenery, visitor use and experience, rare and unique communities, cultural landscapes, and historic structures, for any of the alternatives. The inherent uncertain nature of predicting the true degree of some of these impacts would likely heighten this controversy. Additionally, construction at this particular location in DEWA is likely to accentuate the controversy due to the unique characteristics presented here and high visitor traffic to the area.

TABLE 48: SUMMARY OF NHPA SECTION 106 EFFECTS ON HISTORIC STRUCTURES FOR ALTERNATIVES 2 AND 2B

ID	Name (Date)	Section 106 Effect
103	Newcomb House (Larch Hollow) (1850)	*No adverse effect*
139	*Copper Mine Inn (1840)	*No adverse effect*
162	Calno School (1880)	*Adverse effect*
171	Schoonover Mountain House/Farm (1860)	*Adverse effect*
178/181	John Turn Farm: Limekiln, Smokehouse, Weavehouse (1815)	*No adverse effect*
191	Horace Van Auken House (1880)	*Adverse effect*
196	*Miller House/Amos Van Campen Outbuildings (1860)	*No adverse effect*
197	*Abraham Van Campen House/Zipser House (1900)	*No adverse effect*
198	*B.B. Van Campen House (1840)	*Adverse effect*
206	James Van Campen Farm “Blasi” (c.1875)	*Adverse effect*
236	Costello House (Smith House) (c.1800)	*No adverse effect*
242	Peters House (1840)	*No adverse effect*
247	Bushkill Dutch Reform Church (1860)	*No adverse effect*
283	Captain Jacob Shoemaker House (1810)	*Adverse effect*
294	*Millbrook Schoolhouse (1840)	*Adverse effect*
296	*E. L. Garris House (1852)	*Adverse effect*
297	*Sylvester Hill House (1850)	*Adverse effect*
302/303	*Decker Ferry House (1795/1895)	*Adverse effect*
327	*Salamovka (Delaware View House) (1850)	*Adverse effect*
343	Rosenkrans House (1800)	*No adverse effect*
397	Nyce Farm-Van Gordon House (Eshback Farm) (1775-1795)	*No adverse effect*
464	Brodhead Farm “Wheat Plains” (Heller Farm) (1890)	*No adverse effect*
518-523	Shoemaker-Houck Farm (Silver Spray Farm) (1822)	*No adverse effect*
525	Jacob Roe House (1812)	*No adverse effect*
527	Walpack Center Historic District (1850)	*No adverse effect*
PA-63	Zion Lutheran Church (1851)	*No adverse effect*
PA-66/NJ-1	Appalachian Trail (Appalachian National Scenic Trail) (1926, 1933)	*Adverse effect*
PA-80	John Michael Farm (1875)	*No adverse effect*
PA-84/NJ-11	PA-NJ Interconnection (1928-1956)	*Adverse effect*
NJ-3	Old Mine Road Historic District	*Adverse effect*
NJ-4	Milbrook Village Historic District (1832-1875)	*Adverse effect*
NJ-18	Camp Ken-Etiwa-Pec (1938)	*No adverse effect*
NJ-19	Catfish Fire Tower (State of NJ property) (1922/1993)	*Adverse effect*
NJ-20	Chado Farm/Broadstone Farms (1900/1932)	*No adverse effect*
NJ-21	*George Trauger House (1860)	*Adverse effect*
NJ-22	Isaac Van Campen Inn (c.1750)	*No adverse effect*

*Starred properties contribute to the Old Mine Road Historic District

Alternative 3

Alternative 3 would result in possible effects to 61 identified structures, some known to meet National Register eligibility requirements and others as yet undetermined. With the exception of demolition of the historic B-K Line, none of the effects would be physical, but would be visual, as described for alternative 2. The presence of the large towers and lines would diminish the integrity of setting, feeling, and association of numerous historic structures. Under alternative 3, the overall assessment of effect for section 106 would be an adverse effect to historic structures.

Section 106 Summary

The application of the Advisory Council criteria of adverse effects (36 CFR § 800.5, "Assessment of Adverse Effects") has not been fully completed; however, it is apparent that adverse effects would occur on historic structures. Of the 61 structures identified for study within the APE, 33 have been determined to be historic structures. At this time it has been determined that alternative 3 would have an adverse effect on at least 7 historic structures within the APE. Alternative 3 would have no adverse effect on 26 historic structures (table 49). The assessment of effect for historic structures is ongoing as final design of the transmission line progresses and Section 106 consultation continues. See appendix M for a complete summary of the section 106 process for this final EIS.

TABLE 49: SUMMARY OF NHPA SECTION 106 EFFECTS ON HISTORIC STRUCTURES FOR ALTERNATIVE 3

ID	Name (Date)	Section 106 Effect
37	Slateford Farm (1800, 1833)	*No adverse effect*
39	Munsch-Cyr Farm (1910)	*No adverse effect*
60	Old Delaware Water Gap Railroad Station	*No adverse effect*
103	Newcomb House (Larch Hollow) (1850)	*Adverse effect*
139	*Copper Mine Inn (1840)	*Adverse effect*
162	Calno School (1880)	*Adverse effect*
171	Schoonover Mountain House/Farm (1860)	*No adverse effect*
172	Gonzales Mill Site (1840)	*Eligibility undetermined*
178/181	John Turn Farm: Limekiln, Smokehouse, Weavehouse (1815)	*No adverse effect*
191	Horace Van Auken House (1880)	*No adverse effect*
194	Van Campen Cemetery (1850)	*Eligibility undetermined*
196	*Miller House/Amos Van Campen Outbuildings (1860)	*No adverse effect*
197	*Abraham Van Campen House/Zipser House (1900)	*No adverse effect*
198	*B.B. Van Campen House (1840)	*No adverse effect*
201	De Pue Cemetery (1819)	*Eligibility undetermined*
206	James Van Campen Farm "Blasi" (c.1875)	*No adverse effect*
236	Costello House (Smith House) (c.1800)	*No adverse effect*
242	Peters House (1840)	*No adverse effect*
244	John Turn Store and Tinsmith Shop (1840)	*No adverse effect*
247	Bushkill Dutch Reform Church (1860)	*No adverse effect*
258	Ralph G. Turn Jr. House (1920)	*Eligibility undetermined*
264	Dippre House (1920)	*Eligibility undetermined*

ID	Name (Date)	Section 106 Effect
282	Kinney-Hawkins House/Millbrook General Store (1860)	*Eligibility undetermined*
283	Captain Jacob Shoemaker House (1810)	*No adverse effect*
294	*Millbrook Schoolhouse (1840)	*No adverse effect*
296	*E. L. Garris House (1852)	*No adverse effect*
297	*Sylvester Hill House (1850)	*No adverse effect*
327	*Salamovka (Delaware View House) (1850)	*No adverse effect*
340	Van Scouder-Knight Farm (early 1800s)	*Eligibility undetermined*
343	Rosenkrans House (1800)	*No adverse effect*
PA-1	Unnamed farmstead (1850)	*Eligibility undetermined*
PA-2	Unnamed farmstead (1910)	*Eligibility undetermined*
PA-3	Unnamed dwelling (1920)	*Eligibility undetermined*
PA-4	Henry Transue Farm (1870)	*Eligibility undetermined*
PA-5	Unnamed dwelling (1935)	*Eligibility undetermined*
PA-6	Spring Hills Farm (1830)	*Eligibility undetermined*
PA-7	Inwood (1800)	*Eligibility undetermined*
PA-8	Cortwright-Meegan Farm (1856)	*Eligibility undetermined*
PA-9	Egger Home (1880)	*Eligibility undetermined*
PA-10	Unnamed dwelling (1920)	*Eligibility undetermined*
PA-11	Unnamed dwelling (1930)	*Eligibility undetermined*
PA-63	Zion Lutheran Church (1851)	*No adverse effect*
PA-65	Delaware Water Gap Historic District (1841)	*No adverse effect*
PA-66/NJ-1	Appalachian Trail (Appalachian National Scenic Trail) (1926, 1933)	*Adverse effect*
PA-67	Delaware, Lackawanna and Western Railroad (1908)	*No adverse effect*
PA-69	Ernest and Theresa Fleischman House (1947)	*Eligibility undetermined*
PA-78	Emanuel and Juliette Wagenhouzen House (1923)	*Eligibility undetermined*
PA-80	John Michael Farm (1875)	*Adverse effect*
PA-84/NJ-11	PA-NJ Interconnection (1928-1956)	*Adverse effect*
NJ-2	Delaware Water Gap Slate Co. Historic District (1870-1904)	*No adverse effect*
NJ-3	Old Mine Road Historic District	*Adverse effect*
NJ-4	Millbrook Village Historic District (1832-1875)	*No adverse effect*
NJ-5	New York Susquehanna and Western RR Bridge	*Eligibility undetermined*
NJ-6	Delaware Water Gap Toll Bridge	*Eligibility undetermined*
NJ-9	Yards Creek Pumped Storage Electric Gen. Sta.	*Eligibility undetermined*
NJ-10	Yards Creek Hydro-Power Tunnel and Penstock	*Eligibility undetermined*
NJ-12	Sussex County Bridge #318	*Eligibility undetermined*
NJ-13	Sussex County Bridge #330 (Flatbrookville Bridge) (1884-1886)	*Eligibility undetermined*
NJ-16	Stanley and Louise Parr Property (1940)	*Eligibility undetermined*
NJ-17	Ribble-Boehme Barn (1880)	*Eligibility undetermined*
NJ-21	*George Trauger House (1860)	*No adverse effect*

*Starred properties contribute to the Old Mine Road Historic District

Cumulative Effects

Cumulative effects on historic structures from past, present, and reasonably foreseeable projects inside the study area would be adverse, as described previously in the "Cumulative Effects Common to All Alternatives" section. Within the study area 5 structures (non-historic components of the Copper Mine Inn Complex, Dippre House, non-historic components of the John Michael Farm, Sadie Van Campen House, and Smith House/Costello House) are planned for demolition under the hazardous structures removal program. When the effects on historic structures as a result of alternative 3 are combined with the other projects inside the study area, an overall adverse cumulative effect would be expected. Alternative 3 would not alter the level of effect (table 49).

Conclusion

Alternative 3 would have adverse effects on at least 7 historic structures. The visual effect would be somewhat mitigated by the beneficial effects associated with the planned improvements to several historic structures in the study area. When considered with the adverse effects of other past, present, and reasonably foreseeable projects inside the study area, the overall cumulative effects of alternative 3 would be adverse.

Alternative 3 would have the same types of adverse effects on historic structures as alternatives 2 or 2b and would affect the largest number of historic structures of any of the action alternatives. Like the other action alternatives, alternative 3 has potential for significant impacts associated with the precedent set by permitting a proposed transmission line that would adversely affect multiple protected resources inside the parks. The results of this action would be contrary to NPS practice and principle of protecting and improving these resources and would potentially establish a precedent that may invite similar proposals by others and make it difficult for the NPS to deny such proposals. After applying the Advisory Council criteria for adverse effects, the NPS has determined that implementation of alternative 3 would have an adverse effect on historic structures because, like alternatives 2 and 2b, alternative 3 would involve demolition of the historic B-K Line and diminish the integrity of setting, feeling, and association of numerous other historic structures. For the same reasons outlined for alternatives 2 and 2b, the adverse effects of alternative 3 on historic structures would likely be considered significant.

Public attention surrounding this project is high. There is likely to be a high degree of controversy over any effects on park resources that are particularly popular with the public, such as scenery, visitor use and experience, rare and unique communities, cultural landscapes, and historic structures, for any of the alternatives. The inherent uncertain nature of predicting the true degree of some of these impacts would likely heighten this controversy.

Alternative 4

Alternative 4 would result in possible effects to 24 historic structures, some known to meet National Register eligibility requirements and others as yet undetermined. With the exception of demolition of the historic B-K Line, none of the effects would be direct physical effects to the historic structures, but would be visual, as described for alternative 2. The presence of the large towers and lines would diminish the integrity of setting, feeling, and association of numerous historic structures. Under alternative 4, the overall assessment of effect for section 106 would be an adverse effect to historic structures.

Section 106 Summary

The application of the Advisory Council criteria of adverse effects (36 CFR § 800.5, "Assessment of Adverse Effects") has not been fully completed; however, it is apparent that adverse effects would occur

on historic structures. Of the 24 structures identified for study within the APE, 9 have been determined to be historic structures. At this time it has been determined that alternative 4 would have an adverse effect on at least 4 historic structure within the APE. Alternative 4 would have no adverse effect on 5 historic structures (table 50). The assessment of effect for historic structures is ongoing as final design of the transmission line progresses and Section 106 consultation continues. See appendix M for a complete summary of the section 106 process for this final EIS.

Cumulative Effects

Cumulative effects on historic structures from past, present, and reasonably foreseeable projects inside the study area would be adverse, as described previously in the "Cumulative Effects Common to All Alternatives" section. When the effects on historic structures as a result of alternative 4 are combined with the other projects inside the study area, an overall adverse cumulative effect would be expected. Alternative 4 would not alter the level of effect.

Conclusion

Alternative 4 would have adverse effects on numerous historic structures through physical and visual effects. The presence of the large towers and lines would diminish the integrity of setting, feeling, and association of numerous historic structures. When considered with the adverse effects of other past, present, and future projects inside the study area, the overall cumulative effects from alternative 4 would be adverse.

Alternative 4 would affect the smallest number of historic structures of any of the action alternatives; however, the adverse effects may still be considered significant because alternative 4 would involve demolition of the historic B-K Line and be an intrusion that would diminish setting, feel, and association of one or more historic structures that cannot be effectively mitigated. Adverse impacts would be offset by the B-K Line removal, but the B-K Line removal is itself an impact on a historic structure, and the historic structures with a view of the B-K Line have had the view for 80 years – long enough to become part of the historic landscape, depending on the period of significance. With the exception of APPA, removal of the B-K Line would not benefit the historic structures affected by alternative 4. After applying the Advisory Council criteria for adverse effects, the NPS has concluded that implementation of alternative 4 would have an adverse effect on historic structures as a result of visual effects from the towers and ROW clearing and physical effects from demolition of the historic B-K Line and access roads.

Alternative 4 would contribute to the cumulative adverse impacts on historic structures in the region surrounding the parks and would increase their scarcity and sensitivity inside the parks, where they are afforded special protection. As stated for alternative 2, permitting this project would reverse the trend of preserving resources by removing non-conforming features and it may establish precedent for future actions. The construction of a transmission line with taller towers would adversely impact the historic structures within the parks, which is counter to their enabling legislation and mandates. Considered in the context of the laws and policies that govern protection and management of historic structures in national parks, the adverse effects of alternative 4 would likely be considered significant.

Public attention surrounding this project is high. There is likely to be a high degree of controversy over any effects on park resources that are particularly popular with the public, such as scenery, visitor use and experience, rare and unique communities, cultural landscapes, and historic structures, for any of the alternatives. The inherent uncertain nature of predicting the true degree of some of these impacts would likely heighten this controversy.

TABLE 50: SUMMARY OF NHPA SECTION 106 EFFECTS ON HISTORIC STRUCTURES FOR ALTERNATIVES 4 AND 5

ID	Name (Date)	Section 106 Effect
37	Slateford Farm (1800, 1833)	*Adverse effect*
39	Munsch-Cyr Farm (1910)	*Adverse effect*
60	Old Delaware Water Gap Railroad Station	*No adverse effect*
103	Newcomb House (Larch Hollow) (1850)	*No adverse effect*
PA-12	Unnamed dwelling (1900)	*Eligibility undetermined*
PA-13	Unnamed dwelling (1870)	*Eligibility undetermined*
PA-14	Unnamed dwelling (1890)	*Eligibility undetermined*
PA-15	Totts Gap Farm (1820, 1835, alt. ca. 1935, ca. 1945)	*Eligibility undetermined*
PA-16	Drake Farm (1800)	*Eligibility undetermined*
PA-17	Tranquility Farm (1850)	*Eligibility undetermined*
PA-65	Delaware Water Gap Historic District (1841)	*No adverse effect*
PA-66/NJ-1	Appalachian Trail (Appalachian National Scenic Trail) (1926, 1933)	*Adverse effect*
PA-67	Delaware, Lackawanna and Western Railroad (1908)	*No adverse effect*
PA-71	Unnamed farmstead (1800)	*Eligibility undetermined*
PA-84/NJ-11	PA-NJ Interconnection (1928-1956)	*No adverse effect*
NJ-2	Delaware Water Gap Slate Co. Historic District (1870-1904)	*Adverse effect*
NJ-5	New York Susquehanna and Western RR Bridge	*Eligibility undetermined*
NJ-6	Delaware Water Gap Toll Bridge	*Eligibility undetermined*
NJ-9	Yards Creek Pumped Storage Electric Generating Station	*Eligibility undetermined*
NJ-10	Yards Creek Hydro-Power Tunnel and Penstock	*Eligibility undetermined*
NJ-12	Sussex County Bridge #318	*Eligibility undetermined*
NJ-13	Sussex County Bridge #330	*Eligibility undetermined*
NJ-16	Stanley and Louise Parr Property (1940)	*Eligibility undetermined*
NJ-17	Ribble-Boehme Barn (1880)	*Eligibility undetermined*

Alternative 5

The alignments for alternatives 4 and 5 would follow the same route through DEWA and APPA, except for the portion of the B-K Line from the Bushkill Substation to the western boundary of DEWA. The effects for alternative 5 inside the study area would be the same as those described for alternative 4 and would result from physical and visual effects. Under alternative 5, the overall effect on historic structures would be adverse.

Section 106 Summary

The application of the Advisory Council criteria of adverse effects (36 CFR § 800.5, "Assessment of Adverse Effects") has not been fully completed; however, it is apparent that adverse effects would occur on historic structures. Of the 24 structures identified for study within the APE, 9 have been determined to be historic structures. At this time it has been determined that alternative 5 would have an adverse effect on at least 4 historic structure within the APE. Alternative 5 would have no adverse effect on 5 historic

structures (table 50). The assessment of effect for historic structures is ongoing as final design of the transmission line progresses and Section 106 consultation continues. See appendix M for a complete summary of the section 106 process for this final EIS.

Cumulative Effects

Cumulative effects on historic structures from past, present, and reasonably foreseeable projects inside the study area would be adverse, as described previously in the "Cumulative Effects Common to All Alternatives" section. When the adverse effects on historic structures as a result of alternative 5 are combined with the other projects inside the study area, an overall adverse cumulative effect would be expected. Alternative 5 would contribute an appreciable adverse increment to the overall cumulative effect.

Conclusion

Alternative 5 would have adverse effects on numerous historic structures. The presence of the large towers and lines would diminish the integrity of setting, feeling, and association of numerous historic structures. When considered with the adverse effects of other past, present, and future transmission line projects inside the study area, the overall cumulative effects from alternative 5 would be adverse.

As with the other action alternatives, alternative 5 has potential for significant adverse impacts associated with the precedent set by permitting a proposed transmission line that would adversely affect multiple protected resources inside the parks, contrary to NPS practice and principle of protecting and improving these resources and potentially establishing a precedent that may invite similar proposals by others and make it difficult for the NPS to deny such proposals. As previously noted, DEWA and APPA contain numerous other utility crossings, which makes the risk of such precedent particularly concerning for these parks and which could have ramifications for parks nationwide. The infrastructure of alternative 5 would persist as a non-conforming feature in the parks' landscape and would remain for the life of the line. The adverse effects of alternative 5 are the same as alternative 4; therefore, the adverse effects of alternative 4 would also likely be considered significant.

Public attention surrounding this project is high. There is likely to be a high degree of controversy over any effects on park resources that are particularly popular with the public, such as scenery, visitor use and experience, rare and unique communities, cultural landscapes, and historic structures, for any of the alternatives. The inherent uncertain nature of predicting the true degree of some of these impacts would likely heighten this controversy.

CULTURAL LANDSCAPES

METHODOLOGIES

Existing Data Review: Cultural landscape resources were identified in two ways, depending on their locations: for portions of the APE within the DEWA boundary, where previous investigation has occurred, the DEWA database of cultural landscape inventories, the DEWA inventory of historic resources, and the DEWA list of contributing structures were used; for portions of the APE outside the parks' boundaries, where little or no previous investigation had occurred, a reconnaissance survey was conducted to determine the presence of yet unevaluated (or documented) properties that might be eligible for the National Register. The Pennsylvania SHPO Cultural Resources Geographic Information System website and NJ HPO survey files were also reviewed to determine the presence and location of previously identified resources both inside and outside the parks' boundaries.

Field Investigation: Initial efforts included a field survey of the resources including landscapes identified by DEWA as vulnerable to impacts from the proposed alternatives. Field work also clarified the extent of the current documentation of cultural landscapes. Field work helped verify location, setting, structures, landscape features, direct views to the existing transmission line corridors, physical proximity to the transmission line corridors, site spatial organization, topography, vegetation, small-scale features, conditions, and extant features that survive from the period of significance. Field observation also extended to the larger cultural landscape of the river corridor and the river valley, which continues to mirror the setting, feeling, and association of the earliest periods of habitation into the twentieth century.

Impact/Effect Assessment: In order for a cultural landscape to be listed in the National Register, it must possess significance (the meaning or value ascribed to the landscape) and retain the integrity of those features necessary to convey its significance as well as meeting one or more of the National Register criteria (36 CFR Part 63). The character-defining features in the identified cultural landscapes included spatial organization and land patterns, topography, vegetation, circulation patterns, water features, structures/buildings, and site furnishings and objects. Individual features were not examined alone, but in relationship to the overall landscape. The arrangement and interrelationships of the cultural landscapes' organizational elements and character-defining features provided the key to the determination of the potential impacts and effects of the proposed action presented in the project alternatives.

The cultural landscape resources in the APE were listed and organized by resource type, historical documentation, location and context, and tract number. The location of the resources was mapped according to the APE for each alternative. GIS overlays of vegetation and topography and viewshed analysis were also used in discerning the extent and type of potential effects and impacts (see cultural landscape resource tables in appendix J).

Because the NPS has elected to integrate its compliance with Section 106 of the NHPA into the NEPA process and documentation pursuant to 36 CFR § 800.8(c), the method for assessing impacts/effects on cultural landscapes is designed to comply with requirements of both NEPA and section 106 of NHPA, and with implementing regulations 40 CFR Part 1500 and 36 CFR Part 800, respectively, while considering the differences between NEPA and NHPA language. Impacts and effects on identified cultural landscapes were anticipated to be visual and physical and for the period of analysis of 15 years. Resource-specific context for assessing the significance of the impacts in accordance with NEPA and the CEQ regulations includes the following:

- Encompassing a river valley and the surrounding mountains and gazed down upon by millions of visitors from APPA and hundreds of other trails, the Delaware River Valley is a living ecosystem and an iconic representation of the human environment. This single large cultural landscape is made up of many individual cultural landscapes such that the context of cultural landscapes is larger than simply the individual cultural landscapes analyzed.
- DEWA was established to preserve past land uses and as a whole represents a cultural landscape, encompassing the Delaware River Valley with all of its architecture, history, pre-history, and traditions inextricably interwoven with the magnificent natural resources around which that culture was built.
- APPA is considered a cultural landscape because of its importance to the environmental and outdoor recreation movements and the visionary and volunteer efforts to create the Appalachian Trail.
- DEWA is also important to the past environmental movements due to Tocks Island Dam controversy. Many citizens were seriously aggrieved by the loss of their family homesteads through eminent domain. In the end, however, they asked that the valley be preserved for future

generations. Even today, many of the people who sacrificed the most for the creation of the park for the greater good still ask that it be retained for those higher purposes and never allowed to be denigrated for inappropriate uses.

- A contemporary aspect is the changing relationship of the park to the community around it where the community is increasingly integrating the park into their local community.

STUDY AREA

The designated APE for cultural landscapes is described in the "Historic Structures" section chapter 3.

CUMULATIVE IMPACTS COMMON TO ALL ALTERNATIVES

An assessment of cumulative impacts on cultural resources is required by both the CEQ and NHPA. Existing and anticipated future projects at DEWA, MDSR, and APPA were identified to determine the potential cumulative impacts. Past, present, and reasonably foreseeable activities that could have beneficial or adverse impacts on cultural landscapes in the parks and inside and outside the study area are listed in the following sections and discussed under each alternative as applicable.

Projects Inside the Study Area

Inside the study area, projects that could result in adverse cumulative impacts on cultural landscapes through the alteration of character-defining features of cultural landscapes include the following utility and road projects: the I-80 weigh station, PADOT SR 2001, the rehabilitation of road bridges throughout the parks in New Jersey and Pennsylvania, the repair of failing Watergate Dam #10, the Tennessee Gas Line Proposal, the Columbia Gas Transmission Company pipeline, the PJM Interconnection Proposal, the PPL Electric Utilities Northeast Pocono reliability project, the PPL proposal for a 138/12-kV substation, and existing utility towers within 5 miles. Other development projects that could have adverse effects on cultural landscapes include the hazardous structure demolition/deconstruction of 230 structures; Kittatinny Point Visitor Center; New Jersey Swim Beach (Turtle Beach); McDade Trail realignment; and illegal ORV use, vandalism, trespassing, arson, and encroachment. Other projects that could have adverse impacts include the issuance of special use permits related to visitor use, incidental business permits / commercial visitor services, the DEWA prescribed-burn program, and the DEWA hazard fuel reduction program. Illegal woodcutting could have an adverse impact on cultural landscapes. Projects that could have beneficial impacts on the character-defining features of cultural landscapes include the following: the repair of historic stone culverts on Mountain Road, the stabilization and repair of damaged structures, and the rehabilitation of Childs Park. These projects could preserve and/or rehabilitate significant landscape features inside the study area and protect these landscapes. Inside the study area, cumulative impacts could be adverse.

Projects Outside the Study Area

Outside the study area, projects include other developments that have the potential to adversely affect cultural landscapes, including the Tennessee Gas Line Proposal, the Columbia Gas Transmission Company pipeline, the PJM Interconnection Proposal, the PPL Electric Utilities Northeast Pocono reliability project, the PPL proposal for a 138/12-kV substation, and existing utility towers within 5 miles. Other utility and development projects that may have an adverse impact include the Federal Energy Regulatory Commission relicensing of Yards Creek Generating Station, Marcellus shale natural gas drilling, Blue Mountain Ski Resort wind turbines, wind turbines in northeastern Pennsylvania, PFBC natural gas leasing and water access programs, Fernwood Casino, and residential development. The Alpine Rose Racetrack could have an adverse impact on cultural landscapes. Projects outside the study

area that could have beneficial impacts on cultural landscapes include the following: the high-speed passenger train from northeast Pennsylvania to New York City, the New Jersey to Pennsylvania Lackawanna Passenger Rail cutoff, agricultural leases, Pike County agricultural security areas, and county and township open space and conservation plans. The overall cumulative impacts on cultural landscapes from these projects outside the study area could be adverse.

IMPACTS OF THE ALTERNATIVES ON CULTURAL LANDSCAPES

Common to All Alternatives

Mitigation Measures: Mitigation measures would reduce impacts on cultural landscapes from construction, operation, and maintenance activities for all action alternatives and are described in chapter 2 and appendix F.

Outside the Study Area: Outside the study area, regardless of which alternative is selected, the transmission line could pass through Carbon, Lackawanna, Luzerne, Monroe, Northampton, Pike, and Wayne counties in Pennsylvania and Morris, Sussex, and Warren counties in New Jersey. The clearing, construction, and vegetation maintenance activities outside the study area would be consistent with those described for inside the study area; however, the impacts outside the study area would be indirect. The direct impacts from the construction of the transmission line outside the study area cannot be determined, as described in the introduction of this chapter. Additionally, the specific resources that would be affected by the transmission line outside the study area cannot be identified until the route is chosen by the applicant.

Outside the study area, the S-R Line would pass through a variety of landscapes — some of which could be cultural landscapes — that have inherent National Register eligibility but are as yet undocumented. Under the no-action alternative, the existing B-K Line ROW may have affected cultural landscapes in the surrounding area (specifically in the Pocono environmental heritage region, the Delaware and Lehigh National Heritage Corridor, and the Lackawanna Heritage Valley state and national heritage region) since its construction in the 1920s and may continue to do so. Any impacts related to the existence of the existing transmission line would be adverse.

Outside the study area, the ROW width would be increased to 350 feet as it would be in the study area, with similar impacts. The transmission line would cross a variety of different types of publicly accessible protected areas, heritage areas, and historic resources. A wider ROW, taller structures, and additional access roads would have more impacts on identified or not yet identified or documented cultural landscapes both in heritage areas and outside heritage areas. Impacts could range from no noticeable change to the visual environment to areas where the ROW could cross a historic road corridor, trail, or district and/or cultural landscapes associated with farmsteads and villages. Impacts would be greatest if the ROW traverses a great distance through a heritage area such as the Pocono environmental heritage region, the Delaware and Lehigh National Heritage Corridor, or the Lackawanna Heritage Valley state and national heritage region. Adverse impacts would result from construction and from ongoing maintenance activities.

The effects of other projects could add to the impacts of the S-R-Line on cultural landscapes. Cumulative impacts on cultural landscapes outside the study area could be adverse, as described previously in the "Cumulative Impacts Common to All Alternatives" section. When the indirect adverse impacts on cultural landscapes as a result of activities outside the study area are combined with other past, present, and reasonably foreseeable projects in the study area, an overall adverse cumulative impact could be expected.

Alternative 1: No Action

The no-action alternative would involve no new construction or appreciable changes to current conditions. The existing corridor, galvanized steel tower structures, and conductors would continue to be visible from cultural landscapes in DEWA and would continue to cross documented cultural landscapes in DEWA. The existing corridor and structures cross APPA and would remain part of the viewshed from APPA.

The existing transmission alignment intrudes on historic viewsheds of cultural landscapes located in close proximity to the existing power line corridor. Vegetation along the ROW and trees and shrubs related to the specific historic sites have increased in size and density since the alignment was installed in the 1920s, partially mitigating the transmission line's visual intrusion into historic views. The size and scale of the existing alignment also disrupts character-defining features such as spatial organization and vegetation/open space patterns along historic road corridors, trail corridors, and historic districts. This is evident where the alignment crosses APPA and the Old Mine Road Historic District. Again, existing vegetation mitigates some of the visual disruption at these crossings. The existing transmission line is not visible from a large number of cultural landscapes identified in the study area because the viewing distance is so great that impacts would not be discernible or because vegetation and/or topographic features block potential views from the cultural landscape. In addition, the continued operation of the existing transmission line would require periodic maintenance, including the clearing of vegetation in the ROW. Access roads in the ROW would also require periodic maintenance to provide access for repairs and maintenance of the system. The systematic removal of existing vegetation would impact viewsheds from cultural landscapes to the utility corridor and towers. The vegetation currently provides some visual mitigation for impacts on cultural landscapes. The overall impact on cultural resources under alternative 1 would be adverse, but confined to the limits of the present ROW and would not change existing conditions.

Cumulative Impacts

Cumulative impacts on cultural landscapes from past, present, and reasonably foreseeable projects inside the study area would be adverse, as described previously in the "Cumulative Impacts Common to All Alternatives" section. When the impacts on cultural landscapes as a result of alternative 1 are combined with the other projects inside the study area, an overall adverse cumulative impact would be expected. Alternative 1 would not alter the level of impact.

Conclusion

Alternative 1, the no-action alternative, would result in the continued presence, operation, and maintenance of the existing transmission line route. The presence of the large towers and lines would diminish the integrity of setting, feeling, and association of numerous cultural landscapes. There would also be visual effects from the removal of vegetation during maintenance activities. Overall, alternative 1 would result in adverse impacts to cultural landscapes. The effects of past, present, and reasonably foreseeable projects, when combined with the impacts on cultural landscapes under alternative 1, would result in overall adverse cumulative impacts on cultural landscapes inside the study area.

The adverse impacts of alternative 1 would be confined to the limits of the present ROW and none of the adverse impacts would change existing conditions. After applying the Advisory Council criteria for adverse effects, the NPS determined that implementation of alternative 1 would result in a finding of no adverse effects to cultural landscapes. Therefore, the actions under alternative 1 would be in keeping with the parks' enabling legislations, NPS *Management Policies 2006*, and all other applicable federal and state laws. While there are adverse impacts associated with the continued operation and maintenance of

the B-K Line, the intensity of the adverse impacts in the context of cultural landscapes in the parks would not be considered significant.

Common to All Action Alternatives

Removal of Existing Structures: All action alternatives (2, 2b, 3, 4, and 5) would involve the removal of all or a portion of the B-K Line, as described in chapter 2. During the removal and disposal of existing structures, adverse visual and physical impacts on cultural landscapes would occur from grading activities, dust production, the removal of the crane pads and equipment at wire pulling sites, the disassembly and removal of lattice towers, the creation of access roads, and the transportation of construction equipment to and from the decommissioning sites. Similar impacts would occur related to the construction of the new facilities. Access roads and spur roads would require clearing and grading and would affect cultural landscapes in the immediate vicinity of the roads. After the completion of the transmission lines, access roads with gravel surfacing would continue to be maintained. Such actions would have adverse impacts on cultural landscapes in DEWA and on APPA.

Vegetation Clearing: The ROWs would be cleared of vegetation for the construction of the new double 500-kV transmission line for alternatives 2 through 5. Alternatives 2, 3, 4, and 5 include clearing up to 350 feet; the ROW would be extended up to 175 feet from either side of the centerline of the existing ROW.

Under alternative 2b, the applicant proposes to operate the S-R Line within the existing ROW. The NPS anticipates that the applicant would require additional area for construction; therefore, it is estimated that under alternative 2b, the applicant would expand the ROW to the extent of their deeded property rights, which ranges from 100 feet to 380 feet. For alternative 2b, the ROW would be cleared on either side of the centerline to an appropriate width based on the deeded property rights. Clearing would be complete for all action alternatives, with the exception of the 50-foot buffer near intermittent streams/wetlands and the 100-foot buffer near perennial waterways such as the Delaware River (PPL and PSE&G 2008, 7).

Section 106 Summary

Section 106 Findings of Effect are common to each of the action alternatives. NHPA section 106 regulations apply only to properties that meet the eligibility requirements of the National Register. Therefore, the assessment of NHPA section 106 effects applies only to those cultural landscapes that are listed on the National Register or those that meet National Register criteria for listing. NHPA section 106 effects are summarized by alternative in table 51. There are detailed assessments of effects under section 106 of the NHPA for each action alternative.

TABLE 51: SUMMARY OF NHPA SECTION 106 EFFECTS ON CULTURAL LANDSCAPES

Effect on Cultural Landscapes	Alternative				
	2	2b	3	4	5
No adverse effect	25	25	31	4	4
Adverse effect	18	18	6	4	4
Total resources listed or eligible	43	43	37	8	8

Alternative 2

The expansion and construction of new towers and the permanent loss of vegetation under alternative 2 would result in increased visual intrusion on cultural landscapes, as well as physical impacts, where the

ROW corridor crosses the cultural landscapes inside the study area. Under alternative 2, the expanded ROW would be maintained at an operational width of 200 feet, increasing the acreage of maintained scrub shrub habitat to approximately 129 acres.

Within the APE established for alternative 2, there are 64 cultural landscapes identified for impact/effect assessment. Of these 64 cultural landscapes, there are 43 either in the National Register or that meet National Register criteria for listing (see table 51). Assessment of effect for these 43 cultural landscapes was based on the criteria for adverse effect in 36 CFR Part 800, Protection of Historic Properties. It states that adverse effect is found when an undertaking may alter directly or indirectly any of the characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association. Adverse effects for alternative 2 would occur due to physical destruction or damage to property where the proposed power line alignment would cross the landscape parcels, trails, districts, or roads. The construction of the corridor and towers would introduce large visual elements that diminish viewshed integrity of cultural landscapes in close proximity and disrupt viewsheds from cultural landscapes located at greater distances from the power line corridor. Table J-1 in appendix J presents the cultural landscapes identified for assessment, as well as the National Register documentation and a summary of impacts (NEPA) and effects (NHPA) for alternative 2.

Section 106 Summary

The application of the Advisory Council criteria of adverse effects (36 CFR § 800.5, "Assessment of Adverse Effects") has not been fully completed; however, it is apparent that adverse effects would occur on cultural landscapes. At this time it has been determined that alternative 2 would have an adverse effect on 18 cultural landscapes within the APE. Alternative 2 would have no adverse effect on 25 cultural landscapes. The assessment of effect for cultural landscapes is ongoing as final design of the transmission line continues. See appendix M for a complete summary of the section 106 process for this final EIS.

Impact Assessment

There were 22 cultural landscapes in alternative 2 documented as ineligible or undetermined. Under NEPA guidelines, impacts to the majority of these landscapes would be negligible to minimal due to the distance from the cultural landscape to the utility line corridor, preventing any viewshed disruptions or visual intrusions. Three landscapes out of the 22 with ineligible or undetermined status would be significantly impacted due to the alignment of the corridor across the parcel or road.

There would be no substantial impacts for the landscapes found to have no adverse effects. For these cultural landscapes, distance, topography, and vegetation would preclude any visual intrusions.

The cultural landscapes determined to have adverse effects would be substantially impacted by the proposed corridor alignment and tower construction for alternative 2. These cultural landscapes are in close physical proximity to the powerline corridor, or the alignment would cross the landscape parcel, district, or trail. The alignment would cross the Appalachian Trail and the Old Mine Road Historic District and would be visible from many of the cultural landscapes. Alternative 2 would have substantial adverse impacts to cultural landscapes.

Cumulative Impacts

Cumulative impacts on cultural landscapes from past, present, and reasonably foreseeable projects inside the study area would be adverse, as described previously in the "Cumulative Impacts Common to All Alternatives" section. When the impacts on cultural landscapes as a result of alternative 2 are combined

with the other projects inside the study area, an overall adverse cumulative impact would be expected. Alternative 2 would not alter the level of impact.

Conclusion

Inside the study area, the implementation of alternative 2 would result in adverse impacts on cultural landscapes. The effects of past, present, and reasonably foreseeable projects, when combined with the impacts on cultural landscapes under alternative 2, would result in overall adverse cumulative impacts on cultural landscapes inside the study area.

Alternative 2 would alter character-defining features of cultural landscapes along the alignment with visual intrusion of taller towers and an expanded ROW, diminishing the overall integrity of some and substantially changing the character-defining features of others, including historic viewsheds, spatial organization, and cultural vegetation. There would be permanent adverse effects to the cultural landscapes because the study area of the transmission line is maintained as an existing non-conforming feature. These impacts would last for the life of the line.

Permitting the project would adversely affect multiple protected resources inside the parks, in some instances irreversibly. Allowing such adverse effects in order to facilitate private infrastructure expansion would be contrary to NPS practice and principle of protecting and improving these resources, and of removing incompatible infrastructure to do so. This could establish a precedent that may invite similar proposals by other applicants in the future, and create an expectation of like treatment for those proposals; it may make it difficult to deny such proposals. DEWA and APPA both contain numerous other utility crossings, which makes the risk of such precedent particularly concerning for these parks. Furthermore, as units of the national park system, wherein all parks are entitled to equal protection, creating such a precedent could have ramifications for parks nationwide. The location of this particular crossing through the center of DEWA could make such a precedent even more potent. Installing the S-R Line on this alignment may invite future utilities proposing to follow the same route.

Public attention surrounding this project is high. There is likely to be a high degree of controversy over any effects on park resources that are particularly popular with the public, such as scenery, visitor use and experience, rare and unique communities, cultural landscapes, and historic structures, for any of the alternatives. The inherent uncertain nature of predicting the true degree of some of these impacts would likely heighten this controversy. Additionally, construction at this particular location in DEWA is likely to accentuate the controversy due to the unique characteristics presented here and high visitor traffic to the area.

The applicant’s project would impact portions of several resources inside the park that are also under pressure in the surrounding region. This project is one component of a larger regional plan by the RTO to enhance systems reliability. Other component projects of this plan have already affected, and would continue to affect APPA, especially in the areas of scenic resources and visitor use and experience, as well as other national -arks in their paths. The overall experience of the APPA visitor would be degraded because this project would contribute cumulatively to the adverse impacts cause by the infrastructure projects along the entirety of the trail. Additionally, multiple types of development outside of DEWA and APPA are quickly diminishing several of the resources analyzed at a broader scale. The reduction of these resources in the region surrounding the parks increases the scarcity and sensitivity of them inside the parks where they are afforded special protection. Alternative 2 would contribute to the cumulative adverse impact on these resources.

After applying the Advisory Council criteria for adverse effects, the NPS determined that implementation of alternative 2 would have an adverse effect on cultural landscapes. The adverse effect would result from

the visual intrusion of the larger transmission line that cannot be effectively mitigated and would diminish the integrity of the setting, feeling, and association. These impacts would be further exacerbated by the scarcity of such resources in the highly developed east and the function of the national parks specifically to protect such resources. In the context of the purpose and significance for which DEWA, APPA, and MDSR were established and NPS mandates to specifically preserve the natural, cultural, and scenic resources within them, the adverse impacts of alternative 2 on cultural landscapes would likely be considered significant.

Alternative 2b

The APE for alternative 2b is the same as alternative 2 and both have the same alignment as described for alternative 2. The assessment of effects for alternative 2b would be the same as alternative 2. They both contain the same resources and have the same numbers of cultural landscapes with adverse effects and no adverse effects. Table J-2 in appendix J presents the cultural landscapes identified for assessment, as well as the National Register documentation and a summary of impacts (NEPA) and effects (NHPA) for alternative 2b.

Section 106 Summary

The application of the Advisory Council criteria of adverse effects (36 CFR § 800.5, "Assessment of Adverse Effects") has not been fully completed; however, it is apparent that adverse effects would occur on cultural landscapes. At this time it has been determined that alternative 2b would have an adverse effect on 18 cultural landscapes within the APE. Alternative 2b would have no adverse effect on 25 cultural landscapes. The assessment of effect for cultural landscapes is ongoing as final design of the transmission line continues. See appendix M for a complete summary of the section 106 process for this final EIS.

Impact Assessment

Alternative 2b would follow the same alignment as described for alternative 2. However, due to the differences in the alternatives (two additional towers), the impacts on cultural landscapes differ for alternative 2b.

Under NEPA guidelines, three landscapes along alternative 2b could be substantially impacted due to the alignment of the corridor across the parcel or road. The remainder of these landscapes would have negligible or minimal impacts due to distance from the landscape to the corridor, preventing any viewshed or visual disruptions. Most are too far away from the corridor to be impacted.

There would be no significant impacts for the landscapes found to have no adverse effects. In a few cases, the cultural landscapes would be visually impacted to a greater extent than in alternative 2 due to the additional towers in 2b. These would be moderate impacts but not substantial.

Of the cultural landscapes that would have adverse effects, all would be substantially impacted by the proposed corridor alignment and tower construction for alternative 2b. These cultural landscapes are in close physical proximity to the powerline corridor, or the alignment would cross the landscape parcel, district, or trail. The alignment would cross the Appalachian Trail and the Old Mine Road Historic District and would be visible from many of the cultural landscapes. Alternative 2b would have substantial adverse impacts to cultural landscapes.

Cumulative Impacts

Cumulative impacts on cultural landscapes from past, present, and reasonably foreseeable projects inside the study area would be adverse, as described previously in the "Cumulative Impacts Common to All Alternatives" section. When the impacts on cultural landscapes as a result of alternative 2b are combined with the other projects inside the study area, an overall adverse cumulative impact would be expected. Alternative 2b would not alter the level of impact.

Conclusion

Inside the study area, implementation of alternative 2b would result in adverse impacts on cultural resources. When considered with the effects of other past, present, and reasonably foreseeable projects inside the study area, the overall cumulative impacts from alternative 2b would be adverse.

For the same reasons outlined for alternative 2, alternative 2b would likely have significant adverse impacts on cultural landscapes. Public attention surrounding this project is high. There is likely to be a high degree of controversy over any effects on park resources that are particularly popular with the public, such as scenery, visitor use and experience, rare and unique communities, cultural landscapes, and historic structures, for any of the alternatives. The inherent uncertain nature of predicting the true degree of some of these impacts would likely heighten this controversy. Additionally, construction at this particular location in DEWA is likely to accentuate the controversy due to the unique characteristics presented here and high visitor traffic to the area.

Alternative 2b would contribute to the cumulative adverse impacts of intrusions into cultural landscapes and the reduction of these resources in the region surrounding the parks and increases the scarcity and sensitivity of them inside the parks where they are afforded special protection. As stated for alternative 2, permitting this project would reverse the trend of preserving resources by removing non-conforming features and it may establish precedence for future actions. The construction of a transmission line with taller towers would adversely impact the cultural landscapes within the parks, which is counter to their enabling legislation and mandates. Although impacts to cultural landscapes would be less under alternative 2b than under alternative 2, the integrity of the cultural landscapes would be jeopardized. Therefore, in the context of the purpose and significance of the national parks and NPS policies for protection and management of cultural landscapes, these adverse impacts would be considered significant.

Alternative 3

Within the APE established for alternative 3, there are 57 cultural landscapes identified for impact/effect assessment. Of these 57 cultural landscapes, 37 are either on the National Register or meet National Register criteria for listing (see table 51). Assessment of effect for these 37 cultural landscapes was based on the criteria for adverse effect in 36 CFR Part 800, "Protection of Historic Properties." It states that adverse effect is found when an undertaking may alter directly or indirectly any of the characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association. Adverse effects for alternative 2 would occur due to physical destruction or damage to property where the proposed power line alignment crosses the landscape parcels, trails, districts, or roads. The construction of the corridor and towers would introduce large visual elements that diminish viewshed integrity of cultural landscapes in close proximity and disrupt viewsheds from cultural landscapes located at greater distances from the power line corridor. See table J3 in appendix J for a summary of assessment of effects for alternative 3. Table J-3 in appendix J presents the cultural landscapes identified for assessment for alternative 3, as well as the National Register documentation and a summary of impacts (NEPA) and effects (NHPA).

Section 106 Summary

The application of the Advisory Council criteria of adverse effects (36 CFR § 800.5, "Assessment of Adverse Effects") has not been fully completed; however, it is apparent that adverse effects would occur on cultural landscapes. At this time it has been determined that alternative 3 would have an adverse effect on 6 cultural landscapes within the APE. Alternative 3 would have no adverse effect on 31 cultural landscapes. The assessment of effect for cultural landscapes is ongoing as final design of the transmission line continues. See appendix M for a complete summary of the section 106 process for this final EIS.

Impact Assessment

There were 20 cultural landscapes in alternative 3 documented as ineligible or undetermined. Under NEPA guidelines, impacts to the majority of these landscapes would be negligible to minimal due to the distance from the cultural landscape to the utility line corridor, preventing any viewshed disruptions or visual intrusions. One landscape out of the 20 with ineligible or undetermined status would be significantly impacted due to the alignment of the corridor across the road.

There would be no substantial impacts for the landscapes found to have no adverse effects. For these cultural landscapes, distance, topography, and vegetation would preclude any visual intrusions.

The cultural landscapes determined to have adverse effects would be substantially impacted by the proposed corridor alignment and tower construction for alternative 3. These cultural landscapes are in close physical proximity to the powerline corridor, or the alignment would cross the landscape parcel, district, or trail. The alignment would cross the Appalachian Trail and would be visible from many of the cultural landscapes. Alternative 3 would have substantial adverse impacts to cultural landscapes.

Cumulative Impacts

Cumulative impacts on cultural landscapes from past, present, and reasonably foreseeable projects inside the study area would be adverse, as described previously in the "Cumulative Impacts Common to All Alternatives" section. When the impacts on cultural landscapes as a result of alternative 3 are combined with the other projects inside the study area, an overall adverse cumulative impact would be expected. Alternative 3 would not alter the level of impact.

Conclusion

Inside the study area, the implementation of alternative 3 would result in adverse impacts on cultural landscapes. When the impacts on cultural landscapes as a result of alternative 3 are combined with other projects inside the study area, an overall adverse cumulative impact would be expected.

After applying the Advisory Council criteria for adverse effects, the NPS determined that implementation of alternative 3 would have an adverse effect on cultural landscapes. The adverse effect on cultural landscapes would result from alteration of character-defining features, such as disassociation of road and trail corridors from their vernacular surroundings that would diminish the overall integrity of the cultural landscape.

Like the other action alternatives, alternative 3 has potential for significant impacts associated with the precedent set by permitting a proposed transmission line that would adversely affect multiple protected resources inside the parks. The results of this action would be contrary to NPS practice and principle of protecting and improving these resources and would potentially establish a precedent that may invite similar proposals by others and make it difficult for the NPS to deny such proposals. Public attention

surrounding this project is high. There is likely to be a high degree of controversy over any effects on park resources that are particularly popular with the public, such as scenery, visitor use and experience, rare and unique communities, cultural landscapes, and historic structures, for any of the alternatives. The inherent uncertain nature of predicting the true degree of some of these impacts would likely heighten this controversy.

For the same reasons outlined for alternatives 2 and 2b, the adverse impacts of alternative 3 on cultural landscapes would also likely be considered significant.

Alternative 4

Within the APE established for alternatives 4 and 5 there are 17 cultural landscapes identified for assessment. Of these 17 cultural landscapes, 8 are either on the National Register or meet National Register criteria for listing (see table 51). Assessment of effect for these 8 cultural landscapes was based on the criteria for adverse effect in 36 CFR Part 800, "Protection of Historic Properties." It states that adverse effect is found when an undertaking may alter directly or indirectly any of the characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association. Adverse effects for alternative 4 would occur due to physical destruction or damage to property where the proposed power line alignment would cross the landscape parcels, trails, districts, or roads. The construction of the corridor and towers would introduce large visual elements that diminish viewshed integrity of cultural landscapes in close proximity and would disrupt viewsheds from cultural landscapes located at greater distances from the power line corridor. See table J4 in appendix J for a summary of assessment of effects for alternative 4. Table J-4 in appendix J presents the cultural landscapes identified for assessment for alternative 4, as well as the National Register documentation and a summary of impacts (NEPA) and effects (NHPA).

Section 106 Summary

The application of the Advisory Council criteria of adverse effects (36 CFR § 800.5, "Assessment of Adverse Effects") has not been fully completed; however, it is apparent that adverse effects would occur on cultural landscapes. At this time it has been determined that alternative 4 would have an adverse effect on 4 cultural landscapes within the APE. Alternative 4 would have no adverse effect on 4 cultural landscapes. The assessment of effect for cultural landscapes is ongoing as final design of the transmission line continues. See appendix M for a complete summary of the section 106 process for this final EIS.

Impact Assessment

There were nine cultural landscapes in alternative 4 documented as ineligible or undetermined. Under NEPA guidelines, impacts to the majority of these landscapes would be negligible to minimal due to the distance from the cultural landscape to the utility line corridor, preventing any viewshed disruptions or visual intrusions. Two landscapes out of the nine with ineligible or undetermined status would be moderately impacted due to proximity of the alignment to the cultural landscape.

There would be no substantial impacts for the landscapes found to have no adverse effects. For these cultural landscapes, distance, topography, and vegetation would preclude any visual intrusions.

The cultural landscapes determined to have adverse effects would be substantially impacted by the proposed corridor alignment and tower construction for alternative 4. These cultural landscapes are in close physical proximity to the powerline corridor, or the alignment would cross the resource. The

alignment would cross the Appalachian Trail and would be visible from many of the cultural landscapes. Alternative 4 would have substantial adverse impacts to cultural landscapes.

Cumulative Impacts

Cumulative impacts on cultural landscapes from past, present, and reasonably foreseeable projects inside the study area would be adverse, as described previously in the "Cumulative Impacts Common to All Alternatives" section. When the impacts on cultural landscapes as a result of alternative 4 are combined with the other projects inside the study area, an overall adverse cumulative impact would be expected. Alternative 4 would not alter the level of impact.

Conclusion

Inside the study area, the implementation of alternative 4 would result in adverse impacts on cultural landscapes. When the impacts on cultural landscapes as a result of alternative 4 are combined with other projects inside the study area, an overall adverse cumulative impact would be expected.

For the same reasons outlined for alternatives 2, 2b, and 3, alternative 4 would likely have significant adverse impacts on cultural landscapes. Although fewer cultural landscapes would be substantially altered than under alternatives 2, 2b, and 3, alternative 4 would still be a non-conforming feature within DEWA and APPA cultural landscapes.

Alternative 4 would contribute to the cumulative adverse impacts of intrusions into cultural landscapes and the reduction of these resources in the region surrounding the parks would increase their scarcity and sensitivity inside the parks where they are afforded special protection. The applicant's project is one component of a larger regional plan by the RTO to enhance systems reliability. Other component projects of this plan have already and would continue to affect APPA, as well as other national parks in their paths. The construction of a transmission line with taller towers would adversely impact the cultural landscapes within the parks, which is counter to their enabling legislation and mandates. As with the other action alternatives, alternative 4 may establish precedent for future actions because it reverses the trend of improving visitor experience and scenic values by removing non-conforming features. Thus, the NPS believes that alternative 4 would result in significant adverse impacts to cultural landscapes.

Public attention surrounding this project is high. There is likely to be a high degree of controversy over any effects on park resources that are particularly popular with the public, such as scenery, visitor use and experience, rare and unique communities, cultural landscapes, and historic structures, for any of the alternatives. The inherent uncertain nature of predicting the true degree of some of these impacts would likely heighten this controversy.

After applying the Advisory Council criteria for adverse effects, the NPS has concluded that implementation of alternative 4 would have an adverse effect on cultural landscapes as a result of visual impacts from the towers and ROW clearing and physical impacts from access roads.

Alternative 5

Alternative 5 would follow the same alignment as alternative 4 with the exception of the portion of the B-K Line from the Bushkill Substation to the western boundary of DEWA. Assessment of effects for alternative 5 would be same as for alternative 4. Table J-4 in appendix J presents the cultural landscapes identified for assessment for alternative 5, as well as the National Register documentation and a summary of impacts (NEPA) and effects (NHPA).

Section 106 Summary

The application of the Advisory Council criteria of adverse effects (36 CFR § 800.5, "Assessment of Adverse Effects") has not been fully completed; however, it is apparent that adverse effects would occur on cultural landscapes. At this time it has been determined that alternative 5 would have an adverse effect on 4 cultural landscapes within the APE. Alternative 5 would have no adverse effect on 4 cultural landscapes. The assessment of effect for cultural landscapes is ongoing as final design of the transmission line continues. See appendix M for a complete summary of the section 106 process for this final EIS.

Impact Assessment

Impact assessment for alternative 5 would be the same as alternative 4.

Cumulative Impacts

Cumulative impacts on cultural landscapes from past, present, and reasonably foreseeable projects inside the study area would be adverse, as described previously in the "Cumulative Impacts Common to All Alternatives" section. When the impacts on cultural landscapes as a result of alternative 5 are combined with other projects inside the study area, an overall adverse cumulative impact would be expected. Alternative 5 would not alter the level of impact.

Conclusion

Inside the study area, the implementation of alternative 5 would result in adverse impacts on cultural landscapes. When the adverse impacts on cultural landscapes as a result of alternative 5 are combined with other projects inside the study area, an overall adverse cumulative impact would be expected.

As with the other action alternatives, alternative 5 has potential for significant adverse impacts associated with the precedent set by permitting a proposed transmission line that would adversely affect multiple protected resources inside the parks, contrary to NPS practice and principle of protecting and improving these resources and potentially establishing a precedent that may invite similar proposals by others and make it difficult for the NPS to deny such proposals.

Public attention surrounding this project is high. There is likely to be a high degree of controversy over any effects on park resources that are particularly popular with the public, such as scenery, visitor use and experience, rare and unique communities, cultural landscapes, and historic structures, for any of the alternatives. The inherent uncertain nature of predicting the true degree of some of these impacts would likely heighten this controversy. As previously noted, DEWA and APPA contain numerous other utility crossings, which makes the risk of such precedent particularly concerning for these parks and which could have ramifications for parks nationwide. Alternative 5 would persist as a non-conforming feature in the parks landscape and would remain for the life of the line. For the same reasons outlined for alternative 4, the adverse impacts of alternative 5 would likely be considered significant.

SOCIOECONOMICS

This section evaluates the potential impacts of each alternative on the social and economic elements of the communities near the study area. Values of the social environment mainly include quality of life, while economic values include economic benefits or losses to local communities. Impacts were determined by considering the effect of the existing conditions and the proposed construction and operation of the transmission lines on the overall socioeconomic conditions in the area.

METHODOLOGIES

Impacts were evaluated using the process described in the "General Methodology for Measuring Impacts by Resource" section at the introduction of chapter 4. Impacts were determined by considering the effect of the existing conditions and the proposed construction and operation of the transmission lines on the communities and populations that could be affected by the proposed actions. Impacts related to changes in visitor use as a result of the proposed alternatives were considered in relation to the local economy. Impacts on businesses that provide services to visitors, such as canoe liveries, lodging and food facilities, and others were evaluated qualitatively. No statistical or other quantitative analysis was completed during the course of this socioeconomic impact analysis. Because no measurable difference is expected among the action alternatives, impacts are analyzed collectively under "Common to All Action Alternatives," rather than individually.

Perceptions based on aesthetics and/or safety concerns related to high-voltage transmission lines can affect where people live and work, which can shift populations and affect socioeconomics. Literature assessing the impacts of high-voltage transmission lines on property values was used to estimate how these perceptions could affect development patterns. This literature generally concludes that high-voltage transmission lines do have an effect on property value (Hamilton and Schwann 1995). For example, the obstruction of favored views or the presence of structures in a natural environment may decrease selling price (Furby et al. 1988). Properties adjacent to or within approximately 500 to 650 feet of the transmission line experience the most impact (Hamilton and Schwann 1995; Des Rosiers 2002). Neither the height of the transmission structures nor the voltage of the lines was found to have a significant impact on property values (Hamilton and Schwann 1995).

Conversely, in some studies a small beneficial impact was found associated with a transmission line ROW that provides access to recreational use, is attractively landscaped, or provides added privacy to adjacent properties. However, the literature notes that the value of this "greenspace" "should not be overrated" (Hamilton and Schwann 1995). Being adjacent to an easement can increase value from 7% to 22% only where proximity advantages (enlarged visual field, increased intimacy) exceed drawbacks. Nonadjacent but visually exposed properties can experience higher property values due to improved visual clearance (Des Rosiers 2002).

Transmission lines can affect farm operations and increase costs for farm operators, depending on the transmission line design and type of farming. Transmission lines can affect field operations, irrigation, aerial spraying, windbreaks, and future land development. According to the Public Service Commission of Wisconsin (2010), tower placement in farm fields can

- create problems for turning field machinery and maintaining efficient fieldwork patterns
- create opportunities for weed encroachment
- compact soils and damage drain tiles
- result in safety hazards due to pole and guy-wire placement
- hinder or prevent aerial activities by planes or helicopters
- interfere with moving irrigation equipment
- hinder future consolidation of farm fields or subdividing land for residential development

Some studies of agricultural land indicate that per acre values near transmission lines can be 16% to 29% lower than properties without easements. The negative effects of proximity were largest with smaller properties (Furby et al. 1988).

Resource-specific context for assessing impacts to socioeconomics includes

- the values of the local social environment; primarily quality of life
- economy of the local communities surrounding the parks and local economic values, including economic benefits and losses to the local communities

STUDY AREA

Because socioeconomics primarily pertains to effects outside NPS boundaries, the study area for socioeconomics includes landowners owning in-holdings in DEWA and the counties and townships that are immediately adjacent to the proposed alternatives. Pennsylvania counties in the area of effect include Pike, Monroe, and Northampton. New Jersey counties include Sussex and Warren. Figure 47 shows counties and townships intersected by each alternative.

CUMULATIVE IMPACTS COMMON TO ALL ALTERNATIVES

Appendix H provides a list of past, present, and reasonably foreseeable activities that would have beneficial or adverse impacts on socioeconomics inside and outside the study area. These projects are summarized below, with anticipated impacts identified in the following subsections. The impacts associated with these projects were analyzed in conjunction with the impacts expected for the no-action and action alternatives.

Projects Inside the Study Area

Inside the study area, cumulative projects that would have adverse and beneficial impacts on socioeconomics include the following road projects: Smooth Ride Initiatives, Old Mine Road South rehabilitation, Delaware River bridge projects, US Route 209 – Raymondskill Creek Bridge rehabilitation, the PADOT SR 2001 road project, and the Marshalls Creek traffic relief project. These projects would result in a beneficial impact on local socioeconomics through improved access to the parks and adjacent businesses after the projects are completed. Overall, cumulative projects inside the study area would result in a beneficial impact on socioeconomics.

Projects Outside the Study Area

Outside the study area, cumulative projects that could affect socioeconomics include proposed residential and commercial developments in New Jersey and Pennsylvania, Susquehanna Nuclear Reactor upgrades, the high-speed passenger train from northeast Pennsylvania to New York City, the New Jersey to Pennsylvania Lackawanna Passenger Rail Cutoff, Marcellus shale natural gas drilling, and the proposed Fernwood Casino. These projects would have beneficial impacts from the increased benefit to the regional economy and tourism and increased workforce demand, as well as improved commuting options, increased property values, and additional tax revenue for local governments, who could expand community services. Cumulative projects outside the study area would result in beneficial socioeconomic impacts.

IMPACTS OF THE ALTERNATIVES ON SOCIOECONOMICS

Common to All Alternatives

Outside the Study Area: The direct impacts from construction and maintenance of the line outside the study area cannot be determined, as described in the introduction of this chapter. In addition, specific

impacts outside the study area cannot be identified until the route is chosen by the applicant. However, it is anticipated that the proposed transmission line would pass through populated areas outside the study area where residential and business displacements may occur to accommodate ROW widening. It is assumed that sales tax–generating businesses displaced by ROW widening could be relocated locally and their displacement would not represent a permanent loss in sales tax revenue for state and local jurisdictions. Outside the study area and in urban areas, it is assumed that the applicant would use the existing road system and no new access roads would be required, resulting in no socioeconomic impacts.

Businesses that cater to visitors would experience adverse economic impacts from potential changes in visitation. Impacts caused by changes in visitor spending on counties in the study area cannot be accurately determined, although Monroe and Pike counties rely the most heavily on tourism revenue. Potential impacts on property values would be highly variable and based on distance from the transmission line. No impacts on population growth or migration would occur due to the construction of the S-R Line. Impacts on agricultural revenue and operations would also occur. Construction-related employment and local revenue generation would have a positive socioeconomic impact, while negative effects may occur during construction due to increased noise, dust, light, and glare; displacement of residences and businesses; and decreased recreation, business, and agricultural revenues. Cumulative impacts outside the study area would result in beneficial impacts on socioeconomics as described previously in the “Cumulative Impacts” section. When the impacts on socioeconomic resources as a result of activities outside the study area are combined with other past, present, and reasonably foreseeable projects in the study area, an overall beneficial cumulative impact would be expected.

Alternative 1: No Action

Under the no-action alternative, there would be no changes to tourism revenue. Property value increases or decreases have likely already occurred because the transmission line has been in place for many decades. Neighborhoods have developed around and in response to the existing transmission line. There would be no changes to agricultural land as a result of implementing alternative 1. As a result, alternative 1 would result in no impacts on the local and regional workforce, local businesses, residents, farmers, or property values inside the study area.

Cumulative Impacts

Cumulative projects inside the study area would result in an overall beneficial impact on socioeconomics, as described previously in the “Cumulative Impacts Common to All Alternatives” section. The no-action alternative would have no impacts on socioeconomic conditions. Therefore, there would be no cumulative impacts associated with alternative 1.

Conclusion

Alternative 1 would have no socioeconomic impacts compared to existing conditions and therefore no cumulative impacts. Because alternative 1 would have no socioeconomic impacts, there would be no potential for significant impacts.

Common to All Action Alternatives

Mitigation Measures: Mitigation measures would be implemented to reduce impacts on socioeconomics and are taken into consideration in the impact analysis. Mitigation measures are described in appendix F.

The impact analysis for socioeconomics addresses all alternatives under "Common to All Action Alternatives" to reduce repetition. There are few socioeconomic differences between the alternatives, so the analysis discusses them together and highlights their differences where appropriate.

As noted in chapter 3, visitor spending steadily declined from 2006 to 2009, with a substantial increase of 37% in 2010 over 2009 despite relatively steady visitation. Therefore, the adverse economic impact resulting from potential changes to visitation under the action alternatives cannot be accurately estimated. Some visitors may not be deterred by the new transmission line crossing the river; some may prefer to recreate elsewhere. Although overall visitation to DEWA is expected to increase, future levels of participation in guided river trips and other recreation services are unknown. Adverse economic impacts on river recreation providers, as well as other companies that serve visitors (e.g., food and lodging establishments), could be greater for alternatives 2, 2b, and 3, which would cross the Delaware River within DEWA, as compared to alternatives 4 and 5, which would cross the river south of DEWA and the Delaware Water Gap, a popular takeout location (e.g., many river trips end at the Kittatinny Point Visitor Center). Increased adverse impacts from alternatives 2 and 2b would also occur as a result of fewer campsites at Hamilton River campsites. This would reduce the number of campsites at a very popular river camping location, forcing visitors to camp elsewhere, possibly affecting the number of visitors and trips liveries could provide.

Stringing transmission line wires across the Delaware River would take approximately one day during the eight month construction period. The river would be closed to recreation service providers during that one day period, which may affect multiday river trips as well. However, if visitors using privately owned boats were unaware of the closure, they might leave and recreate elsewhere, or return home. Local service providers, such as food and lodging establishments, would experience impacts based on the loss of business during the closure.

One local outfitter provides guided tours of APPA. Adverse impacts on views from the trail could diminish visitors' experience. However, the majority of visitors would continue to participate in this activity with the service provider. Under alternative 3, the transmission line would parallel APPA for 2.5 miles, creating an adverse visual effect. If the local outfitter used this section, impacts would occur if visitors chose to avoid the area. Impacts on this particular supplier would be measurable, but impacts on overall economic activity and employment in the study area would be slight.

As noted in chapter 3, Pike County's leading industry is tourism, and the county has a goal to retain tourism as a major component of economic development. Similarly, Monroe County has the third largest tourist economy in Pennsylvania and supports the third largest labor force in tourist-related expenditures. Tourism in Pennsylvania's Northampton County does not play a measurable role in the county's economy. Therefore, in Pennsylvania, Pike County would be the most affected by changes to visitation under alternatives 2 through 4, and Monroe County would also be affected under all action alternatives. Because it is difficult to identify precise reasons why visitor spending has been declining since 2006, the magnitude of the economic impact on these counties from implementation of the action alternatives cannot be accurately determined.

Although recreation and tourism are considered the backbone of Sussex County, New Jersey, only 7% to 11% of the county's revenue is generated by tourism, and 60% of the county's workforce travels outside the county for employment. Wages associated with tourism have prevented the tourism sector from becoming the foundation of Sussex County's economy. Warren County, New Jersey, employs the smallest percentage of people in the sales and service industry in the study area and the county sees little potential of generating family wage jobs and increasing the tax base through tourism expenditures. The action alternatives would not likely have a measurable effect on the affected counties in New Jersey given the small role tourism plays in their overall economy.

Potential indirect impacts on residential property values would be highly variable and are not readily predictable. Residential property values may decrease for those residences directly adjacent to the ROW that do not experience proximity advantages, such as enlarged visual field and increased intimacy. No residences currently exist adjacent to the alternative alignments in DEWA. A few homes are located along the alternative 4 and 5 alignments in and adjacent to Cherry Valley NWR. Some residences might experience property value increases if proximity advantages apply. Impacts would vary based on current market value. However, property value increases or decreases may have already occurred because a transmission line is already in place. Because the literature notes that neither the height of the structures nor the voltage of the lines have been found to have a substantial impact on property values, measurable changes to property values due to height and voltage changes are not expected. Impacts related to the expansion of the ROW would be more likely. However, increased tower height may mean that some properties that currently have no view of the existing towers may have views of the new taller towers.

Inside the study area, the alternative alignments would follow an existing utility corridor and transmission line or transportation corridor and traverse forested areas that contain few existing residential and commercial structures. Inside the study area no businesses would require removal and/or relocation. However, a small number of residential displacements may occur for alternatives 2 and 2b in Lehman, Hardwick, and Stillwater townships. Some additional residential displacements may occur for alternatives 3 and 4 in Smithfield, Middle Smithfield, and Blairstown townships. The alternative 5 alignment would parallel or traverse more highly urbanized areas in Monroe County, Pennsylvania, and Morris County, New Jersey, where the potential for displacements and impacts on adjacent communities would be the greatest. Alternatives 4 and 5 would require a ROW from one private inholding in DEWA near Totts Gap Road, but would not result in a commercial or residential displacement. It is assumed that construction staging areas and the locations of new access roads would be selected to avoid existing residences and structures, and that no displacements or relocations would be required.

The initial displacement of residences and businesses would affect a small sector of the local and regional population resulting in adverse impacts. These impacts are expected to occur during ROW land acquisition leading up to the eight-month construction period. The applicant would provide financial compensation to private property owners when acquiring an easement resulting from the widened ROW, under the authority granted by the states' public utility commissions. The usual measure required is payment of fair market value, as determined by agreement between the parties or an independent appraisal, for the property acquired. Upon issuance of the negotiated financial compensation, it is anticipated that property owners would purchase replacement property and relocate their homes and businesses within two years of completion of the project. Throughout the remaining period of analysis, slight impacts on residences, businesses, sales tax revenue, and neighborhood cohesion would occur.

The presence of a high-voltage transmission line could affect where people live based on visual and noise impacts or their perceptions and beliefs about potential health impacts (see the "Health and Human Safety" section). As a result, people may move away from or avoid housing and communities near a transmission line, resulting in potential socioeconomic impacts on the immediate area. The alternative alignments would be located along an existing utility corridor and transmission line or transportation corridor around which communities have developed. Little to no population migration would occur as a result of upgrading to a high-voltage transmission line.

The proposed alternatives would not encourage population growth inside or outside the study area; instead, the alternatives would be a response to growth already occurring and projected to occur in the region. The resident population in communities surrounding DEWA is expected to continue to increase by as much as 50% by 2020. The implementation of the action alternatives is not expected to affect this growth. No impacts on population growth or employment trends would occur under any of the action alternatives throughout the period of analysis.

All action alternatives parallel or traverse agricultural lands inside and outside the study area, including leased agricultural lands in DEWA. Although the ROW would be widened through these lands, the agricultural use of these lands would not necessarily be precluded. If towers are placed in farm fields, the action alternatives could increase costs for farm operators and decrease property values compared to adjacent properties without transmission line ROWs (see "Methodologies" in this section). Counties in the study area have already experienced the loss of agricultural land in recent years, in part related to the rising costs of farm operations, and have goals to protect farmland. Increased costs and decreased property values could further affect agricultural operations in a small sector of the local and regional economy throughout the period of analysis. The alternative 2, 2b, and 3 alignments could result in tower placement in leased agricultural land in DEWA, resulting in decreased revenue for the park. The intensity of the potential adverse impact on agricultural revenue and operations would vary depending on the quantity of farmland affected by each of the action alternatives.

Construction activities common to all action alternatives could cause major increases in noise levels, generate fugitive dust and odors, and generate glare, temporarily affecting residents, businesses, and business patrons and employees inside and outside the study area. Construction work is scheduled to occur throughout most of the daytime hours (12 hours a day), six days a week, for up to eight months. As documented in the "Soundscapes" section of this EIS, noise levels during construction could increase by more than 13 dBA in areas 3,200 feet from the alignment and 5 dBA for areas 6,400 feet from the alignment. Actual noise levels and quantities of dust and glare would depend on the type, amount, and location of construction activities. Construction work would be localized primarily at tower locations, wire pull sites, and staging areas and would progressively move along the alignment. Therefore, no residences or businesses would experience increased levels of noise, dust, light, and glare for the full eight-month construction period. Construction activities outside DEWA would also conform to local noise ordinances, which may restrict the type and duration of construction noise. Existing businesses immediately adjacent to the alternative alignments inside the study area are identified in table 52. Potential construction-related adverse impacts may include decreased business patronage, especially for businesses with outdoor venues, and changes in the timing and frequency of outdoor social activities.

TABLE 52: BUSINESSES ADJACENT TO THE ACTION ALTERNATIVES WITHIN THE STUDY AREA

Alternative	Business Name	Location
Alternatives 2, 2b	Fernwood Hotel, Golf Course and Resort; Petrizzo's Restaurant	Middle Smithfield Township
Alternative 3	Fernwood Hotel, Golf Course and Resort; Petrizzo's Restaurant; Great Bear Golf and Country Club	Middle Smithfield Township
Alternative 4	Fernwood Hotel, Golf Course and Resort; Petrizzo's Restaurant; Great Bear Golf and Country Club; KOA Campground; Cherry Valley Golf Course; retail and commercial developments surrounding the intersection of SR 209 and Municipal Drive	Middle Smithfield and Stroud townships
Alternative 5	Cherry Valley Golf Course; large commercial developments along I-80	Stroud, Hamilton, Stroudsburg, and East Stroudsburg townships

Local companies and residents may be employed during the decommissioning of the B-K Line and the construction of the new transmission line, resulting in slight temporary economic benefits. Construction employment that would occur over the eight-month period would include skilled or semiskilled positions, such as line workers, welders, heavy equipment operators, surveyors, engineers, utility equipment workers, truck drivers, warehouse workers, and laborers. As indicated in chapter 2, the workforce necessary for construction is expected to range from approximately 20 to 120 personnel, with an estimated average daily workforce of 50 personnel. A small number of new workers may also be required

to monitor the newly constructed transmission line ROW for any illegal use and also for resource management throughout the period of analysis. A small proportion of these construction-related and maintenance personnel could be hired locally, resulting in slight beneficial employment impacts. However, it is anticipated that skilled positions would not be filled locally.

The relatively small additions to the construction workforce are not expected to result in a permanent increase in population, employment, or spending in the region. However, the eight-month construction period would temporarily increase overall economic activity, resulting in secondary beneficial economic impacts on local and regional economies. The funds spent directly on the project locally would have multiplier effects throughout the regional economy. Indirect jobs may be created by construction activity, such as material suppliers to construction workers and off-site construction-related workers such as administrative, clerical, and managerial workers. Many construction materials, including the transmission towers and conductors, would likely be purchased outside the study area. Other materials, such as concrete, gravel, and culverts, could be purchased locally. Some local revenues would also be generated through lodging or campground rental fees and through the purchase of meals, etc., for construction workers. Local purchases would result in small increases in local tax revenues, but these generally would not be measurable. Economic impacts would be beneficial.

The removal of existing towers and construction of new towers would likely require construction equipment to traverse agricultural land. This could temporarily restrict crop production or potentially damage crops if activities occurred during the growing season. The restriction of crop production or damage to crops could potentially decrease revenues for agricultural landowners whose crops would be affected. Construction-related adverse impacts on agricultural lands would occur if crop production was decreased or crops were damaged.

All action alternatives would cross DEWA and/or state game lands in Pennsylvania and New Jersey that accommodate hunting and other recreational activities that stimulate the local and regional economy. Construction activity would require restricted public access in some of these areas. These restrictions would be temporary and localized to the immediate construction area; hunting and other recreational activities could continue in unrestricted areas of the park and state game lands. Therefore, temporary changes in visitation patterns for hunting and other forms of recreation, and the resulting effects on tourism revenue for local service providers, are unknown. Prospective visitors could choose to cancel hunting or other recreational trips altogether or could simply choose to hunt or recreate in an alternative location in the park or in state game lands. Normal hunting and recreational activities are expected to resume after construction is completed. The potential impact on the local and regional economy would therefore be limited to the eight-month construction period, and cannot be determined. It is recommended that construction activities be scheduled to avoid peak hunting and recreational seasons in DEWA and other state game lands, if possible.

Cumulative Impacts

Cumulative projects inside the study area would result in an overall beneficial impact on socioeconomics, as described previously in the “Cumulative Impacts Common to All Alternatives” section. When the impacts associated with the action alternatives are combined with other past, present, and reasonably foreseeable projects in the study area, an overall beneficial cumulative socioeconomic impact would be expected. None of the action alternatives would alter the level of impact.

Conclusion

Overall, adverse impacts to the local and regional economy from impacts to recreation would occur, with slight indirect effects on residential property values. Adverse impacts are expected on residential property

and business owners from possible displacement. Adverse impacts on agricultural revenue and operations would occur related to farm operations. Adverse impacts would occur to service providers during construction closures. Beneficial impacts would also occur during construction from possible local employment, and the eight-month construction period would temporarily increase overall economic activity in the area. Construction-related adverse impacts on agricultural lands would occur if crop production was decreased or crops were damaged. Beneficial and adverse effects would occur primarily during the construction phase of the project, although some effects, such as those to real estate, may persist for the life of the line.

All of the action alternatives involve uncertainties regarding socioeconomic impacts. Adjacent homeowners have voiced concerns that real estate values would drop when the S-R Line is constructed across their properties but it is uncertain whether real estate values would drop. Some local businesses that would be used to support construction (materials, lodging, etc.) may benefit, whereas businesses that depend upon the tourism industry may lose business due to road and park closures. There is additional uncertainty as to whether the construction project would result in the creation of new local jobs or if these jobs would go to other skilled laborers from outside the region. There is uncertainty as to how visitors would respond to the introduction of a double circuit 500-kV line with towers twice the height of those currently existing in the area. The methods used to calculate impacts to scenic resources are limited and can only approximate the actual impacts; the scope and magnitude would remain unknown until construction is complete. It is not possible to estimate the loss to the local economies as a result of visitors that may go elsewhere because of construction closures, or visitors that choose not to return to the park units after the power line was constructed, or residents that choose to leave the area as a result of concerns about the proximity of the power line to their homes. Any loss of revenue to the local economies would be an adverse contribution to an overall decline in visitor spending, the reasons for which are also not precisely known. However, regardless of these uncertainties, it is unlikely that the adverse impacts of any of the action alternatives on socioeconomics would reach a level of significance because any changes in visitation or visitor spending would be highly localized; in some cases, would be of limited duration, only occurring when areas were closed for construction and would resume afterward; and would not likely result in all affected visitors choosing not to return to the park units (i.e., of all visitors adversely affected by the presence of the power line, some may choose to leave and not return but others are likely to relocate their activities to other areas of the park units where the power line would not affect their visitation). Similarly, the number of residents affected by the action alternatives is very small and while some may perceive their quality of life to be diminished by the proximity of the power line, it is unlikely that all affected residents would choose to move out of the area. In the context of the local economies in proximity to the action alternatives, any loss of revenue as a result of these changes would likely be small; thus, the adverse impacts of any of the action alternatives are not considered to be significant.

INFRASTRUCTURE, ACCESS, AND CIRCULATION

The section evaluates the alternatives as they relate to impacts on circulation and access on existing and proposed transportation infrastructure, as well as the impact on the condition of this infrastructure.

METHODOLOGIES

The analysis of impacts on infrastructure, access, and circulation was based on a qualitative assessment of how the different phases (construction, operations and maintenance) of the proposed alternatives would affect existing transportation infrastructure and the ability of visitors and the local community to access or travel (circulate) to their desired destinations. Potential impacts on roads in general were evaluated inside and outside the study area. Planned or programmed road improvements were assessed to determine how such improvements would affect, or be affected by, the proposed alternatives.

Resource-specific context for infrastructure, access, and circulation includes the following:

- DEWA is a linear park with primarily parallel roads; not all roads in DEWA are owned by the NPS.
- Commercial uses of DEWA roads are restricted except for US 209 (which requires a permit); most park roads are very basic and unsuitable for use by heavy equipment because they do not have the necessary foundations, do not have the required turning or overhead clearances, and traverse difficult terrain.
- Typically, no new roads are allowed in national parks that do not benefit park purposes.
- Some DEWA roads are also historic resources (e.g., Old Mine Road and River Road).

STUDY AREA

The study area for infrastructure, access, and circulation includes the areas within the parks, with focus on routes that provide direct access to the vicinity of existing and potential transmission line ROW and proposed utility access roads. Traffic control zones for construction are laid out in sections: advance warning, transition, activity, and termination. These zones would vary in length based on the speed limits, road widths, the type of construction, and other factors. As noted in "Chapter 3: Affected Environment," various federal highways, state routes, local county roads, and NPS-owned roads make up the transportation network surrounding DEWA, MDSR, and APPA. There are approximately 86 miles of paved roads and 83 miles of unpaved roads in the 67,210-acre national recreation area, and DEWA has over 50 entry points, with a high proportion of travel through the park made by commuters and local residents (NPS and FHWA 2009, 6, 13). Primary roads in DEWA are owned and managed by the NPS; however, there are some private/public inholdings in the states of Pennsylvania and New Jersey with their own roads used to access their properties (NPS and FHWA 2009). Major roads from New Jersey and Pennsylvania traverse the DEWA boundary as shown in figures 49 through 52 (in chapter 3). The MDSR is accessible from multiple points within the park, and APPA is accessible from points in the park and throughout its length. Visitors boating (canoeing, kayaking) MDSR can access the river from boat launches within DEWA off Old Mine Road and River Road. Visitors hiking the APPA can access it from various trails within DEWA and Worthington State Forest in New Jersey. APPA can also be accessed from I-80 at the south end of DEWA, Camp Road at the Mohican Outdoor Center, and Millbrook-Blairstown Road.

CUMULATIVE IMPACTS COMMON TO ALL ALTERNATIVES

For this EIS, actions inside and outside the parks can affect infrastructure, access, and circulation, primarily during deconstruction and construction activities because infrastructure, particularly roads, must support the additional use by large construction vehicles and a construction workforce. Such use can affect how people access and circulate through the parks, as well as surrounding areas. Completed, current, and future activities that would have beneficial or adverse impacts on infrastructure, access, and circulation in the parks, inside and outside the study area, are summarized here, with anticipated impacts identified. Cumulative impacts that would persist beyond the construction period are the focus of the assessment. Generally, the planned NPS, state, and local transportation improvement projects introduced below would benefit infrastructure, access, and circulation in and to the parks because they are maintenance, road, trail, or multimodal improvement projects that improve traveler safety. However, there may be some adverse effects if the transportation improvements induce population growth resulting in traffic congestion, which can affect access and circulation. Appendix H provides a list of cumulative projects.

Under the discussion of each alternative, the impacts associated with these projects were analyzed in conjunction with the impacts expected for the alternatives.

Projects Inside the Study Area

Projects inside the study area related to road and bridge repair would have beneficial impacts on infrastructure, access, and circulation. Several projects would affect circulation and access inside the study area by improving and restoring infrastructure, reducing traffic and congestion, and providing multiple methods of travel in the parks. The following projects would create beneficial impacts on infrastructure, access, and circulation: the US Route 209 commercial use expiration in 2015, Delaware River Bridge projects, the Alternative Transportation Program; Marshalls Creek traffic relief project; Smooth Ride Initiatives 2006–2007 (pavement resurfacing projects); the PADOT SR 2001 road project; Old Mine Road South rehabilitation; and River Road rehabilitation. These projects would have beneficial impacts from improvements to traffic circulation and heavy vehicle use, road resurfacing, and improved signs, shoulders, and road geometry, as well as the addition of turn lanes, guardrails, and reflectors. However, while the road and bridge repair projects may be immediately beneficial, these projects are not considered beneficial to the parks. These projects are contrary to the parks' goals of maintaining character, scenery, and cultural landscapes. Additionally, these projects could facilitate an increase in population in the area of effect, resulting in additional demands on infrastructure, and could also adversely affect access and circulation.

The construction of Turtle Beach in 2010 resulted in damage to Old Mine Road in New Jersey due to the weight of the trucks and construction equipment used for construction. Park roads not designed to withstand heavy loads might be similarly damaged in the future for projects that require the transport of heavy construction equipment.

Cumulative impacts on infrastructure, access, and circulation inside the study area would be immediately beneficial due to the implementation of maintenance and safety projects for park roads. However, these past, present and reasonably foreseeable future projects represent an adverse impact.

Projects Outside the Study Area

Outside the study area, residential and commercial development would have adverse cumulative impacts on infrastructure, access, and circulation. These projects would have adverse impacts through increased traffic congestion, and increased urbanization, which would require new infrastructure and put stress on the existing system. There would be beneficial impacts from airport improvements and the high-speed passenger train from northeast Pennsylvania to New York City. These projects would provide improvements in the infrastructure of the area. Cumulative impacts on infrastructure, access, and circulation outside the study area would be adverse.

IMPACTS OF THE ALTERNATIVES ON INFRASTRUCTURE, ACCESS, AND CIRCULATION

Common to All Alternatives

Outside the Study Area: Outside the study area, regardless of which alternative is selected, the transmission line could pass through Carbon, Lackawanna, Luzerne, Monroe, Northampton, Pike, and Wayne counties in Pennsylvania and Morris, Sussex, and Warren counties in New Jersey.

Under the no-action alternative, existing conditions would persist outside the study area. There would be no impacts from construction. Slight impacts would occur to access and circulation during maintenance periods. Outside the study area, there would be impacts from project construction under any of the action

alternatives. The specific locations of the access roads outside the study area would be identified during design and are currently not known; however, multiple major and local roads would be crossed. In addition, access roads may be needed along the length of the transmission line. During the transmission wire installation, roads (including some major highways) would be closed, partially closed, or detoured. During these periods, road detours would result in changes to circulation and access to desired destinations resulting in adverse impacts.

Outside the study area, indirect impacts on infrastructure, access, and circulation from vegetation clearing, construction of the transmission line, operation and maintenance of the transmission line, and vegetation maintenance would be adverse and would occur to varying degrees, depending on the location. These impacts would persist for the full period of analysis. Outside the study area, access roads would cross local and regional transportation facilities, to be determined. Cumulative impacts on infrastructure, access, and circulation outside the study area would be expected to be adverse, as described previously in the "Cumulative Impacts Common to All Alternatives" section. When the adverse impacts expected on infrastructure, access, and circulation are combined with other past, present, and reasonably foreseeable projects outside the study area, an overall cumulative adverse impact would be expected.

Alternative 1: No Action

Under the no-action alternative, widening the existing transmission line ROW would not occur. The operation of the existing transmission line would continue to require periodic maintenance, including the clearing of vegetation in the ROW. There would be no impacts on local roads or park access or circulation associated with the alternative 1 alignment related to the operation of the line. During the infrequent periods of maintenance activity for the transmission line, there could be maintenance equipment moving along the roads used to access the ROW. Because maintenance would occur only periodically, there would be a slight, perceptible effect on the ability of the public to access desired destinations or on daily traffic volumes; however, there would be no change from existing conditions. Selected trails are used for existing maintenance activities and would continue to be used under alternative 1. These trails are the Hamilton Trail in New Jersey, the McDade Trail near Community Drive, and part of the Van Campen Glen Trail. Where transmission lines cross roads and trails, there could be temporary, brief road closures or detours during the maintenance periods. Depending on the length of closure or detour and the type of road (e.g., county road), the impact could vary from no perceptible change to a noticeable change that does not limit the ability of the public to readily access their destination. Therefore, impacts on access and circulation would continue to occur during maintenance. As stated in chapter 2, no new construction activity would take place; activities would only include operation and maintenance of the existing line. Therefore, alternative 1 would result in no change from existing conditions.

Cumulative Impacts

Cumulative impacts on infrastructure, access, and circulation inside the study area would be adverse as described previously in the "Cumulative Impacts Common to All Alternatives" section. When the impacts expected on infrastructure, access, and circulation as a result of alternative 1 are combined with other past, present, and reasonably foreseeable projects in the study area, the cumulative impacts would be adverse.

Conclusion

Alternative 1, the no-action alternative, would continue the operation and maintenance of the existing transmission line. Inside the study area, there would be adverse impacts during maintenance. Cumulative impacts would be adverse.

Alternative 1 would not result in any change in existing conditions. The current adverse impacts, such as brief road closures or presence of equipment on local roads or trails, are minimal and have little or no potential to rise to a level of significant impacts because these occurrences are infrequent, of short duration, and represent a temporary interference with visitor and public use of local roads and trails.

Common to All Action Alternatives

Mitigation Measures: Mitigation measures would be implemented to reduce impacts on infrastructure, access, and circulation and are taken into consideration in the impact analysis for each of the build alternatives. Mitigation measures are described in appendix F.

Project Construction: Under all action alternatives, the proposed transmission facilities would require one new double 500-kV line across the parks. This would require the construction of new towers and foundations to accommodate the line. Spur roads, access roads, pulling and splicing sites, wire pull locations, and staging areas would be required for all action alternatives. (Access roads would also be needed for on-going maintenance, discussed below.) Helicopters and trucks would likely be used to transport construction equipment and supplies. These activities would temporarily disrupt road and potentially trail and river activity within the parks' boundaries. The closest rail intermodal facility is located near the intersection of I-81 and I-380, well outside the study area; therefore, the equipment would need to be trucked to the study area. This analysis assumes that equipment would likely be brought into the area from access points along I-80, and construction staging would occur outside the parks or within the existing cleared ROW. From the construction staging area to the site on the transmission line, construction traffic and equipment would travel on existing roads or new transmission line access roads. Roads not designed to withstand heavy loads (e.g., Old Mine Road, River Road, others) could be damaged via the transport of construction vehicles and heavy equipment, with impacts to park infrastructure

New access roads for construction and maintenance of the transmission line would be composed of compacted dirt or gravel. Access roads are considered permanent, because they would be used for maintenance activities once construction is complete. The access roads for decommissioning the existing transmission line are discussed below. In addition to permanent access roads, there may be spur roads to pulling and splicing sites. Pulling and splicing sites would be established inside and outside the study area and would require additional access roads connecting to the associated tower. When possible, these areas would be established where the ground is already disturbed. Tower and pulling and splicing sites would be located to avoid wetlands and sensitive areas where possible, and the spur roads would be restored after construction. During future project planning, design engineers would work closely with park staff to avoid sensitive areas within park boundaries as much as possible. Mitigation measures described in appendix F would be applied, but they would not be sufficient to change the level of impact to NPS roads.

Because all staging areas would be located outside the parks or on existing cleared ROW, there would be no anticipated impacts on parking availability in DEWA.

Overall, construction could last up to eight months, based on a six-day-a-week, 12-hour-a-day schedule. The construction labor force would range from 20 to 120 persons, with an average workforce of 50. The construction crews would use public roads and proposed access roads (described as applicable by alternative, below) to reach the construction sites. The average anticipated workforce of 50 personnel would be detectable when compared to the current traffic volumes on park roads. Volumes are up to 660 to 12,000 per day during the month of August, depending on park location, but lower during the months planned for construction.

In addition to the traffic associated with employees commuting to their work site, there would be traffic associated with the movement of construction equipment. From the staging areas outside the parks there would be daily construction traffic going back and forth to the access road for a specific construction site along the ROW. Estimated construction trips would be seven (one-way) per hour and approximately 140 vehicle miles traveled per day. During the overall project construction, construction would focus on specific transmission line segments and then move to another segment. Therefore, the need to access each site would be localized and of a shorter duration than the duration of construction of the entire project. The movement of heavy equipment and the transport of materials on large trucks could result in traffic delays because this equipment moves slowly or may be oversized, disrupting normal traffic flow. In addition, trucks would be required to stop at the park contact station to show their commercial use authorization, which would impact congestion on park roads such as River Road or Old Mine Road, where no commercial traffic is allowed except permitted canoe liveries. These traffic delays and the potential for less ease of access to desired destinations would be noticeable to the public. These impacts would be similar inside and outside the study area.

The proposed transmission lines would cross existing roads and during transmission wire installation, roads would be closed. Individual road closures would not likely last more than three days, and the roads could be open for access during non-construction work hours. During closure periods there would be road detours resulting in apparent changes to circulation and access to desired destinations.

During periods of maintenance there could be temporary closures of short sections of trails. The proposed transmission line could cross existing trails, including APPA. During transmission wire installation, trails would be closed or detoured. The analysis assumes that similar to roads, trail closures would not last more than three days. Closures to river traffic are anticipated for one day during construction for the removal of the existing B-K Line and one day for the installation of the new line.

Construction for all action alternatives would result in adverse impacts on infrastructure, access and circulation in the study area.

Removal of Existing Structures: Under all action alternatives (2, 2b, 3, 4, and 5), all or a portion of the existing B-K Line within the park boundaries would be removed to the extent feasible as described in chapter 2. The removal of the transmission line would disrupt circulation and access. The use of construction equipment and the potential disruption of traffic and other transportation services would result from the decommissioning the existing transmission line. Individual roads or trails would potentially be closed for a day or more during the removal of the line.

In the study area, the access roads used to decommission the existing transmission line would cross or intersect the following facilities, listed from east to west (with the purpose of the facility in parentheses):

New Jersey:

- APPA (hiking trail)
- Millbrook Road / NPS 602 (main east–west road)
- Old Mine Road (main north–south road, scenic route, southern section closed in winter)
- Pioneer, Hamilton Ridge, and Van Campen Glen trails (hiking trails; Hamilton Ridge Trail provides access to existing utility road)

Pennsylvania:

- Freeman Tract Road (unpaved township road, crossed by B-K Line)

- NPS River Road / Township 515 / (primary entry road to parks, north–south road, scenic route, eligible historic resource, provides access to existing utility road)
- Community Drive (local road)
- US Route 209, located outside park boundaries but inside and outside study area (primary road to parks)
- Creek Road (local road)

The roads listed above, particularly River Road and Old Mine Road, would be affected by the weight of the equipment used to approach and decommission the existing line. Sections of these historic roads are in poor condition, and the weight of heavy vehicles would further damage them. Depending on the weight of the vehicles and the condition of the road section, impacts to infrastructure would range from detectable to readily apparent. There would also be impacts to roadside vegetation and the canopy if it needs to be cut to allow sufficient clearance for construction vehicles and equipment. Local phone, electric, and cable lines could also require relocation.

During the decommissioning of the existing B-K Line, traffic delays from the movement of heavy equipment and transport of materials on large trucks would affect the roads listed above, disrupting normal traffic flow because this equipment moves slowly or may be oversized. These temporary traffic delays and the potential for reduced ease of access to desired destinations would be noticeable to the public for short periods; therefore, adverse impacts on access and circulation would result.

As described in the "Project Construction" section below, there could be temporary closures or detours where the existing line crosses a road (e.g., Old Mine Road) or trail (e.g., APPA) as the existing line is removed. At these specific locations, the impacts would be apparent for access and circulation.

Overall, the removal of the transmission line would result in localized adverse impacts on infrastructure, access and circulation that would last several days to a few weeks, depending on location. Damages to existing roadway infrastructure and the tree canopy could occur. Areas disturbed by road-related construction would be reclaimed after construction is complete (see appendix F). However, this reclamation would not be sufficient to change the level of impact.

Maintenance: After construction is complete, the facility would require periodic inspections via helicopter and truck, and regularly scheduled maintenance every six months to ensure system reliability and performance. The access roads established for construction would be maintained at a width of 12 feet.

During the short periods of maintenance activities for the transmission line or access roads, maintenance equipment could move along public roads (either inside or outside the study area). Because the roads within the parks generally have low traffic volumes, there would be some effect on the ability of the public to access desired destinations or on daily traffic volumes.

Where transmission lines cross roads (either inside or outside the study area), there could be temporary closures or detours of the roads during the maintenance periods. Depending on the length of time of the closure or detour and the type of road (e.g., interstate, highway, and rural road), the impact could vary from no perceptible change to a noticeable change that does not limit the public's ability to readily access their destination.

Maintenance activities would result in adverse impacts on access and circulation and potential impacts to roadway infrastructure from the use of heavy equipment.

Alternative 2

Under alternative 2, the project construction impacts related to infrastructure, access, and circulation in the study area would last an estimated eight months. The roads affected during project construction would be the same as those listed under the "Removal of Existing B-K Line" section above. Potential damages to infrastructure could increase due to the intensified use of the road by construction trucks and equipment for installation of the S-R Line, which may require heavier construction equipment than that used to decommission the existing line.

Use of heavy construction equipment on historic River Road and Old Mine Road, sections of which are in poor condition, could result in adverse impacts that persist beyond the construction period. These roads would be used to reach the transmission line ROW access roads. Equipment such as concrete trucks and cranes can weigh many tons. Although the equipment would be used for short periods, impacts on River Road and Old Mine Road would occur due to their current condition and their intended use, as described in chapter 3. Impacts could occur to other roads (e.g., Community Drive) used by construction equipment, as well. These impacts would affect the roadway condition and would persist after construction. The alternative 2 alignment would cross River Road near the northern terminus where the road is newest and close to DEWA Headquarters. Impacts would likely be apparent. Approximately 1.5 miles of Old Mine Road would be affected by construction vehicles if the alternative 2 alignment is accessed from the north. Depending on the condition of Old Mine Road in this section, impacts on this historic road would be apparent to obvious. The NPS *Park Road Standards* manual notes that "Park roads cannot accommodate all types of vehicles … the Service is not obligated to construct roads or to manage traffic so that all forms of modern transportation technology can be accommodated within the park" (NPS 1984, 8). The NPS *Park Road Standards* manual also describes how park roads are designed based on the types of vehicles allowed to use the facility by park management. The physical dimensions and operating characteristics of the vehicles that would be used on the roads are used to develop design criteria (NPS 1984, 13). Although the parks did not design the original roads, they maintain them as park connector roads, which are not intended to bear heavy loads. Mitigation measures described in appendix F would be applied, but they would not be sufficient to change the level of impact to NPS roads.

Alternative 2 would require 5.4 miles of access roads, 2.0 miles of which would be outside the ROW (1.6 miles in Pennsylvania and 0.4 mile in New Jersey). The new access roads could lead to more unauthorized use of the project corridor. The mitigation measures in appendix F would help offset this potential impact. Potential impacts related to vegetation, soils, and wildlife are addressed under "Vegetation," "Geologic Resources," and "Landscape Connectivity, Wildlife Habitat, and Wildlife."

Cumulative Impacts

Cumulative impacts on infrastructure, access, and circulation inside the study area would be adverse, as described previously in the "Cumulative Impacts Common to All Alternatives" section. When the impacts expected on infrastructure, access, and circulation as a result of alternative 2 are combined with other past, present, and reasonably foreseeable projects in the study area, the cumulative impacts would be adverse.

Conclusion

Inside the study area, impacts on access and circulation would occur at specific locations during the construction period. Use of heavy construction equipment on historic River Road and Old Mine Road would result in adverse impacts on infrastructure, depending on current conditions of existing road sections. These effects would persist until the damage to the roads is repaired. Cumulative impacts would be primarily adverse.

The adverse impacts of alternative 2 on visitor access, circulation, and overall traffic movement would be considerable, especially during the period of construction, but are not likely to be significant. Construction activities would result in temporary closures of trails, roads, and the MDSR to ensure visitor safety. Road and site closures would interrupt visitor access and experience in the park and compound safety management challenges during the busy seasons but this would occur for a finite period and can be managed through advance notice to visitors and the traveling public. The movement of heavy construction equipment through the park would also have adverse impacts on DEWA and Worthington State Forest roads because these roads are not constructed to handle heavy equipment; some of these roads are also historic resources. The roads would be repaired and rehabilitated once construction was completed, although some damage may not be corrected. Like all of the other action alternatives, not all of the property crossed by alternative 2 within the study area is owned or managed by the NPS; meaning not all access to the parks is under NPS control. This alternative crosses federal lands, trails, private properties, and local roads. Permanent closures of river campsites in the vicinity of alternative 2 would impact the amount of camping facilities available, putting pressure on other campsites along the MDSR in DEWA. Specifically, closure of Hamilton Campsites would affect camping opportunities along the entirety of the Delaware River within DEWA and MDSR, as the campsites are evenly spaced to accommodate multi-day trips. Park operations would be adversely impacted because of the increased need for staffing to monitor and patrol areas during construction for visitor safety and to mitigate impacts on resources. In addition, the expansion of the ROW and creation of access roads would make access for illegal uses such as ORVs increasing the need for law enforcement patrols and resource protection in these areas. Construction activities, the presence of heavy equipment, and alterations to typical traffic flow would create greatly increased risks to visitor and staff safety as well as the traveling public. However, such impacts would be temporary. Proper management, advanced planning, and park staff expertise dealing with these types of disruptions would minimize these risks.

Alternative 2 has potential for significant adverse impacts as a result of permitting a proposed transmission line that would adversely affect multiple protected resources inside the parks, in some instances irreversibly. Allowing such adverse effects in order to facilitate private infrastructure expansion would be contrary to NPS practice and principle of protecting and improving these resources, and of removing incompatible infrastructure to do so. This could establish a precedent that may invite similar proposals by other applicants in the future, and create an expectation of like treatment for those proposals (i.e., it may make it difficult to deny such proposals). DEWA and APPA both contain numerous other utility crossings, which makes the risk of such precedent particularly concerning for these parks. Furthermore, as units of the national park system, wherein all parks are entitled to equal protection, creating such a precedent could have ramifications for parks nationwide. The location of this particular crossing within the center of DEWA could make such a precedent even more potent. Installing the S-R Line on this alignment may invite future utilities proposing to follow the same route.

Alternative 2b

The alternative 2b alignment would follow the same route as alternative 2. There would be no measurable change to infrastructure, access, and circulation compared to alternative 2. Therefore, adverse impacts inside the study area would occur as described under alternative 2.

Cumulative Impacts

Cumulative impacts would be the same as alternative 2: adverse.

Conclusion

There would be no measurable difference between the direct and indirect adverse impacts of alternatives 2 and 2b relative to infrastructure, access, and circulation. Cumulative impacts would be primarily adverse.

Similar to alternatives 2, 4, and 5, the adverse impacts of alternative 2b on visitor access, circulation, and overall traffic movement from construction and operation of the proposed transmission line would be large. Alternative 2b would result in temporary closures of roads, trails, and the MDSR during construction activities, and permanent closures of river campsites. Closure of Hamilton Campsites would affect camping opportunities along the entirety of the Delaware River within DEWA and MDSR, as the campsites are evenly spaced to accommodate multi-day trips. DEWA and Worthington State Forest roads would be adversely impacted because these roads were not constructed to handle heavy equipment. These effects would interrupt visitor access and experience in the park and would compound safety management challenged during the busy seasons. An increased need for monitoring and patrolling construction areas and access roads would adversely affect park operations. The potential risk to public safety as a result of construction activities would be minimized through proper management, advanced planning, and park staff expertise dealing with these types of disruptions.

Like the other action alternatives, alternative 2b also has potential for significant impacts associated with the precedent set by permitting a proposed transmission line that would adversely affect multiple protected resources inside the parks. The results of this action would be contrary to NPS practice and principle of protecting and improving these resources and would potentially establish a precedent that may invite similar proposals by others and make it difficult for the NPS to deny such proposals. However, alternative 2b has an additional aspect that raises the potential for significant risk to public safety. Alternative 2b would be constructed within the existing ROW, which is only 100 feet wide in certain places and bordered by 60- to 80-foot high trees on both sides. There is disagreement between the applicant and the NPS as to whether the proposed line could be safely and properly constructed and operated within the existing ROW. NERC guidelines call for clearances between live wires and trees on the edge of the corridor that are greater than what the current ROW would offer. The information obtained by the NPS from independent research indicates that operation of the line in areas where clearances are less than required by NERC standards creates a considerable fire hazard; that is, the increased hazard of live wires contacting trees and sparking a forest fire. Additionally, such an event would likely cause an outage of the line that would lead to loss of power to users downstream, which could create uncalculated health and safety issues. The applicant disputes this claim and the matter remains unresolved. Thus, the NPS believes this risk is a significant impact under alternative 2b.

Alternative 3

Inside the study area, the alternative 3 alignment would traverse DEWA, MDSR, APPA, and Worthington State Forest for approximately 5.4 miles. The alignment would use an existing transmission line ROW that would be expanded from its current 100-foot width by an additional 50 to 100 feet. In total, the alternative 3 alignment would traverse 157 miles and would require the development of new access roads and spur roads. Inside the study area, approximately 1.6 miles of access roads would be required outside the ROW. Additional access roads would be needed for the approximately 5-mile segments running parallel to the north–south boundaries of DEWA on the New Jersey and Pennsylvania sides of the park. These access roads should remain outside the study area. All access roads would be permanently maintained.

The duration of project construction impacts related to infrastructure, access, and circulation in the study area would generally be less than eight months for this alternative. In the study area, the following roads (listed from east to west) would be intersected or crossed by utility access roads:

New Jersey:

- Yards Creek Road (provides access to Yards Creek Hydroelectric Station)
- APPA (hiking trail)
- Old Mine Road (main north–south road, scenic route, listed historic resource, southern section closed in winter)

Pennsylvania:

- McDade Trail (hiking, mountain biking, and cross-country skiing trail)
- River Road (primary road to parks, north–south roadway, scenic route, eligible historic resource, provides access to existing utility road)
- Mosiers Knob Road (local road)
- Creek Road (local road)

During construction, there could be impacts on the roads listed above due to traffic delays from the movement of heavy equipment and the transport of materials on large trucks, disrupting normal traffic flow because this equipment moves slowly or may be oversized. Temporary traffic delays and the potential for reduced ease of access to desired destinations would be noticeable to the public for short periods and would result in adverse impacts on access and circulation. As described under the "Project Construction" section, there could also be temporary road closures or detours where the existing line crosses the road as the existing line is removed. Impacts would be localized and apparent for access and circulation.

As discussed in the "Project Construction" section, the construction for all action alternatives would result in impacts on access and circulation in the study area. Impacts on infrastructure from heavy construction equipment would also occur, as described for the alternative 2 alignment. These impacts would persist beyond the construction period, until the roads are repaired. Additionally, under alternative 3, longer sections of River Road and Old Mine Road would be traveled by construction equipment to reach the transmission line ROW. Approximately 5 miles of both roads would need to be traveled if accessed from I-80 to the south. Approximately 4.5 miles of River Road and 6.5 miles of Old Mine Road would be traveled if accessed from the north. As described in chapter 3, River Road is in poor condition and therefore susceptible to damage from heavy loads. The southern section of Old Mine Road in Worthington State Forest includes a narrow one-lane section that would also be susceptible to damage from wide, heavy loads. This segment may have to be avoided entirely if the construction equipment is too wide to pass safely. If so, the route to the construction site would likely use Millbrook Road (NPS 602) for access to Old Mine Road from the north. Damages to the roads used for transporting construction vehicles and equipment would likely occur, with the severity depending on the condition of the specific road sections. Mitigation measures described in appendix F would be applied, but they would not be sufficient to change the level of impact to NPS roads.

Alternative 3 would require 3.5 miles of access roads, 0.9 mile of which would be outside the ROW. The additional new utility access roads could lead to more unauthorized use of the project corridor. The mitigation measures in appendix F would help offset this potential impact. Potential impacts related to

vegetation, soils, and wildlife are addressed under “Vegetation,” “Geologic Resources,” and “Landscape Connectivity, Wildlife Habitat, and Wildlife.”

Cumulative Impacts

Cumulative impacts on infrastructure, access, and circulation inside the study area would be adverse, as described previously in the “Cumulative Impacts Common to All Alternatives” section. When the impacts expected on infrastructure, access, and circulation as a result of alternative 3 are combined with other past, present, and reasonably foreseeable projects in the study area, the cumulative impacts would be adverse.

Conclusion

Inside the study area, adverse impacts on access and circulation would occur at specific locations during the construction period. The use of heavy construction equipment on park roads, including historic River Road and Old Mine Road, could result in adverse impacts on infrastructure, depending on the current condition of the existing road sections. These effects would persist until the damage to the roads is repaired. Cumulative impacts would be primarily adverse.

Compared to the other action alternatives, the adverse impacts of alternative 3 on infrastructure, access, and circulation could be significant because longer sections of River Road and Old Mine Road would be traveled by construction equipment to reach the transmission line ROW, resulting in potentially longer traffic delays during construction and much more damage to the roads. Mitigation measures would offset some but not all of the damage. Some roads, such as the Yards Creek road and Mosiers Knob road, are primarily used for local access and not normally roads traveled by heavy equipment, increasing the adverse impacts on local traffic and visitors that use these areas. However, like the other action alternatives, any increased safety risk to visitors and park staff from construction activities, the presence of heavy equipment, and alterations to typical traffic flow would be minimized by proper management, advanced planning, and park staff expertise dealing with these types of disruptions. Risks to public safety are expected to be temporary and minimal.

As with the other action alternatives, permitting the project would adversely affect multiple protected resources inside the parks, in some instances irreversibly. Alternative 3 has potential for significant impacts associated with the precedent set by permitting a proposed transmission line that would adversely affect multiple protected resources inside the parks, contrary to NPS practice and principle of protecting and improving these resources and potentially establishing a precedent that may invite similar proposals by others and make it difficult for the NPS to deny such proposals. As previously noted, DEWA and APPA contain numerous other utility crossings, which makes the risk of such precedent particularly concerning for these parks and which could have ramifications for parks nationwide. Furthermore, as units of the national park system, wherein all parks are entitled to equal protection, creating such a precedent could have ramifications for parks nationwide. The location of alternative 3 roughly in the center of DEWA could make such a precedent even more potent. Installing the S-R Line on this alignment may invite future utilities proposing to follow the same route. The removal of the B-K Line under alternative 3 would have beneficial impacts to the recreational sites, roads, and trails within DEWA, the MDSR, and APPA where that line crosses these areas by the removal of the towers and rehabilitation of the vegetation in the long-term. The restoration would restore the natural habitat to the heart of DEWA and MDSR and reduce the number of crossings of APPA. It would also help to offset some of the adverse impact because there would be one less utility crossing of the park units; however, overall, the beneficial impacts of the removal of the existing line do not outweigh the significant negative impacts of visual intrusion of the expanded line paralleling the MDSR and APPA.

Alternative 4

Inside the study area, the alignment for alternatives 4 would follow approximately 1.7 miles parallel to an existing 100-foot-wide ROW for electric utilities in the southernmost portion of DEWA. The ROW would need to be expanded by an additional 100 to 200 feet, with vegetation cleared for construction and operation of the line. This segment would cross NPS Drive and Mountain and Totts Gap roads. It would cross the APPA in the southern part of DEWA. In addition to crossing these areas of DEWA and APPA, Alternative 4 would follow the alignment of the B-K Line for 0.6 mile from the western boundary of DEWA to the Bushkill Station (near Park Headquarters), totaling 2.3 miles within the park. Outside DEWA and APPA, the alternative 4 alignment would angle northeast to follow the existing B-K Line to the Roseland Substation in New Jersey, and would rejoin the alternative 3 alignment on the Pennsylvania side of the river, traveling north, west, and south to Susquehanna Substation. The alignment would require expanding the ROW to cross the Lower Delaware River outside DEWA.

Construction of alternative 4 would be anticipated to last eight months; therefore, the project construction impacts related to infrastructure, access, and circulation for these alternatives would generally last eight months.

Inside the study area, utility access roads would intersect or cross the following facilities (all in Pennsylvania):

- NPS Drive (local road)
- Totts Gap Road (local road)
- APPA (trail)
- Mountain Road (local road)
- Creek Road (local road, alternative 4 only)

During construction, there could be adverse impacts on the roads listed above due to traffic delays from the movement of heavy equipment and the transport of materials on large trucks, disrupting normal traffic flow because this equipment moves slowly or may be oversized. Temporary traffic delays and the potential for reduced ease of access to desired destinations would be noticeable to the public for short periods and would result in impacts on access and circulation. As discussed in the “Project Construction” section, the construction for all action alternatives would result in adverse impacts on access and circulation in the study area. Beyond the construction period, there could be infrastructure impacts on NPS Drive, Totts Gap Road, and Mountain Road from the use of heavy equipment. Depending on the condition of the roads, adverse impacts would vary. Mitigation measures described in appendix F would be applied, but they would not be sufficient to change the level of impact to NPS roads.

Alternative 4 would require 1.6 miles of new access roads, 0.5 mile of which would be outside the ROW. The new access roads could lead to more unauthorized use of the project corridor. The mitigation measures in appendix F would help offset this potential impact. Potential impacts related to vegetation, soils, and wildlife are addressed under “Vegetation,” “Geologic Resources,” and “Landscape Connectivity, Wildlife Habitat, and Wildlife.”

Cumulative Impacts

Cumulative impacts on infrastructure, access, and circulation inside the study area would be adverse, as described previously in the “Cumulative Impacts Common to All Alternatives” section. When the impacts expected on infrastructure, access, and circulation as a result of alternative 4 are combined with other

past, present, and reasonably foreseeable projects in the study area, the cumulative impacts would be adverse.

Conclusion

Inside the study area, adverse impacts on access and circulation would occur during the construction period at specific locations, affecting visitor use and experience from closures of roads, trails, and sites. Additional infrastructure adverse impacts could result from the use of heavy equipment on NPS Drive, Totts Gap Road, and Mountain Road. These effects would persist until the damage to the roads is repaired. Cumulative impacts would be primarily adverse.

As with alternatives 2, 2b, and 5, the adverse impacts of alternative 4 on visitor access, circulation, and overall traffic movement would be considerable, especially during the period of construction, but are not likely to be significant. The movement of heavy construction equipment through the park would have adverse impacts on park roads because these roads are not constructed to handle heavy equipment. Construction activities would result in temporary closures of trails and roads to ensure visitor safety. These temporary closures would have an adverse impact on visitor experience, making traversing the park difficult, but this would occur for a finite period and can be managed through advance notice to visitors and the traveling public. Damage to park and local roads would also likely be considerable, especially at Totts Gap Road and Mountain Road. The roads would be repaired and rehabilitated once construction was completed, although some damage may not be corrected. Like the other action alternatives, not all of the property crossed by alternative 4 within the study area is owned or managed by the NPS; meaning not all access to the parks is under NPS control. This alternative crosses federal lands, trails, private properties, and local roads. Park operations would also be adversely impacted because of the increased need for staff to monitor and patrol areas during construction for visitor safety and to mitigate impacts on resources. In addition, the expansion of the ROW and creation of access roads would make access for illegal uses such as ORVs increasing the need for law enforcement patrols and resource protection in these areas. Alternative 4 crosses the Delaware River outside of the designated MDSR. The Appalachian Trail would be crossed and would need to be re-routed during construction activities.

Construction activities, the presence of heavy equipment, and alterations to typical traffic flow would create greatly increased risks to visitor and staff safety as well as the traveling public. However, such impacts would be temporary. Proper management, advanced planning, and park staff expertise dealing with these types of disruptions would minimize these risks.

The removal of the existing B-K Line as a part of mitigation for construction of alternative 4 has some potentially significant beneficial impacts that may balance the adverse effects of construction, operation, and maintenance of alternative 4: large infrastructure would be moved to the margins of DEWA; an existing transmission line ROW and associated infrastructure would be removed from the center of DEWA; and the river crossing of the MDSR would be completely removed, enhancing the scenic and recreational qualities. Natural habitat would be restored (53 acres total), creating larger patches of contiguous habitat and reducing fragmentation in the core of the park. Additionally, an incompatible feature crossing the landscape would be moved to the southern extent of the DEWA boundary, reducing the total number of cultural and historic structures adversely affected by a double circuit 500-kV the transmission line.

As with the other action alternatives, alternative 4 also has potential for significant adverse impacts associated with the precedent set by permitting a proposed transmission line that would adversely affect multiple protected resources inside the parks, contrary to NPS practice and principle of protecting and improving these resources and potentially establishing a precedent that may invite similar proposals by others and make it difficult for the NPS to deny such proposals. As previously noted, DEWA and APPA

both contain numerous other utility crossings, which makes the risk of such precedent particularly concerning for these parks and which could have ramifications for parks nationwide. The precedent potentially set by alternative 4 may include more consideration of moving infrastructure to the edges of NPS units; however, this does not offset the adverse impacts caused by the presence of such infrastructure. Alternative 4 would persist as a non-conforming feature in the parks landscape and would remain for the life of the line. Although the B-K Line would be removed and restored, the opportunity is lost to remove another incompatible use that intrudes upon the scenic quality and natural character of the parks.

Alternative 5

Inside the study area, the alignment for alternative 5 would follow the same route through DEWA and APPA as alternative 4, with the exception of the portion of the B-K Line from the Bushkill Substation to the western boundary of DEWA. Alternative 5 would require 0.9 mile of new access roads, 0.16 mile of which would be outside the ROW. Outside the study area, the alternative 5 alignment would generally follow I-80 to the Roseland and Susquehanna substations. The adverse impacts on infrastructure, access, and circulation would be the same as described for alternative 4.

Cumulative Impacts

Cumulative impacts on infrastructure, access, and circulation inside the study area would be adverse, as described previously in the “Cumulative Impacts Common to All Alternatives” section. When the impacts expected on infrastructure, access, and circulation as a result of alternative 5 are combined with other past, present, and reasonably foreseeable projects in the study area, the cumulative impacts would be adverse.

Conclusion

Inside the study area, adverse impacts on access and circulation would occur during the construction period at specific locations. Additional adverse impacts on infrastructure could result from the use of heavy equipment on NPS Drive, Totts Gap Road, and Mountain Road. These effects would persist until road damage is repaired. Cumulative impacts would be primarily adverse.

As with alternatives 2, 2b, and 4, the adverse impacts of alternative 5 on visitor access, circulation, and overall traffic movement would be considerable, especially during the period of construction, but are not likely to be significant.

The movement of heavy construction equipment through the park would have adverse impacts on park roads because these roads are not constructed to handle heavy equipment. Construction activities would result in temporary closures of trails and roads to ensure visitor safety. These temporary closures would have an adverse impact on visitor experience, making traversing the park difficult and denying access to popular visitor use sites, but this would occur for a finite period and can be managed through advance notice to visitors and the traveling public. Damage to park and local roads would also likely be considerable, especially Totts Gap Road and Mountain Road. The roads would be repaired and rehabilitated once construction was completed, although some damage may not be corrected. Like the other action alternatives, not all of the property crossed by alternative 5 within the study area is owned or managed by the NPS; meaning not all access to the parks is under NPS control. This alternative crosses federal lands, trails, private properties, and local roads. Park operations would be adversely impacted because of the increased need for staffing to monitor and patrol areas during construction for visitor safety and to mitigate impacts on resources. In addition the expansion of the ROW and creation of access roads would make access for illegal uses such as ORVs increasing the need for law enforcement patrols and

resource protection in these areas. Alternative 5 would cross the Delaware River outside of the designated MDSR. The Appalachian Trail would still be crossed and would need to be re-routed during construction activities.

Construction activities, the presence of heavy equipment, and alterations to typical traffic flow would create greatly increased risks to visitor and staff safety as well as the traveling public. However, such impacts would be temporary. Proper management, advanced planning, and park staff expertise dealing with these types of disruptions would minimize these risks.

The removal of the existing B-K Line as a part of mitigation for construction of alternative 5 has some potentially significant beneficial impacts: large infrastructure would be moved to the margins of DEWA; an existing transmission line ROW and associated infrastructure would be removed from the center of DEWA; and the river crossing of the MDSR would be completely removed, enhancing the scenic and recreational qualities. Natural habitat would be restored (53 acres total), creating larger patches of contiguous habitat and reducing fragmentation in the core of the park. Additionally an incompatible feature crossing the landscape would be moved to the southern extent of the DEWA boundary (DEWA lands west of the Bushkill Substation would not be crossed by new nearly 200-foot towers and additional conductors), reducing the total number of cultural and historic structures adversely affected by a double circuit 500-kV transmission line.

As with the other action alternatives, alternative 5 also has potential for significant adverse impacts associated with the precedent set by permitting a proposed transmission line that would adversely affect multiple protected resources inside the parks, contrary to NPS practice and principle of protecting and improving these resources and potentially establishing a precedent that may invite similar proposals by others and make it difficult for the NPS to deny such proposals. As previously noted, DEWA and APPA contain numerous other utility crossings, which makes the risk of such precedent particularly concerning for these parks and which could have ramifications for parks nationwide. The precedent potentially set by alternative 5 may include more consideration of moving infrastructure to the edges of NPS units; however, this does not offset the adverse impacts caused by the presence of such infrastructure. Alternative 5 would persist as a non-conforming feature in the parks landscape and would remain for the life of the line. Although the B-K Line would be removed and restored, the opportunity is lost to remove another incompatible use that intrudes upon the scenic quality and natural character of the parks.

VISUAL RESOURCES

This section evaluates impacts on visual resources and scenic views associated with DEWA (including MDSR) and APPA. Impacts were determined by assessing the visual quality of existing views at a variety of locations in DEWA and along APPA, and then comparing that assessment with visual simulations representing the proposed changes (see appendix K).

METHODOLOGIES

The analysis of impacts for scenic views and visual resources assesses the potential impact associated with constructing, operating, and maintaining the proposed transmission lines along the alternate alignments being evaluated in this EIS. The analysis also assesses the potential impact associated with decommissioning the existing transmission line.

Visual quality is by nature subjective. The Federal Highway Administration (FHWA) developed an analytical method for assessing visual quality effects by reducing subjectivity and allowing for a more objective assessment of visual effects. This method is described in detail in the manual *Visual Impact Assessment for Highway Projects* (FHWA n.d.).

Visual quality is the character of the landscape that generally gives visual value to the setting. Because visual quality is inherently subjective, objective descriptions are used to quantify the visual assessment. Three critical characteristics of landscape visual quality are considered and appraised, including vividness, intactness, and unity. Each of these characteristics is independent and intended to evaluate one aspect of visual quality. Definitions of these terms are (FHWA 1988, 48):

Vividness: The combination of landform, water, vegetation, and human development that form a memorable composition and distinctive visual scene. Contrast and visual interest tend to contribute to strong vividness. The numeric rating for vividness is derived by appraising each of these four components and dividing their sum by four. The numeric breakdown is as follows:

7–Very high

6–High

5–Moderately high

4–Average

3–Moderately low

2–Low

1–Very low

Intactness: The visual integrity of the natural and built environment and its freedom from visually encroaching elements. The numeric rating is derived by appraising these two components and then dividing their sum by two. The numeric breakdown is then the same as for vividness.

Unity: The degree to which the visible components of the landscape combine to form a coherent, harmonious visual pattern. Human development can contribute to visual unity by adhering to principles of context sensitive design. The numeric breakdown is the same as for vividness.

Evaluations based on these three criteria have proven to be good predictors of the visual quality using the following sample equation:

$$\text{Visual Quality} = \frac{\text{Vividness} + \text{Intactness} + \text{Unity}}{3}$$

The total visual quality was then defined based on the following breakdown:

5.7–7.0: Very high

4.7–5.6: High

3.7–4.6: Moderately high

2.7–3.6: Average

1.9–2.6: Moderately low

1.1–1.8: Low

0.0–1.0: Very low

Following the discussion for each alternative, a table provides the visual quality numeric scoring for each key observation point (KOP) analyzed for the given alternative. The numeric scoring shown in the tables and provided in this analysis was calculated (and in some cases rounded) to two significant digits.

Other terms and definitions used in performing the visual quality assessment include the following:

Viewer Position: The position from which the viewer observes the subject. The viewer is superior when above the subject and inferior when below the subject. The normal position is when the viewer is level with the subject.

In addition, exposure, sensitivity, frequency, viewer numbers, and duration are each terms FHWA uses to identify and consider how viewers interact with and respond to views being evaluated. These terms and impacts to viewers and their experience are discussed in the "Visitor Use and Experience" section.

Enabling and management documentation defines the mission of the NPS as including the preservation of scenic places, among other special qualities of places (i.e., historic, cultural, biological, etc.). Therefore, the integrity of national park system units is reliant on freedom from incompatible visual encroachments or elements in scenic views that conflict with the critical characteristics of high visual quality. The intrinsically scenic character of protected parks calls for the parks themselves to be considered a visual resource, separate from evaluation, and consideration of the sensitivity or possible reaction or quantity of potential resource viewers. However, the potential effects of the proposed actions on viewers (e.g., park visitors) are discussed in the "Visitor Use and Experience" section of this chapter.

In summary, this analysis generally followed these steps:

1. Determine the alternative elements and their extent using the alternatives description prepared for the EIS at the time field work was conducted in the fall of 2010. This involves understanding the transmission corridor alignment alternatives, tower scale and dimensions, layout, and the zone of cleared vegetation along the length of the corridor (350 feet for alternatives 2, 3, 4 and 5, and 100 feet for alternative 2b).

2. Establish the project visual analysis study area: for this analysis, the study area corresponds to the area between the VSLs, as described in chapter 2.

3. Determine the viewshed of the study area. A viewshed can be thought of as the 'seen area' from a given point in the landscape.

4. Determine KOPs, which provide a broad range of representative views from which to view the alternatives (described in more detail below).

5. Conduct field work to establish visual quality at KOPs in their present condition, evaluated using the visual quality rating process described above. The present visual character of the study area was also established during field work (refer to chapter 3).

6. Prepare visual simulations to represent the changes that would be expected under the proposed alternatives as seen from the KOPs (refer to appendix K for images of the existing conditions and simulated conditions).

7. Establish visual quality of the effects of the proposed action as described above using the simulations. Visual quality considers the entire view from a KOP, which may include positive or negative features that are not always able to be captured in the representative photograph used to

create the simulations. To account for this, the simulations were taken into the field and compared with the present view where feasible.

8. Determine visual impacts on KOPs based on the overall change in visual quality ratings. Also, a qualitative discussion of the overall effects of the proposed alternatives is provided in each conclusion.

Key Observation Points and Field Work

Key observation point is a term commonly used in visual resource analysis to describe an identified location and position of a viewer, for the purpose of evaluating potential action impacts from a wide variety of viewing contexts. For this analysis, KOPs are shown on figures 54 and 55. KOPs can be either sensitive points within the viewshed, typical points representative of a common landscape character or view type, or random points (FHWA 1988, 33). Typically, KOPs document the landscape from a stationary view and a level position. Locations of KOPs were determined through field work and consultation with NPS staff familiar with park resources.

In general, the KOPs selected include established scenic vistas; social and recreational attractions such as day-use areas, visitors centers, and campgrounds; cultural landscape resources such as historic sites; and points along roads and trails with special scenic qualities. In addition, points where an alignment would cross a resource feature (trail, river) were included. The locations of all preliminary KOPs identified for this analysis are shown on figures 54 and 55 (in chapter 3).

KOPs are a standard assessment tool used for visual quality impact; however, they are intended to identify representative views within the study area, and therefore they have certain inherent limitations. KOP photographs capture the viewscape as a snapshot in time at a specific location and looking at a defined direction. Level of visibility of the proposed actions could vary depending upon the season (leaf-on or leaf-off in a deciduous forest, for example), and atmospheric and weather conditions can extend or limit views into the distance. KOP analyses are not intended to consider every point in the landscape; they are however, intended to provide an adequate sample from which conclusions regarding potential impacts or benefits to a scenic resource can be determined. Changes to visual resources caused by the alternatives would be seen from locations other than those evaluated by the given KOPs. Also, the impact on a view is affected by the direction the viewer is facing. Consideration for these limitations and variables is included relevant to each KOP.

Field work to establish the study area and document existing view conditions at preliminary KOPs was conducted over two sessions during September and October 2010. Working in teams of at least two, each preliminary KOP was visited to establish visibility of relevant existing transmission or utility features, and representative views and the surrounding landscape were photographed. Each KOP was assessed using the FHWA Visual Quality Rating Scale described above, using a field data sheet to record visual quality ratings for unity, intactness and vividness. A third field work session was conducted in December 2010 after visual simulations representing proposed conditions had been prepared. When feasible, the simulations were brought into the field for comparison with the existing ‘on the ground’ view conditions. A detailed discussion on the creation of visual simulations is provided below.

Creation of Visual Simulations

Each KOP was visited to establish existing visual quality and to collect photographs. An approximately 27-millimeter focal length was selected to represent the field of view perceived by the human eye for all the simulations to best capture each view, including the appropriate context. A single photograph was then selected for each KOP, which was intended to depict a “typical view” of the alignment in the context

of the setting. Digital SLR [single lens reflex] cameras were used to create photographs for the simulations, as they provide the highest quality image and sharp detail close up and at a distance. Photographs were taken using Canon 50D (17- to 40-millimeter lens), Canon 5D Mark II (17- to 40-millimeter lens), and Canon T2i (18- to 55-millimeter lens) cameras.

Digital study area data were gathered and compiled to create a 3D model of each alignment using the primary modeling package (AutoCAD 2008). Elevation data acquired from U.S. Geological Survey Seamless Data Warehouse was used to define the elevation of the proposed tower structures, as well as the KOPs. In addition, GIS-based reference data (existing roads, selected park features, and the proposed alignments) were combined to create a reference file to confirm viewpoints were in the correct spatial relationship to the proposed 3D model. Finally, GPS points acquired during fieldwork provided accuracy in locating the position of the viewer in relation to the 3D model and existing features. Proposed towers were placed according to the design documents provided by the applicant for alternative 2, and approximately 1,200 feet apart for the remaining alternatives where the tower locations have not been determined, with some adjustment as appropriate for topography changes and angle points. The repositioned existing distribution transmission lines were shown within the ROW using the best available information based on industry standards relative to pole type and offset clearances. However, the exact design and placement of these lines is not known at this time.

Next, a 3D model of the proposed alignment, including towers, conductors, insulators, and wires, was modeled per details provided by the applicant. After the model was built in AutoCAD and reference points for the photographs were placed, the model was exported to a rendering software package, Vue 5 Infinite, which allows the application of photorealistic textures and realistic lighting. A virtual camera was placed within this software to correspond to the location of each KOP photograph. Textures were applied to depict proposed elements (i.e., Corten steel transmission towers), and lighting in the existing photograph was duplicated in the software package so shadows, time of day, and weather conditions were matched. The computer rendered the view from each virtual camera at each KOP, matching the angle of view at 27 millimeters to match the existing photograph. The rendering was saved as an image file for the next step.

The images were then prepared for inclusion in the EIS. Using photographic modification software, the photographs were altered to remove existing features, such as steel lattice towers and vegetation that would be removed according to the proposed alternative. The simulations show the proposed conditions at approximately 15 years after implementation, representative of the typical future condition. The 350-foot proposed ROW was used to define the vegetation removal limits from the photographs, and aerial photography combined with reference object dimensions, such as the existing and proposed towers, were used to determine the clearing effects in each photograph. In the case of more challenging areas, such as the alternative 3 crossing of Old Mine Road, a surface model of the existing terrain was created and a 350-foot-wide clearing was modeled to depict the changes as accurately as possible.

In areas where existing vegetation being removed would reveal something currently hidden from view, fieldwork photographs were used to represent the new viewshed. In cases where no reference photographs were available due to geographic features or dense forest, a typical texture of the same forest, land cover, or terrain type was used to replace the removed vegetation. After removing existing features, the rendering of the proposed improvements was overlaid and then appropriately blended into the existing photograph, with adjustments to account for distant haze and shadows from existing vegetation.

Context

Resource-specific context for assessing impacts to visual resources includes

- the Organic Act and the enabling legislation for all three park units specifically identifies scenery as a key resource
- the parks contain views that are unusual in this region in extent, vividness, intactness, and unity (i.e., unbroken views across miles)
- there is intrinsic value in beautiful scenery or views (like a commodity)

STUDY AREA AND VIEWSHED

The geographic study area for visual resources is divided as inside and outside the study area. The NPS cannot prescribe changes on lands outside its ownership, which are those outside the study area. However, due to the nature of scenic views, particularly distant views such as those in the landscape being analyzed for the EIS, visual changes outside defined ownership boundaries still have the potential to directly impact views as seen from adjacent protected areas, including those owned and managed by the NPS. Therefore, the conclusion statements under each alternative discussion refers to locations inside the study area and outside the study area, but the level of impacts on the visual resources were determined regardless of this consideration.

In addition, a second study area, unique to visual resources analyses and not addressed under other resource topics, was defined and considered. As stated previously, visibility is not always limited to defined boundaries, so impacts on visual resources must be considered beyond the localized vicinity of the proposed actions. To account for this, an additional preliminary 'line of sight' analysis was performed early in the process. This analysis used unique study areas for each alternative. Line of sight analyses are often used in visual resource analysis and can help identify patterns of visibility in the landscape of a proposed action, in this case, transmission towers. For this analysis, a zone of visual influence (ZVI) study area was initially defined at 20 miles from the DEWA boundary and the APPA centerline. This conservative distance was considered for two primary reasons. First, many park resources are located at geographic highpoint locations within park boundaries, offering broad vistas of the landscapes outside NPS ownership. Second, the large scale of the proposed actions increases the potential to see the transmission lines from a distance.

Each alternative was analyzed according to a unique corresponding ZVI study area. The area defined as 20 miles offset from DEWA and the centerline of APPA were then overlain onto an area defined as 20 miles offset from each alternative alignment, and the intersection of the two areas became the ZVI study area for the given alternative. This approach was effective for identifying geographic areas most likely to be impacted by the proposed actions.

Once the ZVI study area was defined for each alternative, a GIS line-of-sight analysis was conducted within in the ZVI study area for existing and proposed conditions for each alternative alignment. This process allowed for the identification of places in the landscape where existing transmission poles could be visible for each proposed alignment. The landscape terrain was represented by a 10 meter by 10 meter digital elevation model. Existing transmission poles were analyzed using the best available data, including pole height and location. Because proposed tower locations are not yet known, for the purposes of this analysis, preliminary tower locations were applied for each alternative along the same portion of the line as the existing poles, with spacing of six towers per mile where potential tower locations are unknown. The viewshed was then determined for each alternative by a GIS-based series of yes/no analyses whereby any grid square was highlighted if any part of any tower was visible. The results of these bare earth

visibility analyses were tabulated and are included at the end of each alternative discussion. The tabulations show areas (in acres) from which existing wood poles and proposed monopole towers could be seen under bare earth conditions from within DEWA, from the MDSR and from the APPA corridor, defined at 1,000 feet wide.

Although the ZVI analyses were useful for preliminary study, they consider the landscape under 'bare earth' terrain conditions (without regard for vegetation cover). Detailed vegetation cover data was not available for this level of analysis. Based on field observation, the undeveloped landscape in the study area is generally densely forested and views are commonly limited to the foreground or middle ground by surrounding vegetation. While the visual simulations taken at the KOPs have certain limitations because they are a snapshot in time (see Key Observation Points and Field Work), the bare earth ZVI analyses also has their limitations because they do not consider screening from existing vegetation. However, changes to vegetation from management actions and natural events such as blowdowns and wildfires could potentially open vistas and bring the towers and ROW clearing within view.

The final locations chosen to determine the effects of the proposed alternatives (i.e., the KOPs) were determined with the assistance of NPS staff familiar with park resources and field work.

References to the study area in the remaining portion of this visual resources analysis refer to study area established by the VSLs.

CUMULATIVE IMPACTS

Actions inside and outside the parks can affect scenic quality of views seen from in the parks. Replacement or restoration of park facilities would likely benefit overall visual quality, whereas activities outside the study area, such as expansion of natural gas pipelines or construction of cell towers, could degrade visual resources both inside and outside the study area. Past, present, and reasonably foreseeable future activities that would have beneficial or adverse impacts on visual resources in the parks, inside and outside the study area, are summarized here. Cumulative impacts on visual resources were then determined by combining the impacts from the projects listed below. These projects were taken from a list of potential cumulative projects developed for the S-R Line that can be found in appendix H. Overall cumulative impacts were considered for each alternative and are described below.

Projects Inside the Study Area

Inside of the study area, cumulative projects that would result in adverse impacts on visual resources include the following utility projects: Metropolitan Edison Utility Tree Removal and Trimming, and Metropolitan Edison Enhanced Vegetation Management Program (which will expose more of the transmission line and impact the viewscape); Federal Energy Regulatory Commission Relicensing of Yards Creek Generating Station; Jersey Central Power & Light vegetation maintenance; Marcellus Shale Natural Gas Drilling, Northeastern Pennsylvania and Southern New York; and Columbia Gas Transmission Company (new gas pipeline).

Many activities undertaken within DEWA to upgrade roads would beneficially affect visual resources, including: Smooth Ride Initiatives 2006/2007: Road Surface Rehabilitation throughout DEWA; US Route 209 Roadway Surface and Health and Safety Improvements; Old Mine Road South Rehabilitation; DEWA 14(7) Rehab Remainder of US Route 209; Alternative Transportation Program; US Route 209 Commercial Use Expiration 2015. Other infrastructure improvements within DEWA would beneficially affect visual resources, including Hazardous Structure Demolition/Deconstruction; Stabilize and Repair Damaged Structures; Kittatinny Point Visitor Center Storm Recovery; Kittatinny Point Boat Launch Replacement; River Campsite Restoration of Flood-Damaged Sites; Re-route 150 Feet of Coppermine

Trail; and Agricultural Leases (which would preserve agricultural lands). Although the beneficial impacts of these actions could positively affect visual resources, the beneficial impacts would not outweigh the adverse impacts from the above-mentioned projects. Cumulative impacts inside the study area would result in adverse impacts on visual resources.

Projects Outside the Study Area

Outside of the study area, cumulative projects that would result in adverse impacts on visual resources include the following utility and energy projects: Tennessee Gas Line Proposal; PJM Interconnection Proposal; PPL Proposal for Transmission Line Substation; Blue Mountain Ski Resort Community Scale Wind Turbine, Palmerton, Carbon County, Pennsylvania; and wind turbines in Northeastern Pennsylvania.

Outside of the study area, some NPS activities would beneficially affect visual resources in other parts of the park, including Regrade Six Historic Building Sites, Phase II (Parkwide); Pocono Environmental Education Center Cabin Replacement; Rehabilitate Childs Park; removing dead and dying trees; and upgrading cultural and recreational facilities. The designation of agricultural security areas would also be a beneficial impact, because agricultural security areas would help preserve traditional land uses and viewscapes. Such agricultural security areas include Pike County Agricultural Security Areas; New Jersey Highlands Water Protection and Planning Act (Highlands Council); Pocono Forest and Waters Conservation Landscape Initiative (PA Department of Conservation and Natural Resources); New Jersey State Forests, Parks, & Wildlife Management Areas—NJ DEP Natural Lands Management Program; PA Forest Stewardship Program; NJ Forest Stewardship Program; Sussex County Farmland Preservation; Warren County Farmland Preservation; Monroe County Agricultural Land Preservation Program; Northampton County Farmland Preservation Agricultural Security Areas; County Open Space Plans; Common Waters Partnership (Common Water Fund); TNC New Jersey Chapter; TNC Pennsylvania Chapter Northeast Region; and Wallkill NWR; Cherry Valley NWR. Although these projects could positively affect visual resources, the beneficial impacts would not outweigh the adverse impacts from the above-mentioned projects. Cumulative impacts outside the study area would result in adverse impacts on visual resources.

Projects Specifically Affecting APPA

For APPA, the geographic range for cumulative impacts on visual resources is the entire trail, Maine to Georgia, and includes transportation and infrastructure crossings (roads, bridges, ROWs) that degrade the visual resources of APPA. Scenic quality of the trail is already adversely impacted by other actions.

The development and utility projects listed above, particularly the Marcellus shale and Columbia and Tennessee pipelines, would also adversely affect APPA. The resource management and restoration plans and activities would offer beneficial effects. Additional adverse impacts occur from activities already implemented or planned along the entire length of the trail, including Dominion/Allegheny Power 500-kV Transmission Line Project, 317 antennas 29 greater than 200 feet tall (e.g., cable television, communication towers) within five miles (113 in Pennsylvania, 9 in New Jersey); 63 pipelines (28 in Pennsylvania, 1 in New Jersey); 94 electrical power lines (33 in Pennsylvania, 4 in New Jersey). In addition, approximately 1,500 transportation infrastructure facilities, including local roads, park roads, highways and interstates, and railroads are within, or proposed for development within, the vicinity of APPA (228 in Pennsylvania, 85 in New Jersey).

Of these projects, most are complete and currently affect the visual resources of APPA. The following projects are planned for the future: four transmission line upgrades in Virginia, West Virginia, and New Hampshire, three natural gas line upgrades in Pennsylvania and New Jersey, the Berks County Public

Safety Communications Project (3 tall communication towers on Kittatinny Ridge), and the Highland Wind farm in Maine. Additionally, the continued and expanded exploration of shale gas in the Allegheny Plateau is expected to continue and accelerate the need more transmission projects. Likewise, the increasing interested in development of ridge-top wind resources will generate more projects of that type. The expansion of the cellular network resulting in additional towers is also expected to continue.

IMPACTS OF THE ALTERNATIVES ON VISUAL RESOURCES

Common to All Alternatives

Outside the Study Area: Outside the study area, regardless of which alternative is selected, the transmission line could pass through Carbon, Lackawanna, Luzerne, Monroe, Northampton, Pike, and Wayne and counties in Pennsylvania and Morris, Sussex, and Warren counties in New Jersey. The clearing, construction, and vegetation maintenance activities outside the study area would be consistent with those described for inside the study area. The direct impacts from construction and maintenance of the line outside the study area cannot be determined, as described in the introduction of this chapter. In addition, specific impacts outside the study area cannot be identified until the route is chosen by the applicant.

As indicated in chapter 3, the transmission line would cross a variety of different types of publically accessible protected areas. Under the action alternatives, a wider cleared ROW, taller monopole towers, larger more numerous conductors, and additional access roads could impact visual resources in these areas. The action alternatives would result in noticeable change in scenery. However, adverse impacts would result only from areas where the changes in overall visual quality as a result of the action alternatives were in conflict with stated management plans, policies, or guidelines established for visual resources within these areas. The intensity of impacts would depend on the location and duration of the activity, season, and weather conditions.

Outside the study area, views from APPA would be affected upon approach to the transmission line. Depending on the route outside the study area, the transmission line could cause visual impacts, especially if the line causes disruptions to the middleground, creating a noticeable contrast to the trail scenery and affecting the unity and intactness of the views near the crossing.

Additionally, outside the study area, alternatives 4 and 5 would cross a small section of Cherry Valley NWR in Pennsylvania. As noted in chapter 3, the refuge would permit public access for day use. The stated “premier task” of the refuge is “conserving wildlife” (USFWS 2010c). Cherry Valley NWR is not explicitly managed for visual quality. However, the disruption of forest cover caused by the wider ROW and the presence of large transmission infrastructure could adversely affect scenery relative to a protected natural landscape. Outside the study area, alternatives 4 and 5 would cross the Delaware River. Changes to views, such as views from pedestrian bridges, could result from the increase in tower height and larger more numerous conductors seen crossing the river. These impacts would affect visual resources because they would represent a new visual intrusion where none currently exists. However, the level of impact would depend on whether such views or areas are managed or protected with regard to visual quality.

Outside the study area, impacts on visual resources would be caused by vegetation clearing, construction of the transmission line, operation and maintenance of the transmission line, and vegetation maintenance with the severity depending on the area the line was passing through and any stated management policies, plans, or guidelines for the protection of scenic views or visual quality. Cumulative impacts outside the study area would result in adverse impacts on visual resources as described previously in the “Cumulative Impacts” section. When the impacts on visual resources as a result of activities outside the study area are

combined with other past, present, and reasonably foreseeable projects in the study area, an overall adverse cumulative impact would be expected.

Alternative 1: No Action

Under the no-action alternative, the existing corridor, galvanized steel tower structures, and conductors would remain visible from recreation sites, scenic trails, and scenic drives in DEWA. The existing corridor and structures would also remain visible where the alignment crosses APPA. The existing transmission line ROW would not be widened. Overall visual quality scores for alternative 1 (the present alignment) under existing conditions are provided in table 53.

Affected KOPs with visibility of the existing alignment include the following:

- APPA (where the alignment crosses)
- Old Mine Road
- Fernwood Resort at Hwy 209
- Hamilton Ridge Trail; Pioneer Trail
- McDade Trail near the Schoonover House
- Millbrook Village (vicinity)
- Watergate Recreation Site
- Van Campen Glen Trail
- MDSR (east of Bushkill)
- Hamilton River campsites

In general, the existing transmission alignment prevents the potential for high visual quality where the alignment is visible. The existing alignment hinders visual unity due to the large transmission structures conflicting with the natural, undeveloped aesthetic seen throughout DEWA and along APPA in the study area. Particularly, the existing alignment disrupts the dominance, scale, and diversity of the visual patterns present in the naturally occurring landscape. The abrupt interruption of vegetation created by the cleared ROW also disrupts the visual harmony associated with nationally protected scenic resources, particularly in the regional context of northeast Pennsylvania/western New Jersey, where the undeveloped landscape is predominantly vegetated by mixed deciduous forest.

The presence of the existing alignment also adversely affects visual intactness. Visible towers and conductors represent incompatible intrusions that encroach upon the natural setting. The cleared ROW creates a visually reductive swath that can interrupt continuous forest cover and cause it to appear fragmented. The presence of the alignment tends to diminish overall intactness of the scenic natural area due to the appearance of the transmission line infrastructure. Depending on viewpoint location, the cleared ROW creates unobstructed viewshed corridors along which the lattice towers and conductors can be seen into the distance, typically until visibility is bounded by a topographic feature, commonly a ridgeline. Visual encroachments from the existing alignment are therefore accentuated when viewed from with the ROW looking parallel with it; such as where roads and trails intersect the alignment.

Visual vividness, or memorability, is also affected by the presence of the existing route, because protected scenic resources are often valued, and thus remembered, for their freedom from otherwise ubiquitous and typically unsightly infrastructure elements.

Operation of the existing transmission line would require periodic maintenance, including clearing and mowing of vegetation in the ROW. Definitive vegetation management carried out by the applicant within the existing ROW is not known, so the impacts can only be estimated. All maintenance activities, particularly recent vegetation removal and the presence of large equipment, have the potential to adversely impact protected scenery.

For these reasons, continued operation of the existing alignment, alternative 1, would result in adverse impacts on the visual resources of DEWA, MDSR, and APPA. Conversely, at APPA, the existing ROW clearing provides an opportunity to view east and west, which would not be possible without the continued maintenance of the corridor.

Cumulative Impacts

Cumulative impacts inside the study area from past, present, and reasonably foreseeable projects would result in adverse impacts on visual resources as described previously in the "Cumulative Impacts" section. When the impacts on visual resources as a result of alternative 1 are combined with other projects in the study area, an overall cumulative adverse impact would be expected.

The past, present, and reasonably foreseeable projects identified along the length of APPA would produce adverse cumulative impacts on the trail as explained in the "Cumulative Impacts" section. When the impacts on visual resources as a result of alternative 1 are combined with other projects that affect APPA, an overall adverse cumulative impact would be expected.

Conclusion

Alternative 1, the no-action alternative, would result in the continued presence, operation, and maintenance of the existing transmission line route. Vegetation clearing would result in adverse impacts during maintenance activities and for a time after maintenance activities. When combined with the impacts on visual resources under alternative 1, the effects of past, present, and reasonably foreseeable future projects would result in adverse cumulative impacts on visual resources inside the study area, and adverse cumulative impacts specifically on APPA.

Considering the intensity of the impacts of alternative 1 in the context of the purposes for which these parks were established and are managed, the adverse impacts of alternative 1 on visual resources are not considered to be significant. The existing line diminishes the high visual quality of an otherwise intact natural scenic area; however, the existing line was present when the parks and MDSR were established and thus, was part of the existing conditions. The existing line is partially screened from some locations because of the relative height of the towers versus the surrounding forest canopy. The actions under alternative 1 would be in keeping with the parks' enabling legislations, NPS *Management Policies 2006*, and all other applicable federal and state laws. Any cumulative impacts to resources would remain adverse primarily from other actions taken outside the study area. While there are adverse impacts associated with the continued operation and maintenance of the 230-kV transmission line, the combined context, duration, and intensity of these impacts do not result in significant impacts.

Common to All Action Alternatives

Mitigation Measures: Mitigation measures would be implemented to reduce impacts on visual resources and are taken into consideration in the impact analysis. Mitigation measures are described in appendix F.

Alternatives 3, 4, and 5 include the removal of all or a portion of the B-K Line as described in chapter 2. For these alternatives, the existing B-K Line corridor would be allowed to revegetate, ultimately returning

to forested habitat; under alternatives 2 and 2b the proposed transmission line would be constructed along the existing B-K Line alignment.

During removal and disposal of existing structures, there would be adverse visual impacts from grading activities, dust production, removal of the crane pads and equipment at wire pull sites, disassembly and removal of lattice towers, creation of access roads, and transportation of construction equipment to and from the decommissioning sites. There would be similar impacts related to construction of the new line including grading activities to create level pads for tower sites, construction of foundations, and construction of steel towers, including wire installation. New pulling and splicing sites, as well as new construction staging locations, would further adversely impact scenery and views near the construction activities. Short duration construction detours and/or road closures may increase road signage and create traffic congestion, which would adversely impact general scenic quality in DEWA. In general, construction-related impacts would be most acute where the activity is visible in the foreground to middleground, between 0.25 and 2 miles away. Impacts on visual quality and scenic views during the operation of the proposed action alternatives would vary by alternative, as discussed in subsequent paragraphs.

Because some ROW expansion is necessary only for construction safety and maneuverability, a portion of the corridor along the ROW would be allowed to revegetate after construction is complete. Only the width of the ROW necessary to maintain access roads and the transmission line would continue to be maintained, up to 350 feet. However, for the purposes of this analysis, all visual simulations assume clearing of the entire 350-foot standard ROW width. Revegetation would improve visual quality of DEWA and APPA by potentially increasing the extent of vegetation screening between the proposed action and the viewer, slightly lessening the long-term effects of the ROW expansion.

Maintenance vehicles and field crews would be periodically visible locally from KOPs associated with the alternatives. Effects of recent vegetation clearing (i.e., visible pruning scars, recently removed tree branches and stumps) would adversely impact visual quality where the proposed corridor is visible in the foreground, such as at locations where the alternative passes over a scenic trail or MDSR. It is anticipated that the proposed ROW would be maintained approximately every year or as deemed necessary by the applicant.

For all the action alternatives, certain dynamic components of the visual environment would interact with the proposed actions creating some level of variability in the resulting impact. Examples of these components include ephemeral qualities, such as weather conditions (e.g., low cloud cover or haze) and seasonal variations, such as the deciduous forest condition (leaf-on/leaf-off) and how that affects visibility from a given point. Solar aspect, also a seasonal consideration, would play a role in how the proposed ROW expansions appear when viewed from a moderate distance, because the greatest potential for visibility of the corridor occurs from the visual contrast caused by the shadow effect of the adjacent vegetation. Finally, the position of the viewer and the angle at which one views the alignment would affect the level of impact on visual quality. Each of these components is discussed if or when they influence the level of impact under the proposed alternatives.

It is expected that diverter devices would be placed on static wires and transmission conductors to prevent bird strike along specific segments of the alignment. The potential locations of the bird diverters in the context of the KOP locations and view direction are presented in figures 74, 75, and 76. See figures 54 and 55 for locations of all selected KOPs. The diverters would be required where the alignment would intersect with typical migratory bird routes: crossing MDSR and where the alignment passes over Kittatinny Ridge and the Hogback. Bird diverting devices are also discussed in the “Landscape Connectivity, Wildlife Habitat, and Wildlife” section of this chapter. Generally speaking, the devices would increase visibility of the lines by making the conductors more noticeable and would increase visual

clutter, especially when seen in the foreground. It is not currently known what type of device would be installed; however, the devices would be in accordance with APLIC standards and be considered the best available technology. The spacing of the devices on the conductors would be based on the type installed; but spacing could vary from 30 to 200 feet apart. Spiral wire diverters were originally analyzed along the alignment where diverters would be required. For the sake of completeness, marker ball devices were also considered and simulated at two KOPs at alternative 3: McDade Trail near MDSR and the crossing at APPA. The spiral wires and marker ball type diverters were each simulated for McDade Trail where alternative 3 crosses MDSR, and at APPA where alternative 3 crosses over the trail. Figures 3-4a and 3-4b and 3-13a and 3-13b in appendix K depict possible diverter types that could be installed, and the corresponding visual impacts of each. Based on these simulations, the marker balls would result in greater visual impact than the spiral wire because they result in greater visual clutter and would be visible from further away.

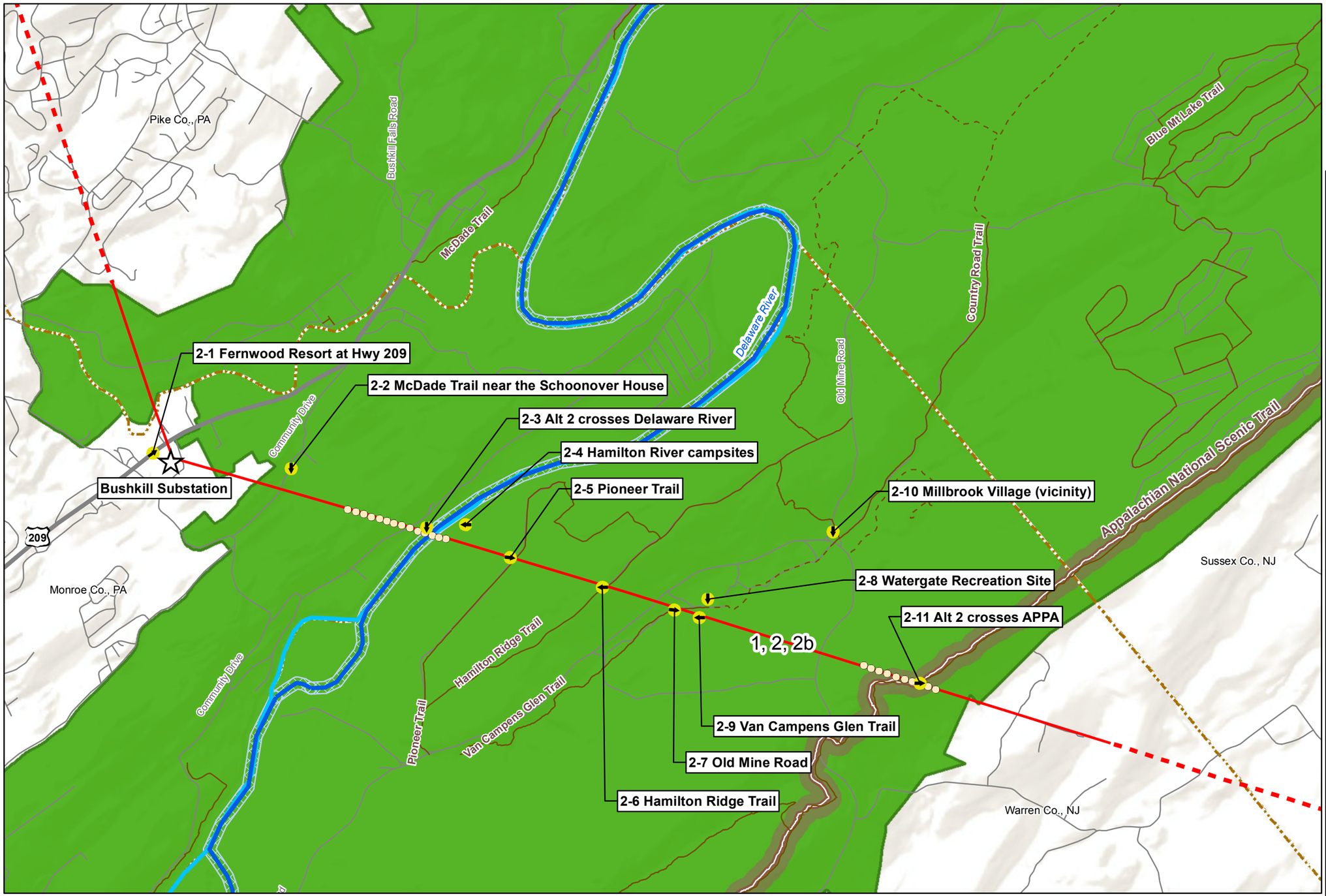
The following analysis and evaluation for each alternative were based on the changes in visual quality at each selected KOP with visibility of a given alternative. Qualitative discussion of the impacts (considering changes to unity, intactness, and vividness) are provided, followed by the change in the visual quality numeric rating, based on FHWA methodology to provide objective analysis. General changes to visual resource resulting from the alternative are also described following each alternative description.

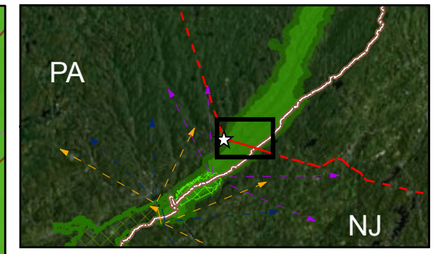
Alternative 2

Alternative 2 would result in widening the existing transmission line ROW through DEWA, MDSR, and APPA for approximately 5.6 miles. The existing structures and lines would be removed and replaced with new monopole towers and lines as described in chapter 2, resulting in a permanent loss of vegetation along the existing ROW. Proposed access roads for maintenance would be the same for alternatives 2 and 2b.

During the course of this analysis, including fieldwork and visual simulation production, certain preliminary KOPs were found to provide no visibility of the proposed actions, because the viewing distance was so great the impact would not be discernible, or vegetation or landform features blocked potential views. These KOPs were subsequently eliminated from further study. For alternative 2, these KOPs include the following:

- APPA at the future relocation section
- Culver fire tower
- Blue Mountain viewpoint
- Rattlesnake Mountain viewpoint
- Sunrise Mountain pavilion
- DEWA Cliff Trail overlooks
- Salamovka House
- Rivers Bend group campground
- Camp Mohican Lodge facility
- Pennsylvania Hwy 209 at Little Egypt Road





Legend

- Approximate location of APLIC-approved bird diverter device placed on conductors
- Selected KOP by view direction
- Substation
- Alternative 2, 2b
- Appalachian National Scenic Trail
- Kittatinny Ridge Migratory Bird Corridor
- Middle Delaware National Scenic & Recreational River
- Delaware River
- Road
- Existing Trail
- Proposed Trail
- Delaware Water Gap National Recreation Area
- Worthington State Forest
- County Line

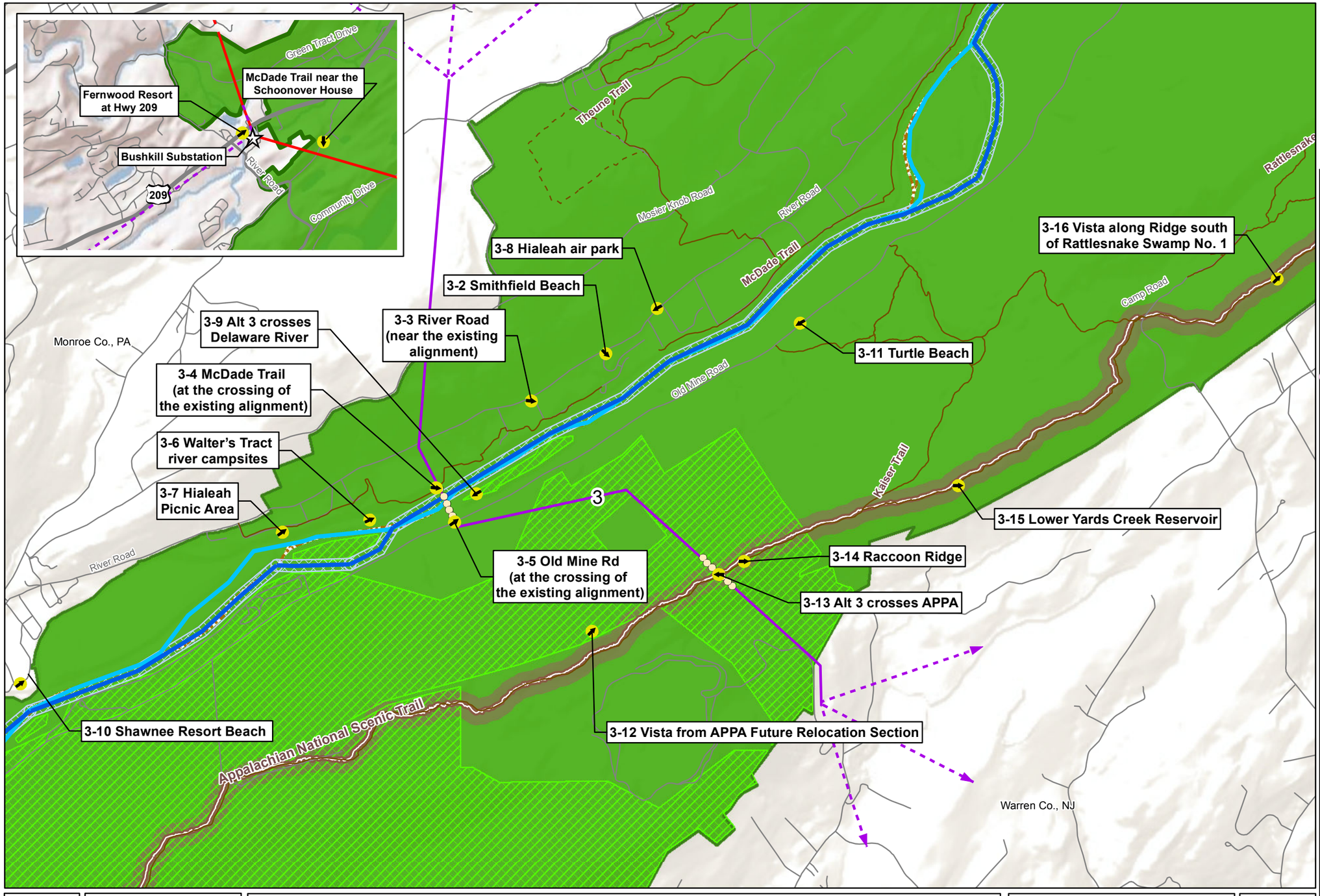
0 0.5 1 Miles

Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 74
Alternative 2, 2b
Locations of Bird Diverter Device Placement

Source: ESRI ArcGISonline Map Service 2012; National Atlas of the United States 2005

Projection: NAD 83 UTM Zone 18N
Date: July 2012

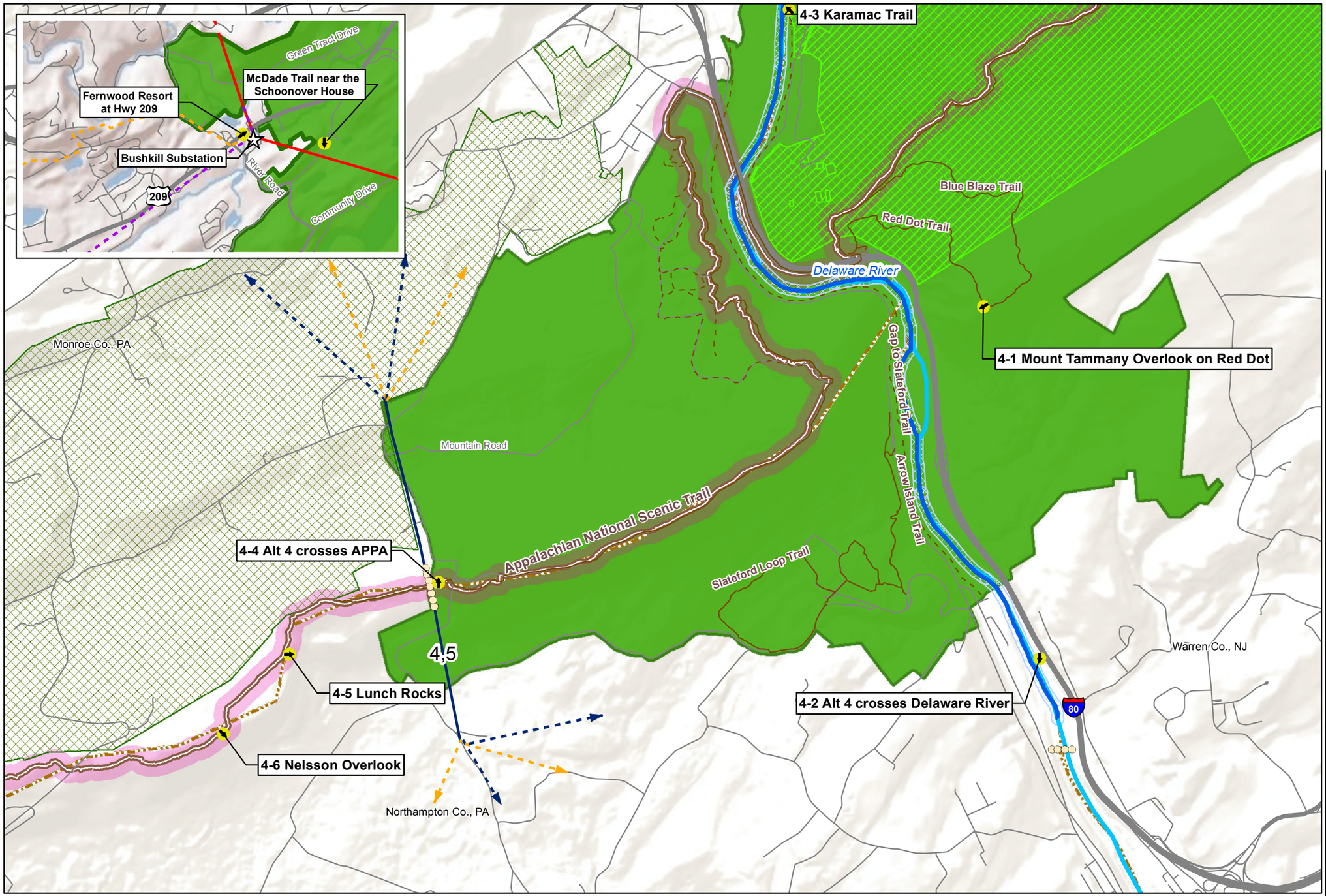


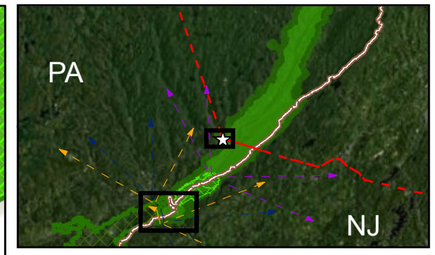
Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 75
Alternative 3
Locations of Bird Diverter Device Placement

Source: ESRI ArcGISonline Map Service 2012; National Atlas of the United States 2005

Projection: NAD 83 UTM Zone 18N
Date: July 2012





Legend

- Approximate location of APLIC-approved bird diverter device placed on conductors
- Selected KOP by view direction
- Substation
- Alternative 2, 2b
- Alternative 3
- Alternative 4
- Alternative 5
- Appalachian National Scenic Trail
- Kittatinny Ridge Migratory Bird Corridor
- Middle Delaware National Scenic & Recreational River
- Delaware River
- Road
- Existing Trail
- Proposed Trail
- Delaware Water Gap National Recreation Area
- Worthington State Forest
- CVNWR Boundary
- County Line

Note: Designated boundary of CVNWR is depicted, not all property is owned within the boundary

0 0.5 1
Miles

Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 76
Alternative 4,5
Locations of Bird Diverter Device Placement

Source: ESRI ArcGISonline Map Service 2012; National Atlas of the United States 2005

Projection: NAD 83 UTM Zone 18N
Date: July 2012

Visual simulations were prepared to depict the changes for KOPs impacted by alternative 2 and are included in appendix K (figures 2-1 through 2-11). Affected KOPs with potential visibility of the proposed actions under alternative 2 include the following:

- Fernwood Resort at Hwy 209
- McDade Trail near the Schoonover House
- MDSR (east of Bushkill)
- Hamilton River campsites
- Pioneer Trail
- Hamilton Ridge Trail
- Old Mine Road
- Watergate Recreation Site
- Van Campen Glen Trail
- Millbrook Village (vicinity)
- APPA (at the point where the existing alignment passes over)

Table 53 summarizes changes in the overall visual quality for the affected KOPs for alternative 2, based on the FHWA scale of 0 to 7.

TABLE 53: ALTERNATIVE 2: SUMMARY OF CHANGES TO VISUAL QUALITY RATINGS* AT IDENTIFIED KOPS

KOP Name	Visual Quality Score Under Existing Conditions	Visual Quality Score Under Simulated Proposed Conditions	Total reduction in Visual Quality, unless noted otherwise
Fernwood Resort	2.54	2.21	(0.33)
McDade Trail near Schoonover House and Community Dr.	5.04	3.42	(1.62)
MDSR at alternative 2	5.00	3.83	(1.17)
Hamilton River campsites	5.13	4.46	(0.67)
Pioneer Trail	3.04	2.50	(0.54)
Hamilton Ridge Trail	3.00	2.79	(0.21)
Old Mine Rd., at alternative 2	3.04	2.96	(0.08)
Watergate Recreation Site	4.67	3.38	(1.29)
Van Campen Glen Trail	3.08	2.33	(0.75)
Millbrook Village	4.42	3.92	(0.50)
APPA at alternative 2 crossing	2.71	2.92	Increase of 0.21 from specific KOP viewpoint (overall impacts to APPA in the vicinity of the crossing would be adverse)

*The ratings are based on the FHWA scale from 1 to 7.

Fernwood Resort, Pennsylvania Hwy 209

Proposed conditions are represented in appendix K, figure 2-1, "Proposed." While Fernwood Resort is located outside the DEWA boundary, its proximity to the park along Pennsylvania Hwy 209 results in its serving as a visual point of access; therefore it has been included for the sake of completeness. As figure 2-1 in appendix K shows, the new towers would be much more visible compared with baseline conditions. Vegetation removal would be visible near the proposed tower and in the background as the alignment crests the slope. Visual unity would be reduced from low to very low to low; due to the scale of the proposed tower giving it stronger dominance in this view. However, in the context of the surrounding development, the change would be less pronounced. Intactness would be reduced due to the increased encroachment resulting from the introduced conductors and tower silhouetted against the sky, but would remain moderately low to average. Vividness for the existing commercial development is currently very low to low, and the proposed action would have adverse effects on this aspect of visual quality. The overall visual quality at Fernwood Resort would remain moderately low (however, the visual quality rating would be reduced from 2.54 to 2.21 on the FHWA scale of 1 to 7). This represents a decrease in overall visual quality of 0.33. Adverse impacts would occur on the visual resources of Fernwood Resort due to the alternative 2 alignment.

McDade Trail near Community Drive, Schoonover House

Proposed conditions are shown in appendix K, figure 2-2, "Proposed." Vegetation would be removed to accommodate the proposed alignment, and the taller tower would noticeably extend above the tree tops. Due to the perpendicular angle of the view from McDade Trail at this point, the widened ROW would be somewhat subtle. Visual unity would be reduced from moderately high to high to moderately low to average due to the scale of the tower drawing focus away from the human-made structure (i.e., the barn) that previously was the focus. The visible tower and conductors appear out of proportion with the other visible elements, creating visual conflict. Intactness would also be reduced from moderately high to high to moderately low to average, as the tower and new conductors encroach upon the view and would be silhouetted against the sky. Vividness would be somewhat reduced from moderately low/average to moderately low, mainly due to the intruding human-made development impacting the ability of the scene to be remembered for its natural or historic and cultural uniqueness. The presence of access roads within the ROW would also contribute to adverse visual impacts compared to baseline conditions. The overall visual quality at McDade Trail at the Schoonover House would be reduced from high to average (shifting from 5.04 to 3.42 on the FHWA scale of 1 to 7). This represents a decrease in overall visual quality of 1.62. Adverse impacts would occur on the visual resources of McDade Trail, Community Drive, and the Schoonover House near the alternative 2 alignment.

MDSR

Proposed conditions are shown in appendix K, figure 2-3, "Proposed." Along MDSR, the taller towers and larger conductors would become more noticeably visible compared with baseline conditions, in which the steel lattice structure is mostly screened from view until seen from directly beneath the alignment. Proposed conditions show the tower extending beyond the tree height, disrupting the scale and balance of the scene. Due to the angle of this view, the proposed vegetation removal would be only somewhat more visible moving toward the line, and then very apparent when viewed within the proposed ROW. For visibility to migratory birds, deflector devices in accordance with APLIC standards and considered best available technology would be installed on the conductors where they cross the river and ascending the Hogback Ridge. While the distance from which the diverters would be discernible would depend on type installed, when seen their presence would increase visual clutter and the ability of the conductors to be noticed.

Affects to visual unity would include a reduction to the existing harmony shown in the baseline condition, caused by the introduced tower and conductors conflicting with the natural view. Therefore, unity would be reduced from moderately high to moderately low. Intactness would be reduced from moderately high / high to average / moderately high due to the new encroaching features and vegetation removal increasing the apparent level of development and contributing to visual intrusions. Vividness would be somewhat reduced numerically but would remain average to moderately high due to the intrusion of incompatible human-made elements detracting from the otherwise memorable combination of natural elements: water, vegetation, and landform. The overall visual quality at MDSR would be reduced from high to moderately high (shifting from 5.00 to 3.83 on the FHWA scale of 1 to 7). This represents a decrease in overall visual quality of 1.17. Adverse impacts would occur on the visual resources of MDSR due to the alternative 2 crossing.

Hamilton River Campsites

Proposed conditions are represented in appendix K, figure 2-4, "Proposed." Taller towers and vegetation removal would be apparent compared with baseline conditions, although the line of sight across the river would remain somewhat screened by trees. Hamilton River includes eleven relatively primitive campsites, and a central, representative site was selected for this analysis. The expanded ROW on the New Jersey bank (the nearer bank in the figure) would also be clearly visible from the campsite, as vegetation removal would likely extend to the northern edge of the campsite. It is possible that a new tower on the New Jersey bank would be visible from the campsite. A new or improved existing (i.e., cleared and graveled) maintenance access road is also proposed near the campsite. For visibility to migratory birds, deflector devices in accordance with APLIC standards and considered best available technology would be installed on the conductors where they cross the river and ascending the Hogback Ridge. While the distance from which the diverters would be discernible would depend on the type installed, when seen their presence would increase visual clutter and the ability of the conductors to be noticed.

Overall, visual unity would be reduced from moderately high / high to average / moderately high, as the proposed actions would conflict with the sense of visual remoteness, free from other visual cues of development. The noticeably cleared ROW across the river would also contribute to disrupted visual harmony. Intactness would be reduced from moderately high / high to moderately high due to the widened ROW vegetation removal and the new encroachment of the tower the conductors. Encroachment would be emphasized to the extent bird diverter devices were visible, particularly during winter 'leaf-off' conditions when opportunity to view the alignment would be greatest. Vividness would be reduced from average / moderately high to moderately low / average due to the intrusion of human-made infrastructural elements into the otherwise undeveloped setting, thus limiting the ability of the view to be remembered as highly natural. The overall visual quality at Hamilton River campsites would be reduced from high to moderately high (shifting from 5.13 to 4.46 on the FHWA scale of 1 to 7). This represents a decrease in overall visual quality of 0.67. Adverse impacts would occur on the visual resources of Hamilton River campsites due to the alternative 2 alignment.

Pioneer Trail

Proposed conditions are shown in appendix K, figure 2-5, "Proposed." Taller poles, larger conductors, and substantial vegetation removal would occur where the trail passes under the alignment. The new, larger towers would have a longer span capacity, resulting in potentially fewer total towers, depending upon terrain, thus contributing to visual unity. As seen in the figure, the nearest tower would be on the distant horizon, rather than in the immediate foreground as in the baseline condition. However, overall unity would still be somewhat reduced compared with baseline conditions, mainly due to the expanded ROW vegetation clearing disrupting the naturally occurring landscape (thus decreased from low / moderately low to low). Intactness would also be reduced from average / moderately low to average, as

the proposed alignment would increase the apparent level of development and increase visual encroachments resulting from the tower fully silhouetted at the top of the ridgeline and the conductors obstructing the sky view. Vividness at Pioneer Trail would be reduced numerically, but would remain low to moderately low, primarily due to the substantial vegetation loss in the proposed ROW creating a manmade intrusion in the context of the scenic wooded landscape trail. No visual benefit would be provided by the cleared vegetation in terms of new views, as visibility would be limited to the near middleground by topography, and the surrounding landscape forms are not highly memorable. The overall visual quality at Pioneer Trail would be reduced from average to moderately low (shifting from 3.04 to 2.50 on the FHWA scale of 1 to 7). This represents a decrease in overall visual quality of 0.54. Adverse impacts would occur on the visual resources of Pioneer Trail due to the alternative 2 alignment.

Hamilton Ridge Trail

Proposed conditions are shown in appendix K, figure 2-6, "Proposed." This KOP is located near Pioneer Trail, as described in the "Visual Resources" section of chapter 3. Impacts on the visual environment would be similar to those at Pioneer Trail; the widening of the cleared ROW being the most apparent change compared with existing conditions. However, the proposed tower design would produce a slight improvement in visual unity. The towers would be visually simpler compared with the steel lattice structures, and in the context of this view, would appear more visually concurrent surrounded by the vegetation due to the color, line, and form of the tower and the woody foreground vegetation. In addition, the position of the viewer- somewhat superior relative to the landscape as it falls away along the corridor- contributes to the proposed tower appearing less visually dominant compared with baseline conditions. Therefore, visual unity would be enhanced from low / moderately low to moderately low. Intactness would be reduced, from average to moderately low, due to the widened cleared ROW resulting in a visual manmade intrusion in the context of the scenic wooded trail. Vividness would not be substantially affected, as the clearing would create an opportunity to view the surrounding landscape. However, the vegetation removal would reduce the vegetation component of the vividness of the scene, and vividness would remain low to moderately low. The overall visual quality at Hamilton Ridge Trail would be reduced from moderately low / low to moderately low (shifting from 3.00 to 2.79 on the FHWA scale of 1 to 7). This represents a decrease in overall visual quality of 0.21. Adverse impacts would occur on the visual resources of Hamilton Ridge Trail due to the alternative 2 alignment.

Old Mine Road

Proposed conditions are shown in appendix K, figure 2-7, "Proposed." Primary impacts would result from the visual fragmentation of the vegetation caused by widening the cleared ROW. Unity would be only slightly altered compared with baseline conditions, enhanced from low / moderately low to moderately low as the proposed monopole towers would be somewhat less visually obtrusive. Intactness would be reduced from average to moderately low to average due to the visual subtraction of forest cover and the encroachment of the conductors. Vividness would be reduced numerically, primarily due to the vegetation removal along the proposed ROW interrupting the otherwise forested scenic drive. Vividness would remain low to moderately low. The overall visual quality at alternative 2 crossing Old Mine Road would remain average (shifting slightly from 3.04 to 2.96 on the FHWA scale of 1 to 7). This represents a decrease in overall visual quality of 0.08. Adverse impacts would occur on the visual resources of Old Mine Road due to the alternative 2 alignment.

Watergate Recreation Site

Proposed conditions are shown in appendix K, figure 2-8, "Proposed." As the figure indicates, the alignment abuts the edge of the picnic area at Watergate Recreation Site, so the proposed ROW expansion would likely encroach onto the existing open lawn area, which would expose much of lawn to wide views of the alternative 2 alignment. The taller towers would noticeably extend above the tree tops, disrupting the scale of the surrounding visual elements and adding visual clutter. Unity would be reduced from moderately high to moderately low due to the obvious presence of a major transmission line being out of visual harmony with the pastoral recreation area. Intactness would be reduced from average / moderately high to moderately low / average due to the encroachment of the proposed ROW corridor and the increased visibility of taller towers and more conductors. Vividness would be somewhat reduced from average / moderately high to moderately low / average due to the encroaching transmission structures limiting the ability of the area to be remembered as scenic and natural. The overall visual quality at alternative 2 crossing Watergate Recreation Site would be reduced from moderately high / high to average (shifting from 4.67 to 3.38 on the FHWA scale of 1 to 7). This represents a decrease in overall visual quality of 1.29. Adverse impacts would occur on the visual resources of Watergate Recreation Site due to the alternative 2 alignment.

Mitigation at Watergate Recreation Site could help reduce the level of impact expected. A conceptual representation of this mitigation is shown in appendix K, figure 2-8, "Mitigation." Conceptual landscaping as represented in the figure shows how vegetation planted outside but along the utility ROW would likely look in approximately 15 years, consistent with the timeframe of this EIS. Beyond that, it is assumed that the vegetation would eventually grow to screen the elements of the alternative from many views in the Watergate Recreation Site picnic area, particularly views from the open picnic lawn thus reducing the overall visual quality impacts of the transmission line at this KOP. However, even after mitigating landscaping (i.e., trees) reaches mature size, it would not necessarily screen all visibility of the proposed towers from all points in Watergate Recreation Site, especially given seasonal changes in canopy cover and the varying topography of the area. Specifically, it is possible that the proposed towers would remain visible from the upper parking lot of the recreation area.

Van Campen Glen Trail

Proposed conditions are shown in appendix K, figure 2-9, "Proposed." Impacts would be similar to those of Pioneer and Hamilton Ridge Trail KOPs. Taller towers would be visible from the trail and would extend higher than the tree tops. The widened clearing of the ROW would interrupt the surrounding forested landscape, creating a visual intrusion. Visual unity would be reduced at this view from low / moderately low to low as the proximity to the nearest tower emphasizes its scale, which does not harmonize with the visual order of the view. The expanded ROW would more strongly dominate the scene, also reducing visual harmony. However, if the towers were placed and thus seen from a greater distance, it is possible they could provide a slight increase in visual harmony compared with baseline conditions (i.e., steel lattice structures). Intactness would be reduced from average to moderately low due to the visual subtraction of the expanded ROW and from the towers silhouetted against the sky. Vividness would be slightly reduced compared with baseline conditions; from low / moderately low to low, as the widened ROW clearing would create a visual intrusion in the context of a scenic wooded trail. The overall visual quality at alternative 2 crossing Van Campen Glen Trail would be reduced from average to moderately low (shifting from 3.08 to 2.33 on the FHWA scale of 1 to 7). This represents a decrease in overall visual quality of 0.75. Adverse impacts would occur on the visual resources of Van Campen Glen Trail due to the alternative 2 alignment.

Millbrook Village, Vicinity

Proposed conditions are shown in appendix K, figure 2-10, "Proposed." No visual impacts are expected under alternative 2 from in the village due to localized tree cover and structures limiting views predominantly to the foreground. However, the existing transmission alignment would be visible approaching the village from Old Mine Road, traveling south. Compared with baseline conditions, alternative 2 would be more noticeable as it passes at an angle across the background slope. Depending on atmospheric and light conditions, the conductors may be highly visible or blend into the vegetation, except where they are visible above the landform and thus become silhouetted. A contrasting shadow line along the proposed ROW would be visible during sunny days, particularly in the afternoon, causing the alignment to be more noticeable. Unity at this view would be slightly reduced from moderately high / average to moderately high due to the alignment conflicting with the texture, pattern, and line of the scene. Intactness would be reduced somewhat from average / moderately high to moderately low / average, as the conductors would add visual clutter and would be visible across the entire background of the view. Vividness would be reduced numerically, but would remain moderately low to average due to the presence of modern human-made infrastructure visible in proximity to an area intended to exhibit historic and cultural landscape values. The overall visual quality near Millbrook Village would remain moderately high (shifting from 4.42 to 3.92 on the FHWA scale of 1 to 7). This represents a decrease in overall visual quality of 0.50. Adverse impacts would occur on the visual resources near Millbrook Village due to the alternative 2 alignment.

APPA at Alternative 2 Crossing

Proposed conditions are shown in appendix K, figure 2-11, "Proposed." Visual changes would include new steel towers, more and larger conductors, and an expanded ROW clearing, which would be visible when hiking toward the corridor and from the trail looking into the distance to the east. Bird diverter devices meeting APLIC standards would be required at this location, placed along the proposed alignment approximately 500-feet to either side of the APPA centerline.

From this specific KOP viewpoint, the form and color of the monopole tower harmonize slightly better in the context of the surrounding landscape compared with the existing steel lattice structure, marginally improving visual unity. However, this improvement would be offset by the disharmony created by the widened cleared ROW swath receding into the distance, emphasized by the angle of view looking parallel to the alignment. Overall unity would, therefore, be only slightly enhanced from low to low / moderately low. Intactness would receive some benefit from the proposed tower design reducing visual clutter in the foreground and opening the opportunity to view out. However, the taller monopole towers and larger conductor would remain encroachments, particularly because this location would require installation of bird diverters on the conductors. Also, the visual subtraction created by the widened ROW clearing in the middleground would negate some of the benefit. For these reasons, intactness would not be altered at this view. Vividness would be slightly benefited as the reduction in visual clutter would create an opportunity to view farther into the scenic landscape, and would be enhanced from low / moderately low /moderately low. Overall visual quality where alternative 2 crosses APPA would remain average. The visual quality score from this viewpoint would be marginally enhanced compared with existing conditions, shifting slightly from 2.71 to 2.92 on the FHWA scale of 1 to 7. This represents a slight increase in overall visual quality of 0.21 at this particular viewpoint, so visual quality could improve depending upon on the viewer's position. However, overall, the expanded ROW clearing, taller monopole towers, and larger more numerous conductors (including diverter devices) would very likely degrade visual quality of views approaching the ROW and from other points within it relative to APPA. For these reasons, adverse impacts would occur on the overall visual resources of APPA at the alternative 2 crossing. It is also possible that the widened ROW could be seen from points along APPA where the ROW traverses outside the study area.

Zone of Visual Influence (ZVI) Bare-Earth Terrain Modeling

As described in the "Methodologies" section, table 54 provides areas (in acres) from which the existing lattice towers and proposed transmission towers could potentially be seen under bare earth conditions, for alternatives 2 and 2b, for lands within DEWA and along the APPA alignment (defined at 1000 feet wide). Similar tables indicating the 'zone of visual influence' are provided for each alternative. Figures representing this bare-earth analysis are provided for existing and proposed alignment conditions for all the alternatives in appendix K and in the Visual Resources Summary Report. Figures 77 and 78 present a comparison of the existing pole visibility across the alternatives and proposed pole visibility, respectively. See figures 79 and 80, respectively, for existing pole visibility and proposed pole visibility specific to alternatives 2 and 2b.

TABLE 54: ALTERNATIVE 2/2B VISIBILITY USING ZVI BARE-EARTH TERRAIN MODELING (ESTIMATED IN ACRES)

Pole / Tower height	Number of poles/towers within DEWA:	Potential Visibility from within DEWA	Potential Visibility from MDSR	Potential Visibility from APPA
Existing 85' lattice towers along the alternative 2 alignment	23	31,606	902	2,305
Proposed 195 foot monopole (6 towers per mile)	21 (alternative 2) 19 (alternative 2b)	35,307	1,506	5.903

Overall Alternative 2 Impacts

Activities related to deconstruction and construction near KOP sites would adversely affect visual resources and scenic views, as described in the "Common to All Action Alternatives" section. Under alternative 2, these impacts would be most apparent along Millbrook-Flatbrook Road and Old Mine Road in New Jersey. Affected sites in Pennsylvania potentially include Fernwood Resort, Pennsylvania Hwy 209 near Bushkill, McDade Trail, the cultural landscape related to the Schoonover house, and Community Drive. Affected sites in New Jersey potentially include Van Campen Glen, Hamilton, and Pioneer trails, Watergate Recreation Site, and Millbrook Village. Adverse impacts would depend on the extent to which deconstruction and construction activities could be seen, as well as the location of temporary spur roads. Adverse impacts would occur, with the most impacts related intense deconstruction and construction activities. Impacts related to operation and maintenance of the transmission line would be the same as for alternative 1: adverse.

Cumulative Impacts

Cumulative impacts inside the study area would result in adverse impacts on visual resources as described previously in the "Cumulative Impacts" section. When the impacts on visual resources as a result of alternative 2 are combined with other past, present, and reasonably foreseeable projects in the study area, an overall cumulative adverse impact would be expected.

The past, present, and reasonably foreseeable projects identified along the length of APPA would produce adverse cumulative impacts on the trail as explained in the "Cumulative Impacts" section. When the impacts on visual resources as a result of alternative 2 are combined with other projects that affect APPA, an overall adverse cumulative impact would be expected.

Conclusion

Inside the study area, alternative 2 would result in adverse impacts on visual quality and scenic views, in particular at the McDade Trail. In general, visual contrast resulting from shadow lines within the ROW corridor swath would be more apparent and visually dominant during spring and summer 'leaf-on' conditions; conversely, the taller towers and larger conductors would be more visible during winter 'leaf-off' conditions. The straight line formed by the B-K Line alignment provides opportunities to view the corridor at specific locations, such as beneath it while driving Old Mine Road. In such cases, the corridor would be highly visible and would encroach briefly as the viewer approaches or is within the ROW. The adverse impacts would potentially be highest at the Watergate Recreation Site depending on the proximity of the viewer to the transmission line. Impacts related to deconstruction and construction would be localized. Ongoing maintenance activities would be of limited duration and in specific locations, resulting in localized adverse impacts. When combined with the impacts on visual resources under alternative 2, the effects of past, present, and reasonably foreseeable future projects would result in adverse cumulative impacts on visual resources inside the study area, and adverse cumulative impacts specifically on APPA.

The applicant's project would impact the portions of several resources inside the park that are also under pressure in the surrounding region. Multiple types of development outside of DEWA and APPA are quickly diminishing several of the resources analyzed on a broader scale, including scenic viewsheds. Alternative 2 would cross in the center part of DEWA, including the MDSR. In general, this area is one of the most undeveloped areas of the park, containing large swaths of contiguous mature forest with few manmade intrusions. Alternative 2 would cross close to a unique river feature, the Walpack Bend, which is a premier visitor attraction in DEWA. Installation of new taller towers would introduce a noticeable visual intrusion that would diminish scenic quality. This, in turn, would have adverse impacts on the MDSR through degradation of the scenic values for which the river was designated. The visual change would affect a relatively large area and a large number of users, and would exist for the period of analysis.

The crossing's location in DEWA makes it visible from distant high points like APPA. For APPA, alternative 2 would traverse what is now a very natural and relatively unspoiled viewshed provided by these undeveloped lands below it. The applicant's project is one component of a larger regional plan by the RTO.

The presence of large and obtrusive infrastructure in a relatively undeveloped zone would be a distraction and would detract from the experience visitors seek at the parks. It would degrade the regionally unique and unusual wilderness-like viewshed for APPA that DEWA and MDSR provide. A crossing at this location poses high risk for drastic scenic degradation. Alternative 2 contributes to the cumulative adverse impact on visual resources; in addition, the loss of visual resources in the region surrounding the parks would increase their scarcity and sensitivity inside the parks, where they are afforded special protection. Construction in this location would have some marginal beneficial impacts because replacement of the existing lattice structures with steel monopoles would reduce visual clutter at close distances.

Alternative 2/2b

Alternative 3

Alternative 4

Alternative 5

Delaware River

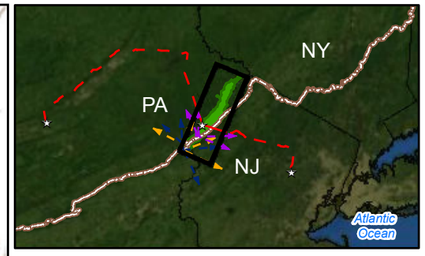
Alternative 2/2b

Alternative 3

Alternative 4

Alternative 5

Total acreage for alternative 5 is less than for the other alternatives due to the extent of the study area



Legend

- ☆ Substations
- Alternative 2/2b
- Alternative 3
- Alternative 4
- Alternative 5
- • Existing Tower

Notes: Existing tower locations are located along existing transmission lines. Large towers were given an 85 foot elevation (tower height) and small and medium towers were given a 65 foot elevation.

Existing Towers			
	Sm/Med (65')	Large (85')	Total
Alt 2/2b	--	46	46
Alt 3	75	65	140
Alt 4	35	37	72
Alt 5	35	5	40

Number of Existing Towers Potentially Visible

- 1 to 6
- 7 to 12
- 13 to 18
- 19 to 24
- 25 to 30
- 31+

The viewshed analysis results were clipped to the extent of the Delaware Water Gap NRA.

- Visual Analysis Study Area
- Appalachian National Scenic Trail
- Middle Delaware National Scenic and Recreational River
- Delaware River
- Delaware Water Gap National Recreation Area
- CVNWR Boundary
- Worthington State Forest
- County Line

0 3 6
Miles

Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 77
Existing Tower Visibility: Bare Terrain Analysis

Source: NPS 2010, EA Engineering 2010, DEWA 2008, ESRI 2002, ESRI 2006, ESRI 2010, NJOIT - OGIS 2008, PASDA 2010

Projection: NAD 83 UTM Zone 18N
Date: July 2012

Alternative 2/2b

Alternative 3

Alternative 4

Alternative 5

Total acreage for alternative 5 is less than for the other alternatives due to the extent of the study area

Delaware River

Alternative 2/2b

Alternative 3

Alternative 4

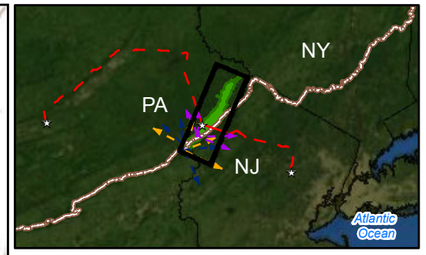
Alternative 5

# Towers Visible	% Area of DEWA	Acres
1 to 6	22%	14,958
7 to 12	14%	9,625
13 to 18	8%	5,592
19 to 24	3%	1,970
25 to 30	2%	1,550
31+	2%	1,612
Towers Visible	51%	35,307
No Towers Visible	49%	33,754
Total	100%	69,062

# Towers Visible	% Area of DEWA	Acres
1 to 6	16%	10,877
7 to 12	10%	7,093
13 to 18	8%	5,456
19 to 24	5%	3,252
25 to 30	3%	2,250
31+	6%	4,377
Towers Visible	48%	33,305
No Towers Visible	52%	35,757
Total	100%	69,062

# Towers Visible	% Area of DEWA	Acres
1 to 6	15%	10,455
7 to 12	7%	5,056
13 to 18	5%	3,494
19 to 24	5%	3,152
25 to 30	3%	2,103
31+	4%	2,890
Towers Visible	39%	27,149
No Towers Visible	61%	41,913
Total	100%	69,062

# Towers Visible	% Area of DEWA	Acres
1 to 6	22%	11,787
7 to 12	8%	4,334
13 to 18	2%	1,010
19 to 24	0%	0
25 to 30	0%	0
31+	0%	0
Towers Visible	32%	17,131
No Towers Visible	68%	35,808
Total	100%	52,939



Legend

- Substations
- Alternative 2/2b
- Alternative 3
- Alternative 4
- Alternative 5
- Proposed Tower

Note: Proposed towers are located along the proposed transmission lines. Towers were given a 195 foot elevation and spaced approximately 6 towers per mile.

Proposed Towers (195')	
Alt 2/2b	424
Alt 3	484
Alt 4	557
Alt 5	432

Number of Proposed Towers Potentially Visible

- 1 to 6
- 7 to 12
- 13 to 18
- 19 to 24
- 25 to 30
- 31+

The viewshed analysis results were clipped to the extent of the Delaware Water Gap NRA.

- Visual Analysis Study Area
- Appalachian National Scenic Trail
- Middle Delaware National Scenic and Recreational River
- Delaware River
- Delaware Water Gap National Recreation Area
- CVNWR Boundary
- Worthington State Forest
- County Line

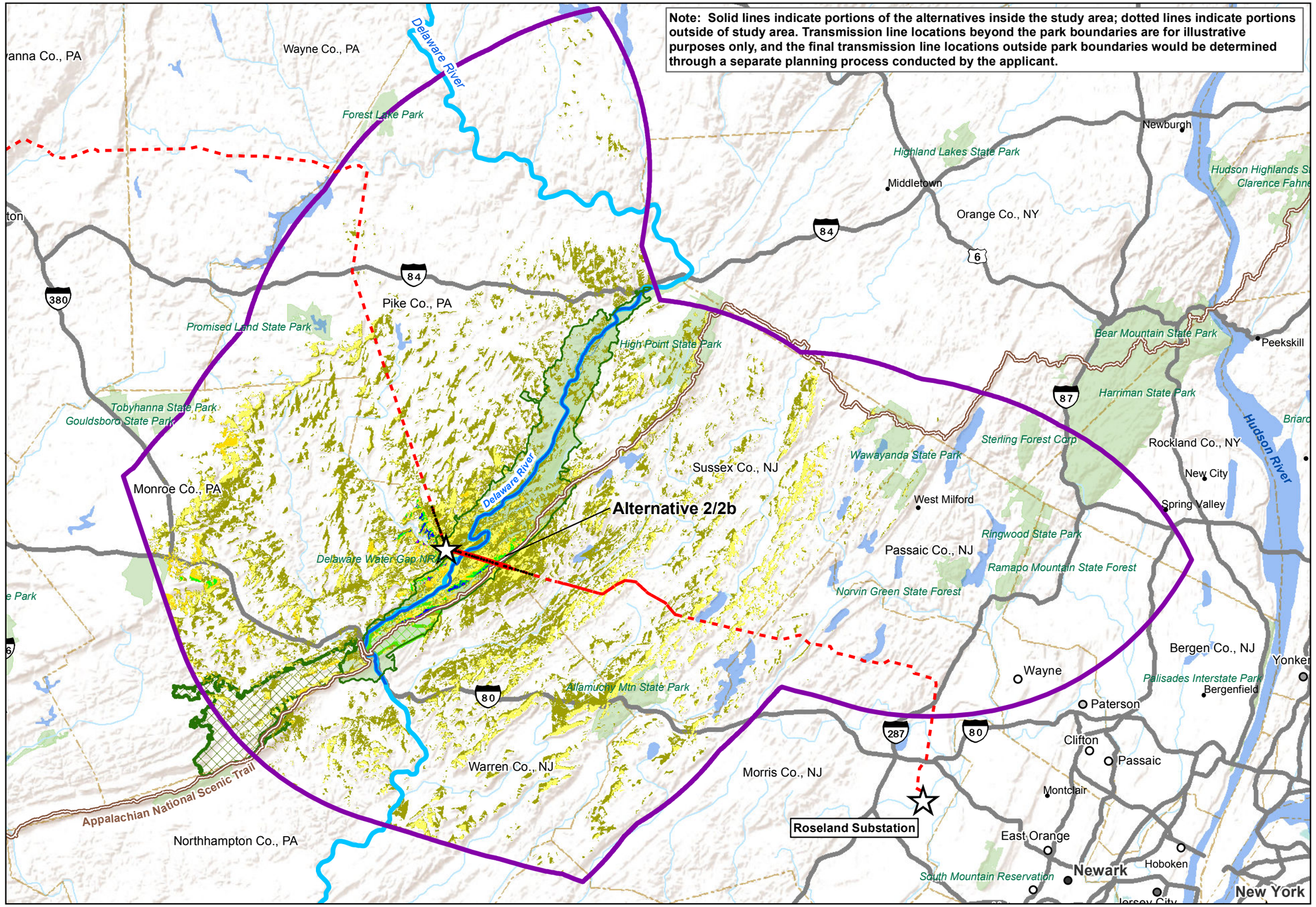
0 3 6
Miles

Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 78
Proposed Tower Visibility: Bare Terrain Analysis

Source: NPS 2010, EA Engineering 2010, DEWA 2008, ESRI 2002, ESRI 2006, ESRI 2010, NJOIT - OGIS 2008, PASDA 2010

Projection: NAD 83 UTM Zone 18N
Date: July 2012



Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

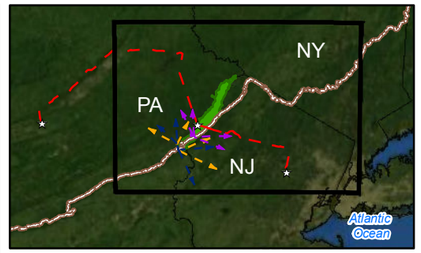
Figure 79
Existing Tower Visibility: Bare Terrain Analysis
Alternative 2/2b

Source: NPS 2010, EA Engineering 2010, DEWA 2008, ESRI 2002, ESRI 2006, ESRI 2010, NJOIT - OGIS 2008, PASDA 2010

Projection: NAD 83 UTM Zone 18N
Date: July 2012

Figure 80 - Alt 2/2b		
# Towers Visible	% of Study Area	Acres
1 to 6	9%	136,987
7 to 12	4%	59,645
13 to 18	3%	51,186
19 to 24	1%	9,671
25 to 30	0%	3,701
31+	0%	2,473
Towers Visible	17%	263,663
No Towers Visible	83%	1,316,570
Total	100%	1,580,233

Note: Solid lines indicate portions of the alternatives inside the study area; dotted lines indicate portions outside of study area. Transmission line locations beyond the park boundaries are for illustrative purposes only, and the final transmission line locations outside park boundaries would be determined through a separate planning process conducted by the applicant.



Legend

- Substation
- Alternative 2/2b

Number of Proposed Towers Potentially Visible

- 1 to 6
- 7 to 12
- 13 to 18
- 19 to 24
- 25 to 30
- 31+
- Proposed Tower

Note: Proposed towers are located along the proposed transmission lines. Towers were given a 195 foot elevation and spaced approximately 6 towers per mile.

The study area is defined as the union of the areas that are 20 miles from the DEWA boundary and 20 miles from the APPA alignment, intersected with the area that is 20 miles from the alternative alignment.

- Visual Analysis Study Area
- Appalachian National Scenic Trail
- Middle Delaware National Scenic and Recreational River
- Delaware River
- Delaware Water Gap National Recreation Area
- CVNWR Boundary
- Worthington State Forest
- State Park
- County Line
- Interstate Hwy

0 5 10 Miles

Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 80
Proposed Tower Visibility: Bare Terrain Analysis
Alternative 2/2b

Source: NPS 2010, EA Engineering 2010, DEWA 2008, ESRI 2002, ESRI 2006, ESRI 2010, NJOIT - OGIS 2008, PASDA 2010

Projection: NAD 83 UTM Zone 18N
Date: July 2012

Installation of new, more visibly apparent towers would introduce a non-conforming characteristic into the environment of these resources degrading their relevant integrities. Impacts to scenic resources would be significant. The taller towers and wider ROW would create a dramatic visual disturbance where very little disturbance currently exists. These impacts would be widely distributed across both APPA and DEWA at any location where the line is visible. Overall, the significance of the impact of alternative 2 is a result of two considerations: the particularly resource-rich area through which the alternative crosses, and the potential to inflict harm to those resources because of the magnitude and duration of the adverse impacts. Although it is true that not all impacts can be predicted with great certainty, in the context of the purpose and significance for which DEWA, APPA, and MDSR were established and NPS mandates to specifically preserve the natural, cultural, and scenic resources within them, additional precautions are warranted when considering risks to these resources, many of which are of national importance. Visual resources are under threat by other actions and outside pressure, which in the context of the function of the parks as an "oasis" or refuge within the highly developed east coast, elevates the need to preserve and protect these scarce, sensitive resources. Similarly, certain resources are non-renewable, which makes any impacts to them all the more serious because they cannot be replaced if lost. And some resources are under threat by other actions and outside pressure, which in the context of the function of the parks as an "oasis" or refuge within the highly developed east coast, elevates the need to preserve and protect these scarce, sensitive resources.

Public attention surrounding this project is high. There is likely to be a high degree of controversy over any effects on park resources that are particularly popular with the public, such as scenery, visitor use and experience, rare and unique communities, cultural landscapes, and historic structures, for any of the alternatives. The inherent uncertain nature of predicting the true degree of some of these impacts would likely heighten this controversy. Additionally, construction at this particular location in DEWA is likely to accentuate the controversy due to the unique characteristics presented here and high visitor traffic to the area.

Permitting the project would adversely affect multiple protected resources inside the parks, in some instances irreversibly. Allowing such impacts is contrary to typical NPS practice of improving scenic conditions by removing non-conforming features and may establish precedent for future actions. This could establish precedent that may invite similar proposals by other applicants in the future, and create an expectation of like treatment for those proposals; it may make it difficult to deny such proposals. DEWA and APPA both contain numerous other utility crossings, which makes the risk of such precedent particularly concerning for these parks. Furthermore, as units of the national park system, wherein all parks are entitled to equal protection, creating such a precedent could have ramifications for parks nationwide. The location of this particular crossing through the center of DEWA could make such a precedent even more potent. Installing the S-R Line on this alignment may invite future utilities proposing to follow the same route. Thus, the NPS believes that alternative 2 would result in significant adverse impacts to visual resources.

Alternative 2b

The alternative 2b alignment would follow the same route as alternative 2, described previously. However, under alternative 2b the proposed alignment would be constructed within the existing ROW limits currently in place within DEWA boundaries, which varies from 100 to 350-feet wide. The KOPs with potential visibility of the proposed actions under alternative 2b are the same as those for alternative 2. In general, alternative 2b would result in similar visual effects as alternative 2 given the coincident alignments. However, installing the proposed towers within the existing cleared ROW would have less noticeable visual effects compared with alternative 2 where vegetation widening is proposed.

Table 55 summarizes the change in overall visual quality ratings at the affected KOPs for alternative 2b, based on the FHWA scale of 1 to 7.

TABLE 55: ALTERNATIVE 2B: SUMMARY OF CHANGES TO VISUAL QUALITY RATINGS* AT IDENTIFIED KOPS

KOP Name	Visual Quality Score Under Existing Conditions	Visual Quality Score Under Simulated Proposed Conditions	Total reduction in Visual Quality, unless noted otherwise
Fernwood Resort	2.54	2.29	(0.25)
McDade Trail near Schoonover House and Community Dr.	5.04	3.75	(1.29)
MDSR at alternative 2b	5.00	3.83	(1.17)
Hamilton River campsites	5.13	4.75	(0.38)
Pioneer Trail	3.04	2.50	(0.54)
Hamilton Ridge Trail	3.00	2.79	(0.21)
Old Mine Rd., at alternative 2	3.04	2.79	(0.25)
Watergate Recreation Site	4.67	4.58	(0.09)
Van Campen Glen Trail	3.08	2.58	(0.50)
Millbrook Village	4.42	4.17	(0.25)
APPA at alternative 2 crossing	2.71	2.92	Increase of 0.21 at specific KOP location (impacts are anticipated to APPA as a result of alternative 2b)

*The ratings are based on the FHWA scale from 1 to 7.

Visual simulations were prepared to depict the changes for KOPs impacted by alternative 2b (appendix K, figures 2b-1 through 2b-11). Because the changes to the transmission corridor would be similar to alternative 2, it was not necessary to include detailed analysis for each KOP. However, numeric scoring of the proposed conditions based on the simulations was required to determine the intensity of impact. The results of that scoring are shown in the visual analysis matrix for alternative 2b included in appendix K. For those segments of the alignment where the existing ROW width is 100-feet or 150-feet, slightly less visual disruption and fragmentation would occur under alternative 2b compared with the expanded clearing proposed under alternative 2, especially when the ROW is viewed along its length. This difference is most notable relative to the overall intactness of a view and the vegetation component of the vividness of a view.

Overall Alternative 2b Impacts

Impacts from the height of the proposed towers, particularly when silhouetted against the sky, along with the larger and more apparent conductors, would be similar to alternative 2. This would result in adverse impacts at several KOPs under alternative 2b, with the most intense impacts at McDade Trail near the Schoonover House and Community Drive, and MDSR. Overall, alternative 2b would have adverse impacts on visual resources.

Cumulative Impacts

Cumulative impacts inside the study area would result in adverse impacts on visual resources as described previously in the "Cumulative Impacts" section. When the impacts on visual resources as a result of alternative 2b are combined with other past, present, and reasonably foreseeable projects in the study area, an overall cumulative adverse impact would be expected.

The past, present, and reasonably foreseeable projects identified along the length of APPA would produce adverse cumulative impacts on the trail as explained in the "Cumulative Impacts" section. When the impacts on visual resources as a result of alternative 2b are combined with other projects that affect APPA, an overall adverse cumulative impact would be expected.

Conclusion

Inside the study area, alternative 2b would result in adverse impacts on visual quality and scenic views. In general, similar to alternative 2, visual contrast resulting from shadow lines within the ROW corridor swath would be more apparent and visually dominant during spring and summer "leaf-on" conditions; conversely, the taller towers and larger conductors would be more visible during winter "leaf-off" conditions. The straight line formed by the B-K Line alignment provides opportunities to view the corridor at specific locations; however, for those segments of the alignment where the existing ROW width is 100 feet or 150 feet, slightly less visual disruption and fragmentation would occur under alternative 2b compared with the expanded clearing proposed under alternative 2. Installing the proposed towers within the existing cleared ROW would have less noticeable visual effects compared with alternative 2 where vegetation widening is proposed. Despite some marginally improved views from very specific view locations as a result of the removal of the lattice tower, shown at the KOP, impacts on APPA from alternative 2b would remain adverse. When combined with the impacts on visual resources under alternative 2b, the effects of past, present, and reasonably foreseeable future projects would result in adverse cumulative impacts on visual resources inside the study area, and adverse cumulative impacts specifically on APPA.

Though the route would be identical to alternative 2, alternative 2b would include two towers in addition to those required for alternative 2. These two towers would be located in the vicinity of Bushkill Substation. Through the course of this analysis, the additional towers were found to be screened from view from the selected KOPs—including Fernwood Resort—by vegetation and landforms. Adverse impacts could still occur, however, from other locations within DEWA where the towers could be visible.

As stated for alternative 2, many resources outside of the park units are under pressure from development; visual resources are being impacted by this development. Alternative 2b would cross through the middle of DEWA and MDSR, where many unique vegetation communities exist. The construction of the S-R Line through this portion of the parks would diminish scenic quality. For APPA, alternative 2b would traverse what is now a very natural and relatively unspoiled viewshed provided by these undeveloped lands below it. The visual change would affect a relatively large area and a large number of users, and would exist for the period of analysis.

Overall, the significance of the impact of alternative 2b is a result of two considerations: the particularly resource-rich area through which the alternative crosses, and the potential to inflict harm to those resources because of the magnitude and duration of the adverse impacts.

Public attention surrounding this project is high. There is likely to be a high degree of controversy over any effects on park resources that are particularly popular with the public, such as scenery, visitor use and experience, rare and unique communities, cultural landscapes, and historic structures, for any of the alternatives. The inherent uncertain nature of predicting the true degree of some of these impacts would likely heighten this controversy. Additionally, construction at this particular location in DEWA is likely to accentuate the controversy due to the unique characteristics presented here and high visitor traffic to the area.

Allowing impacts to scenic resources is contrary to typical NPS practice of improving scenic conditions by removing non-conforming features and may establish precedent for future actions. Thus, the NPS believes that alternative 2b would result in significant adverse impacts to visual resources.

Common to Alternatives 3, 4, and 5

Removal of the B-K Line: Under alternatives 3, 4, and 5, the B-K Line would be decommissioned and removed, allowing that corridor to be revegetated according to its natural condition, as described in chapter 2. Benefits of this action to the visual resources of DEWA and APPA would include improved visual cohesiveness and unity resulting from the unobstructed natural forest cover within. The absence of the B-K Line has the potential to improve overall vividness for views in DEWA, as the landscape would provide unencumbered views of natural forest and a greater aesthetic of remoteness consistent with a nationally protected scenic resource.

KOPs that would be directly benefited with regard to visual quality due to decommissioning, removal and revegetation of the existing alignment include the following:

- APPA at the crossing of the existing alignment (however, the benefits of the existing distant view opportunity created by the cleared vegetation there would be lost)
- McDade Trail near Schoonover House along Community Drive
- MDSR at the crossing of the existing corridor
- Hamilton River campsites
- Pioneer and Hamilton Ridge trails
- Old Mine Road
- Watergate Recreation Site
- Van Campen Glen Trail
- Millbrook Village

Impacts resulting from the decommissioning, removal and revegetation would be consistent with those discussed earlier for construction activities. The presence of dismantling equipment and periodic traffic congestion related to the activity would cause adverse impacts on the visual resources of DEWA and APPA, especially at the listed KOPs. Decommissioning and revegetating the existing B-K Line would improve the larger visual environment to these KOPs in DEWA and along APPA.

The following alternatives propose to follow various existing rights of way in the study area and vicinity, as described in chapter 2. Where an alternative would follow an existing transmission line for a portion of its route, the proposed 500-kV conductors and towers would be collocated within ROW with the existing line The visual impact would be exacerbated by the inconsistent appearance and scale of the different lines: the proposed alignment consisting of tall monopole towers while the existing alignments include various styles of shorter wooden poles. For the purposes of this analysis, the visual simulations of the proposed conditions show repositioned existing distribution transmission lines based on the best available information in accordance with applicable safety and clearance standards. The final design and placement of these lines is not known at this time.

Alternative 3

The existing alignment the alternative 3 corridor would follow includes several angle points, where the route would change direction, resulting in the proposed corridor being visible from many different locations in DEWA and along APPA. Unlike alternative 2, the existing distribution line wooden poles along the route the alternative 3 alignment follows would be reconstructed within the proposed ROW, alongside the new line. Visual simulations show this proposed condition.

During the course of this analysis, including fieldwork and visual simulation production, certain preliminary KOPs were found to provide no visibility of the proposed actions, because the viewing distance was so great the impact would not be discernible, or vegetation or landform features blocked potential views. These KOPs were subsequently eliminated from further study. For alternative 3, these KOPs include the following:

- Camp Mohican Lodge facility
- Sunfish Pond

Visual simulations were prepared to depict the changes for KOPs impacted by alternative 3 and are included in appendix K (figures 3-1 through 3-18). Affected KOPs with potential visibility of the proposed actions under alternative 3 include the following:

- Hidden Lake Dam
- Smithfield Beach
- River Road (near the existing transmission alignment)
- McDade Trail at the crossing of the existing alignment
- Old Mine Road at the crossing of the existing alignment
- Walter’s Tract river campsites
- Hialeah Picnic Area (as seen from the exit road)
- Hialeah air park
- MDSR at the crossing of the existing alignment
- Shawnee Resort Beach
- Turtle Beach
- APPA from the future relocation section
- APPA at the crossing of the existing alignment

- APPA at Raccoon Ridge
- APPA at the view overlooking Lower Yards Creek Reservoir
- Two views along APPA at the ridge near Rattlesnake Swamp
- Catfish fire tower

Hidden Lake Dam

Proposed conditions are shown in appendix K, figure 3-1, "Proposed." Visual changes would be limited to a few towers being visible, but not apparent, in the distance. The changes would not be substantially visible enough to alter visual unity or vividness, which would remain high for unity and average to moderately high for vividness. However, the marginal encroachment of the towers extending above the canopy line would slightly reduce intactness from high to very high / moderately high to high. This impact would be limited to favorable weather conditions not hindered by low clouds or haze. The overall visual quality at Hidden Lake Dam would remain high (shifting slightly from 5.58 to 5.42 on the FHWA scale of 1 to 7). This represents a decrease in overall visual quality of 0.16. Adverse impacts would occur on the visual resources of Hidden Lake Dam due to the alternative 3 alignment.

Smithfield Beach

Proposed conditions are shown in appendix K, figure 3-2, "Proposed." The proposed 500-kV ROW and towers would be much more noticeable and visually intrusive compared with baseline conditions. While only the tower at the top of the ridge would be seen silhouetted against the sky, the other towers and conductors would still be distinguished above the vegetation. The widened ROW would create a shadow line that contrasts with the color and texture of the forested slope. This effect would be even stronger under sunny conditions. The replacement 115-kV transmission poles and wires could also be seen, though the poles would not be visible above the canopy. At this view, unity would be reduced substantially, from moderately high / high to moderately low / average, as the proposed changes would conflict considerably with the form, emphasis, pattern, and texture of the landscape, drawing focus away from the river and onto the distracting ROW corridor. Intactness would also be reduced, from moderately high / high to average / moderately high, due to the vegetation removal along the ROW creating a visual intrusion across much of the forest backdrop. Vividness would be reduced from moderately high / high to average / moderately high, due to the intrusion of human-made transmission features limiting the ability of the view to be remembered as natural and scenic. The overall visual quality at Smithfield Beach would be reduced from high to moderately high (shifting from 5.38 to 4.00 on the FHWA scale of 1 to 7). This represents a decrease in overall visual quality of 1.38. Adverse impacts would occur on the visual resources of Smithfield Beach due to the alternative 3 alignment.

Table 56 summarizes the change in overall visual quality ratings at the affected KOPs for alternative 3, based on the FHWA scale of 1 to 7.

TABLE 56: ALTERNATIVE 3: SUMMARY OF CHANGES TO VISUAL QUALITY RATINGS* AT IDENTIFIED KOPS

KOP Name	Visual Quality Score Under Existing Conditions	Visual Quality Score Under Simulated Proposed Conditions	Total Reduction in Visual Quality
Hidden Lake Dam	5.58	5.42	(0.16)
Smithfield Beach	5.38	4.00	(1.38)
River Rd at alternative 3	4.54	3.96	(0.58)
McDade Trail at alternative 3- A (spiral wire)	4.92	3.46	(1.46)
McDade Trail at alternative 3- B (marker balls)	4.92	3.38	(1.54)
Old Mine Rd., at alternative 3	4.08	2.92	(1.16)
Walter's Tract River campsites	5.50	3.38	(2.12)
Hialeah Picnic Area	4.67	3.92	(0.75)
Hialeah Air Park	4.25	3.38	(0.87)
MDSR at alternative 3	5.50	3.29	(2.21)
Shawnee Resort Beach	4.54	4.46	(0.08)
Turtle Beach	4.88	4.79	(0.09)
APPA: Future relocation section	6.58	5.96	(0.62)
APPA: alternative 3 crossing- A (spiral wire)	4.17	2.83	(1.34)
APPA: alternative 3 crossing- B (marker balls)	4.17	2.67	(1.42)
APPA: Raccoon Ridge	5.96	4.83	(1.13)
APPA: View overlooking Yards Creek Reservoir	5.54	4.00	(1.54)
APPA: Vista from Rattlesnake Swamp Ridge no. 1	5.25	3.75	(1.50)
APPA: Vista from Rattlesnake Swamp Ridge no. 2	5.50	3.58	(1.92)
Catfish fire tower	5.25	4.75	(0.50)

* Visual quality ratings based on FHWA scale from 1 to 7.

River Road

Proposed conditions are shown in appendix K, figure 3-3, "Proposed." The widened ROW would be more noticeable compared with baseline conditions, and several proposed towers would be seen. The parallel angle of view toward the alignment would emphasize this impact. However, the middleground riparian vegetation and distance to the change would reduce the impacts somewhat. The replacement 115-kV transmission poles and wires could also be seen on the slope of Kittatinny Ridge, though the poles would not be visible above the canopy. Unity would be slightly reduced from moderately high / average to moderately high, as the larger ROW would disrupt the color, form, and texture of the forested slope, and distract from the rural scene. Intactness would be reduced from moderately high to average due to the increased visibility of the transmission elements, which would add visual clutter, and the visually subtractive result of the vegetation removal. Vividness would remain moderately low to average, as the change would interrupt the pastoral aesthetic of the view. The overall visual quality at River Road near

the alternative 3 alignment would remain moderately high (shifting slightly from 4.54 to 3.96 on the FHWA scale of 1 to 7). This represents a decrease in overall visual quality of 0.58. Adverse impacts would occur on the visual resources of River Road near the alternative 3 alignment.

McDade Trail, at Alternative 3

Proposed conditions are shown in appendix K, figure 3-4, "Proposed." This view is from directly beneath the alignment. The widened ROW would appear expansive on the near and far banks of MDSR. Bird diverter devices meeting APLIC standards would be required on the conductors at this location crossing the river. Figures 3-4a and 3-4b in appendix K depict possible diverter types that could be installed, and the corresponding visual impacts of each. Based on these, the diverters would increase visibility of the conductors when seen in the foreground and would increase visual clutter, because the conductors and diverters would be seen silhouetted against the sky. Between the two diverter types, the marker balls would be much more apparently visible than the spiral wires, result in comparatively more visual clutter, and would be seen from farther away. For these reasons, marker ball diverters would result in greater visual impacts compared with spiral wires.

The angle point towers would be more noticeable across the river, and the angle point itself would create visual distraction and relief from viewing the alignment swath straight up the ridge face. Unity would be substantially impacted, changing from moderately high to moderately low due to the proposed corridor interrupting the visual order of the scene, including the scale, balance, texture, and emphasis. The proposed towers and ROW would appear out of scale with the surrounding landscape elements, rising above the tree tops and dominating the view. Intactness would be reduced from moderately high / high to moderately low / average, as the expanded cleared corridor would create a visually subtractive intrusion in the context of the wooded, scenic trail. This impact would be limited slightly by the angle point across the river, where visibility of the clearing would become screened by the perpendicular angle of view and existing vegetation. The larger towers and more visible conductors would increase encroachment on the view. Migratory bird diverters would also be clearly visible on the conductors over the river, as the figures show. The use of bird diverters is discussed in the "Landscape Connectivity, Wildlife Habitat, and Wildlife" section of this chapter. Vividness would be slightly reduced numerically, but would remain average to moderately high, sustained somewhat by the expanded view to the river, including new visibility of a small island, which would enhance the landform component of vividness. However, the vegetation component of vividness would be reduced due to the larger ROW clearing.

For the purpose of comparison, simulations for two possible bird diverter devices were prepared for this KOP and are considered representative of the additional change to the visual environment different styles could result in. If spiral wires were selected, the overall visual quality for McDade Trail at alternative 3 would change from high to average (shifting slightly from 4.92 to 3.46 on the FHWA scale of 1 to 7). This represents a decrease in overall visual quality of 1.46. Considering the simulation depicting the marker ball style, overall visual quality would be further reduced, to a score of 3.38. Regardless of the style of diverter selected, adverse impacts would occur on the visual resources of McDade Trail at alternative 3.

Old Mine Road at Alternative 3

Proposed conditions are shown in appendix K, figure 3-5, "Proposed." As the figure demonstrates, there would be substantial changes where alternative 3 passes over Old Mine Road. Vegetation removal for the cleared ROW would create an opening wide enough to provide views to MDSR and open the view to more sky, interrupting the predominantly canopy-enclosed viewscape along the road. The angle point double-tower structure would be plainly visible from the road traveling north, as would the corridor passing up the slope, because the view would parallel that portion of the alignment. APLIC-approved bird

diverter devices would be required to be placed on the conductors as the alignment crosses MDSR, these would be visible to viewers passing under on Old Mine Road as well, given that the road is so near the river. The repositioned 115-kV poles would be visible but would be somewhat visually absorbed by background vegetation. In general, views traveling south would be less impacted. Visual unity would be reduced from moderately low / average to low, as the visible towers, conductors and angle point, coupled with the existing appurtenances (i.e., highway-style guard rail, smaller transmission line) combine to create a somewhat jumbled, disharmonious view. Intactness would be reduced, changing from moderately high / high to moderately low / average, due to the removal of vegetation and encroachment of the conductors and proposed towers. Conversely, vividness would be marginally enhanced numerically due to the newly created opportunity to view the river, which is relatively unusual along this portion of Old Mine Road, as the river is commonly screened by riparian vegetation (appendix K, figure 3-5, "Existing"). Vividness would remain moderately low to average. The overall visual quality for Old Mine Road at alternative 3 would change from moderately high to average (shifting from 4.08 to 2.92 on the FHWA scale of 1 to 7). This represents a decrease in overall visual quality of 1.16. Adverse impacts would occur on the visual resources of Old Mine Road at the alternative 3 crossing.

Walter's Tract River Campsites

Proposed conditions are shown in appendix K, figure 3-6, "Proposed." Although the alignment would be only barely visible from in the campsite, this view was selected to capture the effects of the changes as viewed from the riverbank access trail. Primary changes would include the introduction of several proposed towers, and two visible angle points resulting in views of overlapping conductors. The repositioned existing distribution line would also be visible in the ROW, though its wood poles would not protrude above the canopy. APLIC-approved bird diverter devices would be required were the alignment crosses MDSR, and depending upon the style of diverter selected, these could be visible from the KOP location. To the extent the diverters were visible, the primary effect would be to increase visual clutter and encroaching elements. Visual unity would be decreased substantially, changing from high to low due to the complex alignment adding disorder to the scene. Intactness would be reduced from high to average, because the multiple angle points would increase the extent of the encroachment and introduce visual clutter to the otherwise unencumbered natural setting. The visible removal of vegetation in the proposed ROW would also reduce intactness. Vividness would be reduced numerically, due to the intrusion of human-made structures into the natural view and the removal of vegetation detracting from the memorability of the river setting. Vividness would remain average to moderately high. The impact on vividness would be restrained somewhat by the landscape extending outside the figure, such as views directly across the river and downstream, which would not be impacted and would thus be more memorable. The overall visual quality for Walter's Tract river campsites at alternative 3 would be reduced from high to average (shifting from 5.50 to 3.38 on the FHWA scale of 1 to 7). This represents a decrease in overall visual quality of 2.12. Adverse impacts would occur on the visual resources of Walter's Tract river campsite due to the alternative 3 alignment.

Hialeah Picnic Area, Exit Road

Proposed conditions are shown in appendix K, figure 3-7, "Proposed." No impact is expected to within the picnic area, as views toward the alternative 3 alignment would be blocked by vegetation. This view is from the existing facility exit road, where the proposed alignment would be briefly visible when exiting the picnic area. Changes to the visual resources would include a noticeably visible proposed tower on top of the ridge in the distance, and visible conductors at each side; these features would be silhouetted against the sky. The widened ROW clearing would also be perceptible. These impacts would be tempered somewhat by the distance from the alignment. The repositioned existing distribution line wood poles would be seen, but from this distance would be absorbed by the vegetation. Unity would be slightly reduced from moderately high to average to moderately high due to the distraction caused by

disharmonious elements introduced into an otherwise natural scene. Intactness would also be reduced, changing from moderately high to high to average to moderately high due to the introduced encroachments of the tower and conductors, particularly as they would appear silhouetted against the sky. Vividness would be only marginally affected due to the encroaching human-made structures and slightly visible disruption of vegetation. Vividness would be reduced from moderately low to average to moderately low. The overall visual quality for Hialeah Picnic Area would be reduced from high to moderately high (shifting from 4.67 to 3.92 on the FHWA scale of 1 to 7). This represents a decrease in overall visual quality of 0.75. Adverse impacts would occur on the visual resources of Hialeah Picnic Area as viewed from the exit road due to the alternative 3 alignment.

Hialeah Air Park

Proposed conditions are shown in appendix K, figure 3-8, "Proposed." Compared to baseline conditions, the proposed ROW expansion would be noticeably visible from Hialeah Air Park as it climbs the far slope. The increased width of the corridor, combined with the view angle, would create a contrasting shadow line in the ROW, which would dominate the view and disrupt the color, line, balance, and texture of the view. A few towers, and to a lesser degree, the conductors, would be discernible. The wood poles of the repositioned distribution line would be visible in the ROW, though they would easily be absorbed into the vegetation. Unity would be reduced, changing from average to moderately low due to the encroaching ROW and transmission features conflicting with the existing visual elements. Intactness would be reduced, from moderately high/high to average, due to the scale of the proposed corridor increasing the amount of perceived development and encroaching upon the primarily pastoral recreational setting. Vividness would be reduced numerically somewhat, but would remain moderately low to average due to the introduction of human-made structures and the visual fragmentation of the otherwise contiguous forested slope, which limits the ability of the scene to be remembered as unencumbered and pastoral. The overall visual quality for Hialeah Air Park would be reduced from moderately high to average (shifting from 4.25 to 3.38 on the FHWA scale of 1 to 7). This represents a decrease in overall visual quality of 0.87. Adverse impacts would occur on the visual resources of Hialeah Air Park due to the alternative 3 alignment.

MDSR, at Alternative 3

Proposed conditions are shown in appendix K, figure 3-9, "Proposed." In the context of the surrounding landscape, this view would be considerably more expansive than could be captured in a single frame. Therefore, the visual quality scores were determined onsite during field reconnaissance and account for views beyond the frame of the figure.

The proposed angle point towers' scale, coupled with the surrounding cleared vegetation, would result in the towers and conductors becoming dominant in the view. Bird diverter devices meeting APLIC standards would be required along this segment as the alignment crosses the river. The devices would very likely be visible to water recreationalists passing beneath the line. To the extent the devices were visible and from what distance they could be seen, the diverters would increase encroachments into the scene and would cause reduced visual intactness.

Similar to other KOPs, the reconstructed existing distribution line would be visible but not dominant. However, at MDSR, the alignment angle point would emphasize the visual clutter of the collocated transmission lines resulting in many encroachments. Visual unity would be substantially reduced, changing from moderately high / high to moderately low / average, due to the shift in the emphasis and balance of the scene. The introduced transmission elements would create disharmony and conflict with the existing natural features of water, landform, and vegetation. Intactness would be substantially reduced as well, changing from moderately high / high to low / moderately low, due to the encroachments from

vegetation removal along the proposed ROW, the angle point of the alignment creating a cluttered appearance, and the multiple conductors being clearly visible across the viewshed. Bird diverters would increase these impacts. Vividness would be reduced, changing from moderately high / high to average / moderately high, due to the increased scale of the human-made objects in the context of the scenic natural landscape. The overall visual quality for MDSR would be reduced from high to average (shifting from 5.50 to 3.29 on the FHWA scale of 1 to 7). This represents a decrease in overall visual quality of 2.21. Adverse impacts would occur on the visual resources of MDSR at the crossing of alternative 3.

Shawnee Resort Beach

Proposed conditions are shown in appendix K, figure 3-10, "Proposed." Similar to Fernwood Resort discussed under alternative 2, Shawnee Resort Beach is located outside DEWA boundaries. However, visible changes that could affect the immediate shoreline and the river are relevant to MDSR in addition to Shawnee Resort Beach. The changes to the view would introduce visibility of a single proposed tower marginally detectable in the far distance, protruding above the tree tops. Opportunity to detect the tower would be highly dependent upon atmospheric conditions. Haze or fog would make the tower indistinguishable, but in clear conditions, it may be slightly more visible than under the simulated conditions. However, visual unity would be unaffected and would remain average. Vividness would also be unaffected and would remain average to moderately high. Intactness would be marginally impacted numerically due to the added encroachment of the tower. The overall visual quality for Shawnee Resort Beach would remain moderately high (the rating would change from 4.54 to 4.46 on the FHWA scale of 1 to 7). This represents a decrease in overall visual quality of 0.08. Adverse impacts would occur on the visual resources of Shawnee Resort Beach due to the alternative 3 alignment, depending on atmospheric conditions.

Turtle Beach

Proposed conditions are shown in appendix K, figure 3-11, "Proposed." The alternative 3 alignment would be slightly closer to the viewer at Turtle Beach compared to Shawnee Resort Beach, but the effects on the visual resources would be similar. A tower at the top of the ridge on the opposite bank (Pennsylvania) would be visible under favorable climatic conditions; fog or haze would make the tower indistinguishable. A slight shadow line would result along the widened ROW corridor. Unity would be unaffected and would remain moderately high. Vividness would also be unaffected and would remain average to moderately high. Impacts on intactness would be similar to those at Shawnee Resort Beach; intactness would be reduced numerically but would remain average to moderately high. The addition of the tower atop the ridge would slightly encroach upon the view, particularly because most of the tower would be silhouetted against the sky. The overall visual quality for Turtle Beach would remain high (shifting from 4.88 to 4.79 on the FHWA scale of 1 to 7). This represents a decrease in overall visual quality of 0.09. Adverse impacts would occur on the visual resources of Turtle Beach due to the alternative 3 alignment, depending on atmospheric conditions.

APPA at Future Relocation Section

Proposed conditions are shown in appendix K, figure 3-12, "Proposed." This KOP is currently located a few hundred feet from APPA, and is in DEWA. However, this analysis evaluates effects on the future APPA relocation site. Changes to the existing view at the relocation site include the introduction of a transmission tower and conductors that were previously absent, but would be seen in the distance on the ridge. Visual unity would be slightly reduced from very high to moderately high to high due to this encroachment disrupting the visual balance of the scene and detracting somewhat from the existing highly harmonious view. Intactness would also be reduced from high to moderately high to high due to the newly encroaching element. Vividness would remain high to very high, as the distance to the

encroachment would offset effects on the memorability of the existing scene. The overall visual quality for APPA at the future relocation section would remain very high (shifting somewhat from 6.58 to 5.96 on the FHWA scale of 1 to 7). This represents a decrease in overall visual quality of 0.62. Adverse impacts would occur on the visual resources of APPA at the trail future relocation section due to the alternative 3 alignment.

The following KOPs are located along APPA and within the boundaries of DEWA as well as Worthington State Forest.

APPA at Alternative 3 Crossing

Proposed conditions are shown in appendix K, figure 3-13, "Proposed." Changes to the view would include new transmission towers, larger conductors, and expansion of the cleared ROW, which would be visible into the middleground as it passes over a forested ridge. Vegetation removal resulting from the expanded ROW clearing would increase the frame of this view, providing a greater opportunity to view the surrounding scenery to the east and west. The increased scale of the steel monopole in the immediate foreground would cause it to become more dominant in the view, compared with baseline conditions. The additional conductors would also distract from and clutter the landscape scene, further emphasized by the inclusion of APLIC-approved bird diverting devices on the conductors, which would be required where the alignment passes over Kittatinny Ridge. Figures 3-13a and 3-13b in appendix K depict possible diverter types that could be installed, spiral wire and marker balls, and the corresponding visual impacts of each. Based on the simulations, the diverters would increase visibility of the conductors when seen in the foreground and would increase visual clutter, because the conductors and diverters would be seen silhouetted against the sky. Between the two diverter types, the marker balls would be more apparently visible than the spiral wires, result in comparatively more visual clutter, and would be seen from farther away.

Visual unity would be reduced from average to low, due to the increased visibility of the transmission structures conflicting with the natural setting and interrupting the color, texture and emphasis of the view. Intactness would be reduced from average to low / moderately low due to the increased visual encroachment of the tower, the larger and more numerous conductors, accumulated visual clutter of the collocated lines, and the visually subtractive quality of the widened ROW. The increase in the scale of the alignment would increase the apparent level of development in the viewshed, also causing a reduction in visual intactness in the context of a protected scenic resource. Vividness would be slightly reduced, due to the vegetation fragmentation and human-made encroachments, but this would be offset somewhat by the increased cleared ROW providing a wider view opportunity of the surrounding landscape, which is scenic and memorable.

As for McDade Trail, two simulations were prepared for this KOP which depict two possible bird diverter styles, spiral wires and marker balls. With spiral wires, the overall visual quality for APPA at alternative 3 would be reduced from moderately high to average (shifting from 4.17 to 2.83 on the FHWA scale of 1 to 7). This represents a decrease in overall visual quality of 1.34. If the marker ball-type bird diverters were selected to be installed on the conductors at this location, the overall visual quality score would be further reduced, to 2.67.

Regardless of the style of bird diverter selected, adverse impacts would occur on the visual resources of APPA at the alternative 3 crossing.

APPA at Raccoon Ridge

Proposed conditions are shown in appendix K, figure 3-14, "Proposed." Changes to the view would include the introduction of a steel transmission tower behind the existing trees and multiple visible conductors. The widened alignment would also be noticeable in the middleground (across MDSR in Pennsylvania) as it climbs a forested ridge. Visibility of the new transmission line components would decrease visual unity from very high / average to moderately high, compared with baseline conditions, which do not include views of the utility line in the foreground. Added encroachments of the tower and conductors and the ROW visible in the middleground would reduce intactness from very high to average / moderately high. Bird diverter devices would be required on the conductors at this location also, further reducing intactness to the extent they could be seen. Spiral wires were determined to not be visible from this distance. The proposed alignment would affect the memorability of the contiguous vegetation of the scene and its lack of human-made development, reducing vividness numerically, although it would remain moderately high to high. The overall visual quality for the APPA view at Raccoon Ridge would be reduced from very high to moderately high (shifting from 5.96 to 4.83 on the FHWA scale of 1 to 7). This represents a decrease in overall visual quality of 1.13. Adverse impacts would occur on the visual resources of APPA at Raccoon Ridge due to the alternative 3 alignment.

APPA at View Overlooking Lower Yards Creek Reservoir

Proposed conditions are shown in appendix K, figure 3-15, "Proposed." Changes to the view would include a more noticeable transmission alignment, vegetation removal, larger towers, and numerous visible conductors. The wood poles of the repositioned existing distribution would be seen from the superior viewing angle, but would be easily absorbed by the background vegetation. Visual unity would be reduced from high to average, due to the widened ROW clearing disrupting the texture, pattern, and emphasis of the view and detracting from its existing harmony. The wider proposed corridor, towers and conductors would encroach upon the view, reducing intactness from moderately high / high to moderately low / average. Impacts on the vegetation pattern and increased visible transmission development would affect the memorability of the view, reducing vividness from moderately high to high to average to moderately high. The overall visual quality for the APPA vista overlooking Lower Yards Creek Reservoir would be reduced from high to moderately high (shifting from 5.54 to 4.00 on the FHWA scale of 1 to 7). This represents a decrease in overall visual quality of 1.54. adverse impacts would occur on the visual resources of APPA at the view overlooking Lower Yards Creek Reservoir due to the alternative 3 alignment.

Outside the study area, the following KOPs (which are located in DEWA but outside Worthington State Forest) would be affected by the alternative 3 alignment. Additional adverse impacts en route to the substations would be the same as for alternative 2.

APPA at Vista from Ridge near Rattlesnake Swamp, No. 1

Proposed conditions are shown in appendix K, figure 3-16, "Proposed." In the vicinity of Rattlesnake Swamp, APPA follows the edge of a rocky ledge for about 2.5 miles, providing continuous scenic views to the east, including opportunities to view the alternative 3 alignment in the valley below. For this reason, two view locations along APPA were selected to evaluate the proposed actions.

Changes in this view would include taller, more noticeable towers and increased visibility of numerous conductors. The repositioned distribution line would also be seen where it passes near the viewer before becoming screened by vegetation. In the foreground, the existing alignment passes over a series of small open fields of rural residential development; therefore, no impacts on vegetation resulting from the proposed ROW expansion would occur. However, the expanded clearing would be noticeable and

intrusive in the distance, particularly as the view parallels that portion of the alignment. Visual unity would be substantially reduced from high to moderately low, due to the scale of the proposed alignment conflicting with that of the existing landscape elements and detracting from the harmony of the pastoral scene. The visible angle points of the alignment in the distance would create fragmentation and detract from a cohesive, harmonious visual pattern. Intactness would be reduced from moderately high to high to average to moderately high, due to the encroachment of the noticeable conductors and taller towers, particularly as the alignment would be visible across the viewshed. The higher position of APPA, and thus the viewer relative to the proposed changes, would restrain impacts on intactness to some degree, as the transmission elements would not be seen silhouetted against the sky. The increased scale of the proposed alignment would contribute to a greater perceived level of development, which would affect the ability of the view to be remembered for its consistent rural pattern. Vividness would change from average to moderately high to average. The overall visual quality for the first APPA vista at the ridge near Rattlesnake Swamp would be reduced from high to moderately high (shifting from 5.25 to 3.75 on the FHWA scale of 1 to 7). This represents a decrease in overall visual quality of 1.50. Adverse impacts would occur on the visual resources of APPA at the first vista near Rattlesnake Swamp due to the alternative 3 alignment.

APPA at Vista from Ridge near Rattlesnake Swamp, No. 2

Proposed conditions are shown in appendix K, figure 3-17, "Proposed." Changes in this view would include noticeable expansion of the cleared ROW visible across the viewshed, taller towers rising above the tree canopy, and numerous conductors. The repositioned existing distribution line would contribute to the overall visual clutter, because the view is superior and looks parallel up the alignment into the distance. Vegetation removal along the proposed ROW would result in a strongly contrasting shadow line, emphasizing the alignment. This effect would be somewhat moderated under overcast weather conditions when lighting would be much more diffused. The dominance of the alignment would conflict with the color, texture, scale, and emphasis of the view, substantially reducing unity from moderately high to high to moderately low. Intactness would also be substantially reduced from high to moderately low / average due to the fragmentation of vegetation and additional visually encroaching transmission elements. Vividness would be reduced from moderately high to average to moderately high due to the increased level of human-made development and the impacts on vegetation cover limiting the ability of the view to be remembered as highly natural. The overall visual quality for the second APPA vista at the ridge near Rattlesnake Swamp would be reduced from high to average (shifting from 5.50 to 3.58 on the FHWA scale of 1 to 7). This represents a decrease in overall visual quality of 1.92. In the short term, the existing towers would also remain visible, further impacting visual quality. Adverse impacts would occur on the visual resources of APPA at the second view near Rattlesnake Swamp due to the alternative 3 alignment.

APPA at Catfish Fire Tower

Proposed conditions are shown in appendix K, figure 3-18, "Proposed." As discussed in the "Visual Resources" section of chapter 3, views from inside the fire tower at this KOP could not be considered for this analysis because the tower cannot be lawfully entered. However, the trail near the base of the tower offers views to the south. Changes to this view along APPA would include somewhat visible conductors and the tapered top of a single tower. None of the proposed transmission line elements would be highly noticeable from APPA, as they would be below the natural line of sight and would be somewhat screened by branches in leaf-off condition, as simulated. (The changes may be less apparent when the vegetation is leafed out in spring and summer.) Under simulated conditions, visual unity would be marginally affected, and would change from high to moderately high to high. Intactness would be reduced slightly from moderately high to high to moderately high, due to the encroachment of the proposed conductors, given the slightly contrasting effect of their horizontal orientation relative to vegetation. Vividness would be

marginally affected by the introduced human-made development and would change from average to moderately low to average. The overall visual quality for APPA at Catfish fire tower would remain high (shifting from 5.25 to 4.75 on the FHWA scale of 1 to 7). This represents a decrease in overall visual quality of 0.50. The existing towers would not be visible from this location. Adverse impacts would occur on the visual resources of APPA at Catfish fire tower due to the alternative 3 alignment.

Zone of Visual Influence Bare-Earth Terrain Modeling: As described in the "Methodologies" in this section, table 57 provides areas (in acres) from which the existing wood poles and proposed transmission towers could potentially be seen under bare earth conditions, specific to alternative 3, for lands within DEWA and along the APPA alignment (defined at 1,000 feet wide). See figures 81 and 82, respectively, for existing pole visibility and proposed tower visibility specific to alternative 3.

TABLE 57: ALTERNATIVE 3 VISIBILITY USING ZVI BARE-EARTH TERRAIN MODELING (ESTIMATED IN ACRES)

Pole / Tower Height	Number of poles/ towers within DEWA	Potential Visibility from within DEWA	Potential Visibility from MDSR	Potential Visibility from APPA
Existing 65- to 85-foot poles along the alternative 3 alignment	46	31,645	1,026	3,565
Proposed 195-foot monopole (6 towers per mile)	32	33,305	1,509	6,166

Overall Alternative 3 Impacts

Activities related to deconstruction and construction in proximity to KOP locations would adversely affect visual resources as described in the "Common to All Action Alternatives" section. Impacts would depend on proximity and the extent to which deconstruction and construction activities could be seen, as well as the location of temporary spur roads. Under alternative 3, these impacts would be most apparent where the alignment would cross a resource like the McDade Trail, Old Mine Road, MDSR, and APPA. Views along the McDade Trail, MDSR, and APPA would remain unchanged until reaching the alignment, where the views would be affected during construction. KOPs close to the existing route such as Walter's Tract river campsites would also be impacted for short periods due to construction activities. Adverse impacts would occur on the remaining KOPs considered for alternative 3. Impacts related to operation and maintenance of the transmission line would be the same as alternative 2 and would involve periodic vehicular access for vegetation and equipment maintenance. Such impacts would be localized and of short duration. Overall, alternative 3 would result in adverse impacts on visual resources inside the study area.

Cumulative Impacts

Cumulative impacts inside the study area would result in adverse impacts on visual resources as described previously in the "Cumulative Impacts" section. When the impacts on visual resources as a result of alternative 3 are combined with other past, present, and reasonably foreseeable projects in the study area, an overall cumulative adverse impact would be expected.

The past, present, and reasonably foreseeable projects identified along the length of APPA would produce adverse cumulative impacts on the trail as explained in the "Cumulative Impacts" section. When the impacts on visual resources as a result of alternative 3 are combined with other projects that affect APPA, an overall adverse cumulative impact would be expected.

Conclusion

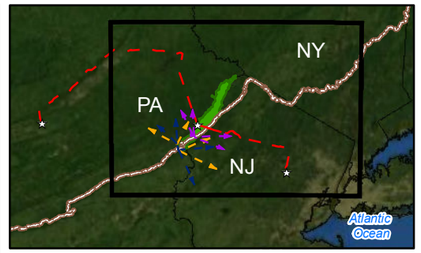
Inside the study area, alternative 3 would result in adverse impacts of varying intensity depending upon the KOP. In general, the complexity of the alignment (i.e., numerous angle points) would affect views from several locations, thereby impacting visual quality at several KOPs and potentially from areas away from the corridor but looking toward the corridor. Similar to alternative 2, the ROW corridor would be most visually apparent in the landscape during spring and summer 'leaf-on' conditions when shadow lines increase the visual contrast created by the cleared ROW. During winter 'leaf-off,' the proposed towers could become more apparent, but the corridor would be visually de-emphasized. Unlike alternative 2, the existing distribution transmission line would be reconstructed and co-located within the expanded ROW, adding to the visible clutter within the corridor as seen from specific KOPs. The alternative 3 alignment would also create visual intrusions where none currently exist at Raccoon Ridge along APPA, and would be seen from other view locations along the trail. When combined with the impacts on visual resources under alternative 3, the effects of past, present, and reasonably foreseeable future projects would result in adverse cumulative impacts on visual resources inside the study area, and adverse cumulative impacts specifically on APPA.

When considered in the context of the purposes for which DEWA and APPA were established and the scenic qualities of the MDSR for which it was designated as part of the national wild and scenic river system along with the high expectations of visitors as to the type of experience they should have in these places, the adverse impacts of increased visibility and intrusion of the transmission line along alternative 3 are significant. Alternative 3 would cross and then parallel the Kittatinny Ridge which APPA traverses. The transmission line corridor and structures would be clearly visible under alternative 3 and the presence of two sets of structures would increase the adverse impact on aesthetics and scenery, lasting the life of the project. Because of the route up the Kittatinny Ridge, the visibility of the tall towers would be greatly increased along the MDSR, and would also visible from the McDade Trail and popular recreational sites like Smithfield Beach and Hialeah Air Park, and the scenic drives and cultural landscapes of Old Mine Road in New Jersey and River Road in Pennsylvania. The visual impacts from alternative 3 would be experienced by a large number of visitors due to the concentration of recreational facilities within sight of the transmission line corridor. Removal of the existing B-K Line would have beneficial impacts by restoring the natural habitat at the heart of DEWA and MDSR and reducing the number of crossings of APPA; however, overall the beneficial impacts of the removal of the existing line do not outweigh the negative impacts of visual intrusion of the expanded line paralleling the MDSR and APPA. Alternative 3 also contributes to the cumulative adverse impacts of intrusions into scenic viewsheds. The reduction of these resources in the region surrounding the parks would increase their scarcity and sensitivity inside the parks, where they are afforded special protection.

Public attention surrounding this project is high. There is likely to be a high degree of controversy over any effects on park resources that are particularly popular with the public, such as scenery, visitor use and experience, rare and unique communities, cultural landscapes, and historic structures, for any of the alternatives. The inherent uncertain nature of predicting the true degree of some of these impacts would likely heighten this controversy.

Allowing impacts to visual resources is contrary to typical NPS practice of improving scenic conditions by removing non-conforming features and may establish precedent for future actions. As stated for alternative 2, permitting this project reverses the trend of improving visitor experience and scenic values by removing non-conforming features. The construction of an additional line with taller towers would adversely impact the scenic nature of APPA, DEWA, and MDSR, which is counter to their enabling legislation and mandates to protect scenery. Thus, the NPS believes that alternative 3 would result in significant adverse impacts to visual resources.

Note: Solid lines indicate portions of the alternatives inside the study area; dotted lines indicate portions outside of study area. Transmission line locations beyond the park boundaries are for illustrative purposes only, and the final transmission line locations outside park boundaries would be determined through a separate planning process conducted by the applicant.



Legend

- Substation
- Alternative 3

Number of Existing Towers Potentially Visible

- 1 to 6
- 7 to 12
- 13 to 18
- 19 to 24
- 25 to 30
- 31+
- Existing Tower

Notes: Existing tower locations are located along existing transmission lines. Large towers were given an 85 foot elevation (tower height) and small or medium towers were given a 65 foot elevation.

The study area is defined as the union of the areas that are 20 miles from the DEWA boundary and 20 miles from the APPA alignment, intersected with the area that is 20 miles from the alternative alignment.

- Visual Analysis Study Area
- Appalachian National Scenic Trail
- Middle Delaware National Scenic and Recreational River
- Delaware River
- Delaware Water Gap National Recreation Area
- CVNWR Boundary
- Worthington State Forest
- State Park
- County Line
- Interstate Hwy

0 5 10 Miles

Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

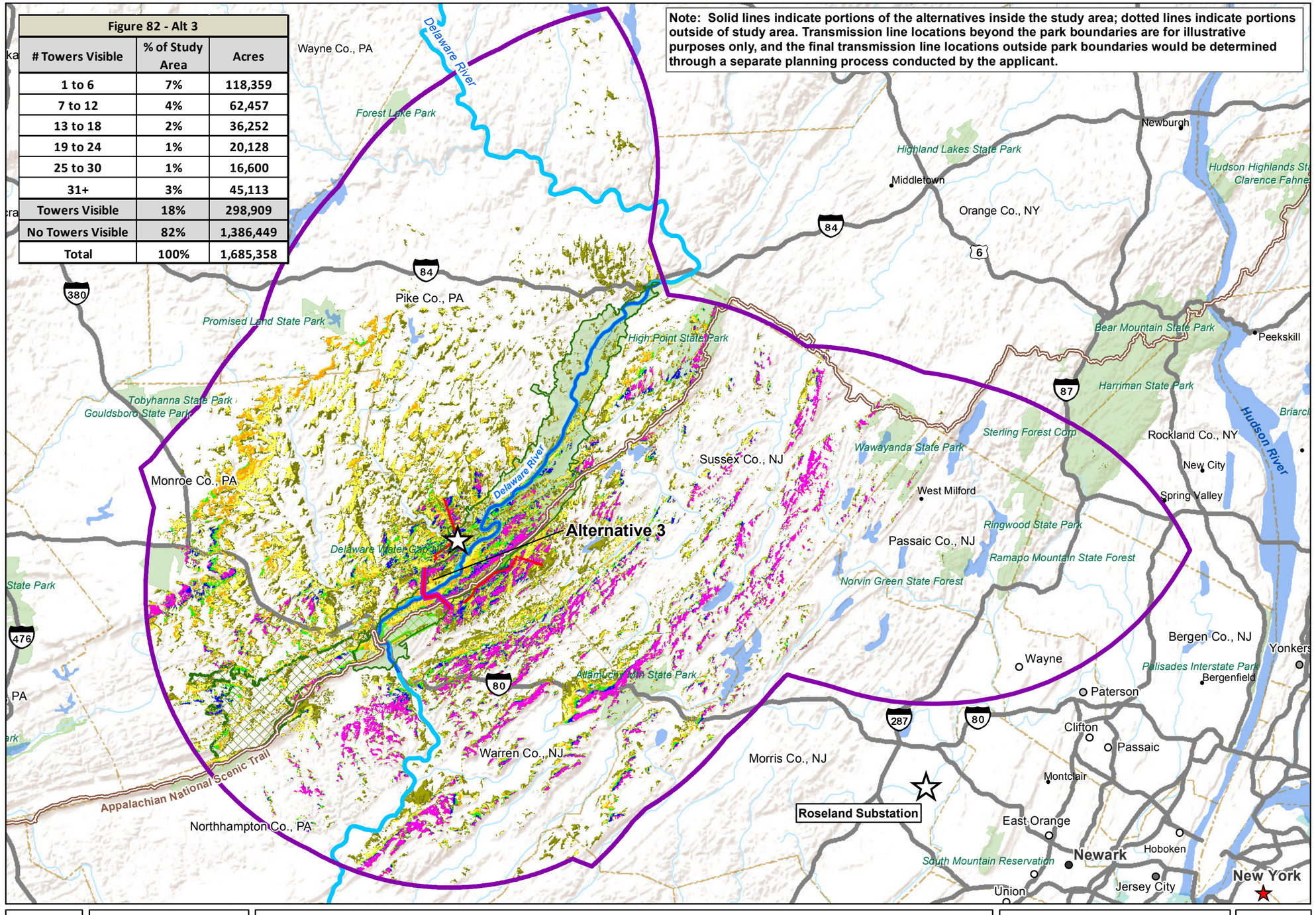
Figure 81
Existing Tower Visibility: Bare Terrain Analysis
Alternative 3

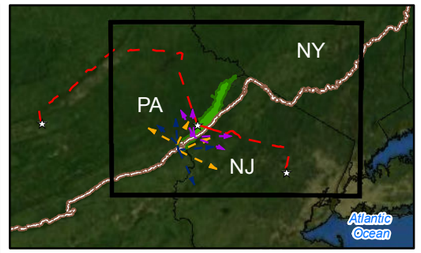
Source: NPS 2010, EA Engineering 2010, DEWA 2008, ESRI 2002, ESRI 2006, ESRI 2010, NJOIT - OGIS 2008, PASDA 2010

Projection: NAD 83 UTM Zone 18N
Date: July 2012

Figure 82 - Alt 3		
# Towers Visible	% of Study Area	Acres
1 to 6	7%	118,359
7 to 12	4%	62,457
13 to 18	2%	36,252
19 to 24	1%	20,128
25 to 30	1%	16,600
31+	3%	45,113
Towers Visible	18%	298,909
No Towers Visible	82%	1,386,449
Total	100%	1,685,358

Note: Solid lines indicate portions of the alternatives inside the study area; dotted lines indicate portions outside of study area. Transmission line locations beyond the park boundaries are for illustrative purposes only, and the final transmission line locations outside park boundaries would be determined through a separate planning process conducted by the applicant.





Legend

- Substation
- Alternative 3

Number of Proposed Towers Potentially Visible

- 1 to 6
- 7 to 12
- 13 to 18
- 19 to 24
- 25 to 30
- 31+
- Proposed Tower

Note: Proposed towers are located along the proposed transmission lines. Towers were given a 195 foot elevation and spaced approximately 6 towers per mile.

The study area is defined as the union of the areas that are 20 miles from the DEWA boundary and 20 miles from the APPA alignment, intersected with the area that is 20 miles from the alternative alignment.

- Visual Analysis Study Area
- Appalachian National Scenic Trail
- Middle Delaware National Scenic and Recreational River
- Delaware River
- Delaware Water Gap National Recreation Area
- CVNWR Boundary
- Worthington State Forest
- State Park
- County Line
- Interstate Hwy

0 5 10 Miles

Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 82
Proposed Tower Visibility: Bare Terrain Analysis
Alternative 3

Source: NPS 2010, EA Engineering 2010, DEWA 2008, ESRI 2002, ESRI 2006, ESRI 2010, NJOIT - OGIS 2008, PASDA 2010

Projection: NAD 83 UTM Zone 18N
Date: July 2012

Alternative 4

Like alternative 3, the existing distribution line would be replaced and repositioned within the ROW to accommodate the proposed double 500-kV line. Visual simulations show both the repositioned existing transmission line and the proposed new alignment.

During the course of this analysis, including fieldwork and visual simulation production, certain preliminary KOPs were found to provide no visibility of the proposed actions because the viewing distance was so great the impact would not be discernible, or vegetation or landform features blocked potential views. These KOPs were subsequently eliminated from further study. For alternative 4, preliminary KOPs eliminated during analysis include the following:

- Arrow Island Overlook
- Lookout Rocks (near Mount Minsi)
- Council Rock.

Visual simulations were prepared to depict the changes for KOPs impacted by alternative 4 and are included in appendix K (figures 4-1 through 4-6). Affected KOPs with potential visibility of the proposed actions under alternative 4 include the following:

- Mount Tammany Summit
- Delaware River as viewed from the river, north of the existing rail bridge
- Karamac Trail along MDSR
- APPA at the crossing of the existing alignment
- APPA at Lunch Rocks
- Nelson Overlook
- Fernwood Resort at Hwy 209.

Table 58 summarizes the change in overall visual quality ratings at the affected KOPs, based on the FHWA scale of 1 to 7.

TABLE 58: ALTERNATIVES 4 AND 5: SUMMARY OF CHANGES TO VISUAL QUALITY RATINGS AT IDENTIFIED KOPS

KOP Name	Visual Quality Rating Under Existing Conditions	Visual Quality Rating Under Simulated Proposed Conditions	Total Reduction in Visual Quality
Mt. Tammany Summit (alternative 4 only)	5.71	4.46	(1.25)
Delaware River at alternative 4/5 crossing	6.25	4.67	(1.58)
View from Karamac Trail (alternative 4 only)	5.21	4.79	(0.42)
APPA: at alternative 4/5 crossing	3.00	2.00	(1.00)
APPA: Lunch Rocks	5.04	3.04	(2.00)
APPA: Nelson Overlook	5.21	3.88	(1.33)

Mount Tammany Summit

Proposed conditions are shown in appendix K, figure 4-1, "Proposed." Changes to the view due to the alignments for alternative 4 would include a noticeable corridor in the middleground, emphasized by a pronounced shadow line under simulated conditions (the visibility of which would vary depending on atmospheric conditions). The proposed corridor would disrupt the existing texture and line of the view. Proposed towers would be somewhat discernible from this distance, about 2 miles, but only during favorable weather conditions. No proposed conductors would be detectable from this distance. Unity would be reduced from high to average, due to the conflicting line created by the proposed alignment and the disruption of the contiguous forest pattern in the view. Intactness would be reduced from moderately high to average, due to the encroachment created by the proposed alignment, which would disrupt the otherwise intact forested landscape. (This effect would be moderated during winter "leaf-off" conditions, when the shadow line and visual contrast would not occur.) Impacts resulting from the increased visibility of intrusive human-made elements and vegetation removal would impact the ability of the view to be remembered as unencumbered and natural. However, the distance to the proposed actions and size of the corridor when viewed from this distance would offset the impacts slightly. Also, the level of impact would vary based on season and weather conditions. Therefore, vividness would be reduced in numeric score, but remain moderately high. The overall visual quality at Mount Tammany summit would be reduced from very high to moderately high (shifting from 5.71 to 4.46 on the FHWA scale of 1 to 7). This represents a decrease in overall visual quality of 1.25. Adverse impacts would occur on the visual resources at the Mount Tammany summit due to the alignment for alternative 4.

MDSR at Alternative 4 Crossing

Proposed conditions are shown in appendix K, figure 4-2, "Proposed." Changes to the view would include the introduction of tall transmission towers on both sides of the Delaware River, with multiple angle point towers seen to the east (in New Jersey) where the alignment would change direction. Several conductors would be visible across the viewshed. Because the alignment would cross the river, bird diverter devices meeting APLIC standards would be required on the conductors or static lines, which could be visible, depending on the type of diverter applied. The perpendicular angle of the view toward the alignment and existing vegetation screening would combine to make impacts on vegetation unnoticeable from this view. Visual unity would be reduced from very high to average to moderately high from the transmission line features detracting from the existing historic rail bridge and conflicting with the scale, line, and focus and detracting from the harmony of the existing scene. Intactness would be reduced from high to average to moderately high, due to the encroachment of the towers and conductors, especially when silhouetted against the sky. Vividness would be reduced from moderately high to high to moderately high, due to the encroaching transmission development detracting from the memorability of the unique view focused on a scenic historic object. The overall visual quality at Delaware River at the crossing of alternative 4 would be reduced from very high to high (shifting from 6.25 to 4.67 on the FHWA scale of 1 to 7). This represents a decrease in overall visual quality of 1.58. Adverse impacts would occur on the visual resources of the Delaware River at the alignments for alternative 4 due to the alternatives.

Karamac Trail

Proposed conditions are shown in appendix K, figure 4-3, "Proposed." Changes to the view would include introduced visibility of a portion of a single transmission tower and several conductors in the distant middleground, rising above existing vegetation. The presence of the transmission structure would somewhat detract from the cohesive, harmonious riverside scene. Unity would be reduced from moderately high to average to moderately high. The tower and conductors would cause a slight encroachment, so overall intactness would be reduced from moderately high to average to moderately

high. Vividness would be slightly affected by the introduction of encroaching transmission elements, but would remain moderately high. The overall visual quality at Karamac Trail would remain high (shifting from 5.21 to 4.79 on the FHWA scale of 1 to 7). This represents a decrease in overall visual quality of 0.42. Adverse impacts would occur on the visual resources of Karamac Trail along MDSR due to the alternative 4 alignment.

APPA at Alternative 4 Crossing

Proposed conditions are shown in appendix K, figure 4-4, "Proposed." Changes to the view would include obvious widening of the alignment, and introduction of several tall towers along the repositioned distribution line as the route continues into the middleground before changing direction. Existing unity at this view is already low (refer to the "Visual Resources" section of chapter 3), and the proposed expanded ROW and numerous visible towers would disrupt the existing scale and emphasis, therefore, reducing unity from low to very low. Intactness would be reduced from average / moderately high to low / moderately low due to the widened ROW creating a visual subtraction in the context of the forested landscape. The encroachment of the towers and increased number of conductors would also affect intactness. Bird diverters would be required at this location as well, further reducing visual intactness to the extent they were visible and apparent as hikers passed beneath the lines. Vividness would be reduced from low / moderately low to very low / low, as the expanded ROW would open up a greater opportunity to view the background landscape, although this would be outweighed by the visually obtrusive proposed corridor development and the impacts on vegetation. The overall visual quality for APPA at the crossing of alternative 4 would be reduced from average to moderately low (shifting from 3.00 to 2.00 on the FHWA scale of 1 to 7). This represents a decrease in overall visual quality of 1.00. Adverse impacts would occur on the visual resources of APPA at the alternative 4 crossing due to the alternatives.

APPA at Lunch Rocks

Proposed conditions are shown in appendix K, figure 4-5, "Proposed." Changes to the view would include obvious visibility of the proposed ROW, which would enter the scene from the left and continue down the slope, before changing direction away from the viewer. Visibility of the proposed corridor would be emphasized by a contrasting shadow line. It is likely that from this distance the alignment would appear less severe in overcast weather conditions or during winter 'leaf-off' when the corridor would create less visual contrast. Portions of several tall towers would be seen above the existing tree canopy, and numerous conductors would be detectable. Visual unity would be substantially reduced from high to moderately low, due to the conflict and disharmony created by the alignment in the context of the existing contiguously forested landscape. Intactness would be similarly reduced from moderately high to high to average, resulting from the visual intrusion created by the proposed cleared ROW, emphasized by the contrasting shadow line and visual subtraction of vegetation. The impacts from the introduced human-made transmission development and, to a larger degree, the loss of the existing continuously intact forest cover would substantially reduce the ability of the view to be remembered for its natural and remote aesthetic. Therefore, vividness would be reduced from moderately low to average, to low to moderately low. The overall visual quality for APPA at Lunch Rocks would be reduced from high to average (shifting from 5.04 to 3.04 on the FHWA scale of 1 to 7). This represents a decrease in overall visual quality of 2.00. Adverse impacts would occur on the visual resources of APPA at Lunch Rocks due to the alignments for alternative 4.

APPA at Nelson Overlook

Proposed conditions are shown in appendix K, figure 4-6, "Proposed." Visible changes would include the introduction of the proposed cleared ROW carving a "U" shape into the existing forest canopy in the middleground. New transmission towers and conductors would be detectable under favorable weather

conditions. Unity would be reduced from moderately high to high to moderately low to average due to the widened corridor disrupting the existing form, texture, balance, and pattern of the view, particularly given the multiple directional changes of the proposed alignment. Intactness would be reduced from moderately high to high to moderately low to average, due to the encroachment created by the proposed corridor. The distance of the proposed towers would not add appreciably to encroachments. Vividness would remain average to moderately high, but would be impacted by the intrusion of the human-made transmission line on the visual pattern; and changes to vegetation from the expanded ROW, each of which would impact the memorability of the pastoral aesthetic view. The overall visual quality for APPA at Nelson Overlook would be reduced from high to moderately high (shifting from 5.21 to 3.88 on the FHWA scale of 1 to 7). This represents a decrease in overall visual quality of 1.33. Adverse impacts would occur on the visual resources of APPA at Nelson Overlook due to the alternative 4 alignment.

Fernwood Resort, Pennsylvania Hwy 209

The first 0.6-mile segment of the alternative 4 alignment includes the portion of the alternative 2 alignment from Bushkill Substation to the western boundary of DEWA. Therefore, the Fernwood Resort KOP was analyzed for alternative 2 and the proposed conditions are represented in appendix K, figure 2-1, "Proposed." The adverse impacts under alternative 4 would be the same as those described for alternative 2.

Zone of Visual Influence Bare-Earth Terrain Modeling: As described in the "Methodologies" section, table 59 provide areas (in acres) from which the existing wood poles and proposed transmission towers could be seen under bare earth conditions, specific to alternative 4, for lands within DEWA and along the APPA alignment (defined at 1000 feet wide). See figures 83 and 84, respectively, for existing pole visibility and proposed pole visibility for alternative 4 and figures 85 and 86 for alternative 5.

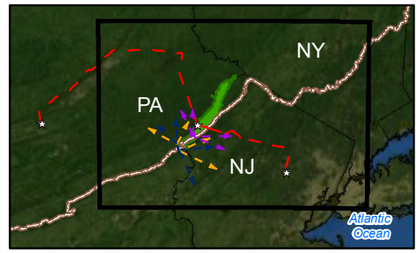
TABLE 59: ALTERNATIVE 4 VISIBILITY USING ZVI BARE-EARTH TERRAIN MODELING (ESTIMATED IN ACRES)

Pole / Tower Height	Number of poles/ towers within DEWA	Potential Visibility from within DEWA	Potential Visibility from MDSR	Potential Visibility from APPA
Existing 65- to 85-foot poles along the alternative 4 alignment	14	22,591	530	3,444
Proposed 195-foot monopole (towers as sampled)	9	27,149	1,995	6,721

Overall Alternative 4 Impacts

Activity during deconstruction and construction would adversely affect visual quality as described in the "Common to All Action Alternatives" section. Impacts would depend on the extent to which deconstruction and construction activities could be seen, as well as the location of temporary spur roads. Under alternative 4, construction impacts would be most apparent where the line would be in proximity to APPA. At this location, the access road would veer east outside the ROW and would cross APPA about 600 feet from the transmission line. This would represent two crossings of the trail related to alternative 4. The widened ROW clearing, reconstructed and collocated distribution line and taller poles as a result of alternative 4 would create impacts. Adverse impacts related to operations and maintenance of the transmission line would occur inside the study area. Overall, alternative 4 would result in adverse impacts to visual resources.

Note: Solid lines indicate portions of the alternatives inside the study area; dotted lines indicate portions outside of study area. Transmission line locations beyond the park boundaries are for illustrative purposes only, and the final transmission line locations outside park boundaries would be determined through a separate planning process conducted by the applicant.



Legend

- Substation
- Alternative 4

Number of Existing Towers Potentially Visible

- 1 to 6
- 7 to 12
- 13 to 18
- 19 to 24
- 25 to 30
- 31+
- Existing Tower

Notes: Existing tower locations are located along existing transmission lines. Large towers were given an 85 foot elevation (tower height) and small or medium towers were given a 65 foot elevation.

The study area is defined as the union of the areas that are 20 miles from the DEWA boundary and 20 miles from the APPA alignment, intersected with the area that is 20 miles from the alternative alignment.

- Visual Analysis Study Area
- Appalachian National Scenic Trail
- Middle Delaware National Scenic and Recreational River
- Delaware River
- Delaware Water Gap National Recreation Area
- CVNWR Boundary
- Worthington State Forest
- State Park
- County Line
- Interstate Hwy

0 5 10 Miles

Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

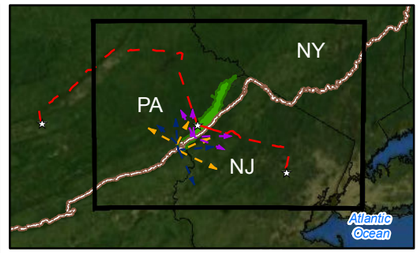
Figure 83
Existing Tower Visibility: Bare Terrain Analysis
Alternative 4

Source: NPS 2010, EA Engineering 2010, DEWA 2008, ESRI 2002, ESRI 2006, ESRI 2010, NJOIT - OGIS 2008, PASDA 2010

Projection: NAD 83 UTM Zone 18N
Date: July 2012

Figure 84 - Alt 4		
# Towers Visible	% of Study Area	Acres
1 to 6	9%	174,273
7 to 12	2%	42,261
13 to 18	1%	26,944
19 to 24	1%	16,688
25 to 30	1%	13,077
31+	1%	15,651
Towers Visible	15%	288,893
No Towers Visible	85%	1,578,075
Total	100%	1,866,968

Note: Solid lines indicate portions of the alternatives inside the study area; dotted lines indicate portions outside of study area. Transmission line locations beyond the park boundaries are for illustrative purposes only, and the final transmission line locations outside park boundaries would be determined through a separate planning process conducted by the applicant.



Legend

- Substation
- Alternative 4

Number of Proposed Towers Potentially Visible

- 1 to 6
- 7 to 12
- 13 to 18
- 19 to 24
- 25 to 30
- 31+
- Proposed Tower

Note: Proposed towers are located along the proposed transmission lines. Towers were given a 195 foot elevation and spaced approximately 6 towers per mile.

The study area is defined as the union of the areas that are 20 miles from the DEWA boundary and 20 miles from the APPA alignment, intersected with the area that is 20 miles from the alternative alignment.

- Visual Analysis Study Area
- Appalachian National Scenic Trail
- Middle Delaware National Scenic and Recreational River
- Delaware River
- Delaware Water Gap National Recreation Area
- CVNWR Boundary
- Worthington State Forest
- State Park
- County Line
- Interstate Hwy

0 5 10 Miles

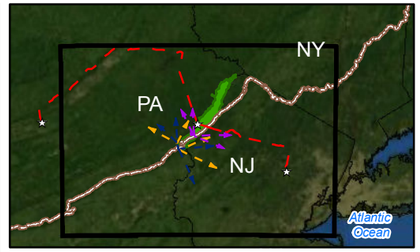
Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 84
Proposed Tower Visibility: Bare Terrain Analysis
Alternative 4

Source: NPS 2010, EA Engineering 2010, DEWA 2008, ESRI 2002, ESRI 2006, ESRI 2010, NJOIT - OGIS 2008, PASDA 2010

Projection: NAD 83 UTM Zone 18N
Date: July 2012

Note: Solid lines indicate portions of the alternatives inside the study area; dotted lines indicate portions outside of study area. Transmission line locations beyond the park boundaries are for illustrative purposes only, and the final transmission line locations outside park boundaries would be determined through a separate planning process conducted by the applicant.



Legend

- Substation
- Alternative 5

Number of Existing Towers Potentially Visible

- 1 to 6
- 7 to 12
- 13 to 18
- 19 to 24
- 25 to 30
- 31+
- Existing Tower

Notes: Existing tower locations are located along existing transmission lines. Large towers were given an 85 foot elevation (tower height) and small or medium towers were given a 65 foot elevation.

The study area is defined as the union of the areas that are 20 miles from the DEWA boundary and 20 miles from the APPA alignment, intersected with the area that is 20 miles from the alternative alignment.

- Visual Analysis Study Area
- Appalachian National Scenic Trail
- Middle Delaware National Scenic and Recreational River
- Delaware River
- Delaware Water Gap National Recreation Area
- CVNWR Boundary
- Worthington State Forest
- State Park
- County Line
- Interstate Hwy

0 5 10
Miles

Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

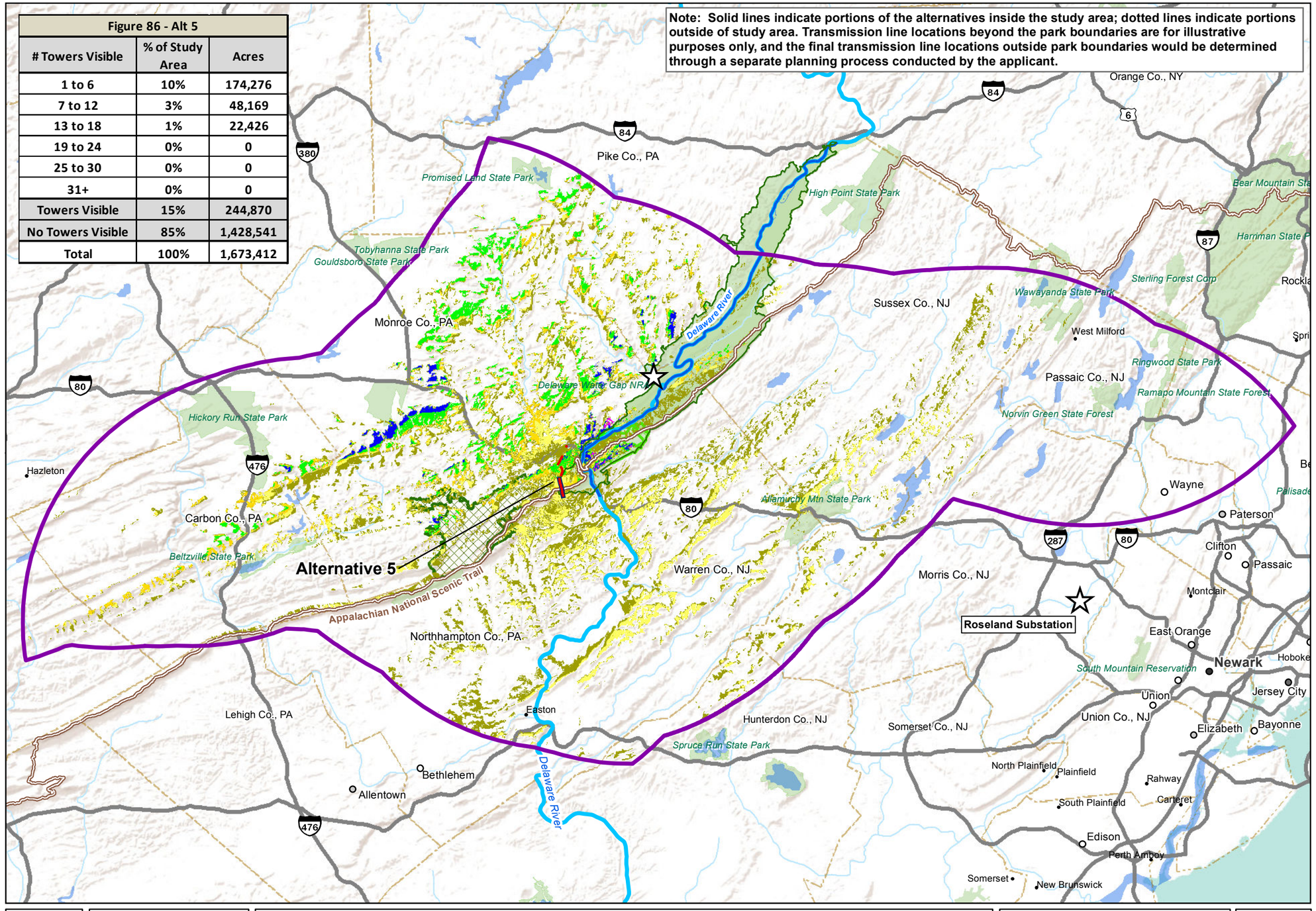
Figure 85
Existing Tower Visibility: Bare Terrain Analysis
Alternative 5

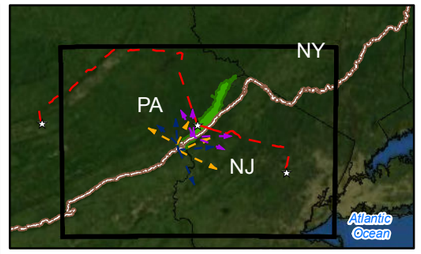
Source: NPS 2010, EA Engineering 2010, DEWA 2008, ESRI 2002, ESRI 2006, ESRI 2010, NJOIT - OGIS 2008, PASDA 2010

Projection: NAD 83 UTM Zone 18N
Date: July 2012

Figure 86 - Alt 5		
# Towers Visible	% of Study Area	Acres
1 to 6	10%	174,276
7 to 12	3%	48,169
13 to 18	1%	22,426
19 to 24	0%	0
25 to 30	0%	0
31+	0%	0
Towers Visible	15%	244,870
No Towers Visible	85%	1,428,541
Total	100%	1,673,412

Note: Solid lines indicate portions of the alternatives inside the study area; dotted lines indicate portions outside of study area. Transmission line locations beyond the park boundaries are for illustrative purposes only, and the final transmission line locations outside park boundaries would be determined through a separate planning process conducted by the applicant.





Legend

- Substation
- Alternative 5

Number of Proposed Towers Potentially Visible

- 1 to 6
- 7 to 12
- 13 to 18
- 19 to 24
- 25 to 30
- 31+
- Proposed Tower

Note: Proposed towers are located along the proposed transmission lines. Towers were given a 195 foot elevation and spaced approximately 6 towers per mile.

The study area is defined as the union of the areas that are 20 miles from the DEWA boundary and 20 miles from the APPA alignment, intersected with the area that is 20 miles from the alternative alignment.

- Visual Analysis Study Area
- Appalachian National Scenic Trail
- Middle Delaware National Scenic and Recreational River
- Delaware River
- Delaware Water Gap National Recreation Area
- CVNWR Boundary
- Worthington State Forest
- State Park
- County Line
- Interstate Hwy

0 5 10
Miles

Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 86
Proposed Tower Visibility: Bare Terrain Analysis
Alternative 5

Source: NPS 2010, EA Engineering 2010, DEWA 2008, ESRI 2002, ESRI 2006, ESRI 2010, NJOIT - OGIS 2008, PASDA 2010

Projection: NAD 83 UTM Zone 18N
Date: July 2012

Cumulative Impacts

Cumulative impacts inside the study area would result in adverse impacts on visual resources as described previously in the "Cumulative Impacts" section. When the impacts on visual resources as a result of alternative 4 are combined with other past, present, and reasonably foreseeable projects in the study area, an overall cumulative adverse impact would be expected.

The past, present, and reasonably foreseeable projects identified along the length of APPA would produce adverse cumulative impacts on the trail as explained in the "Cumulative Impacts" section. When the impacts on visual resources as a result of alternative 4 are combined with other projects that affect APPA, an overall adverse cumulative impact would be expected.

Conclusion

Under alternative 4, adverse impacts on visual resources at the affected KOPs would occur. Impacts on DEWA would occur at Mount Tammany summit, the Karamac Trail in Worthington State Forest, and affect APPA where the alignment crosses over. Construction-related and maintenance adverse impacts would occur. When combined with the impacts on visual resources under alternative 4, the effects of past, present, and reasonably foreseeable future projects would result in adverse cumulative impacts on visual resources inside the study area, and adverse cumulative impacts specifically on APPA.

When considered in the context of the purposes for which DEWA and APPA were established, the adverse impacts of increased visibility and intrusion of the transmission line along alternative 4 would be significant. The transmission line corridor and structures would be clearly visible under alternative 4 and the presence of two sets of structures would increase the adverse impact on aesthetics and scenery. The abrupt opening of the cleared ROW and the intrusion of transmission line towers would likely be intense and would diminish the sense of naturalness to visitors of the parks. Topography and vegetation cover would not screen the visual intrusion on the scenic landscape from almost 200-foot tall towers. These impacts are adverse, would last the life of the project, and cannot be further mitigated. Several significant benefits would occur from removing the B-K Line as part of mitigation for the construction of alternative 4. These benefits may balance the adverse effects of construction, operation, and maintenance of alternative 4.

Alternative 4 also contributes to the cumulative adverse impacts of intrusions into scenic viewsheds and the reduction of these resources in the region surrounding the parks would increase their scarcity and sensitivity inside the parks, where they are afforded special protection. The applicant's project is one component of a larger regional plan by the RTO to enhance systems reliability. Other component projects of this plan have already affected, and would continue to affect APPA, especially in the areas of scenic resources, as well as other National Parks in their paths. The scenic resources of the APPA visitor would be degraded because this project would contribute cumulatively to the adverse impacts cause by the infrastructure projects along the entirety of the trail.

Public attention surrounding this project is high. There is likely to be a high degree of controversy over any effects on park resources that are particularly popular with the public, such as scenery, visitor use and experience, rare and unique communities, cultural landscapes, and historic structures, for any of the alternatives. The inherent uncertain nature of predicting the true degree of some of these impacts would likely heighten this controversy.

The scenic resources of DEWA and APPA are held in public trust. The Organic Act and the parks' enabling legislation mandate that these resources are protected in perpetuity. Visitors come to the parks to experience the scenic resources. As with the other action alternatives, alternative 4 may establish

precedent for future actions because it reverses the trend of improving visitor experience and scenic values by removing non-conforming features. Thus, the NPS believes that alternative 4 would result in significant adverse impacts to visual resources.

Alternative 5

Alternative 5 would follow the same alignment as alternative 4 with the exception of the portion of the B-K Line from the Bushkill Substation to the eastern boundary of DEWA. Affected KOPs with potential visibility of alternative 5 include the following:

- Delaware River as viewed from the river, north of the existing rail bridge
- APPA at the crossing of the proposed alignment

The impacts on visual resources from the proposed transmission line along the alternative 5 alignment would be the same as those discussed for alternative 4 inside the study area.

Zone of Visual Influence Bare-Earth Terrain Modeling: As described under the "Methodologies" section, table 60 provide areas (in acres) from which the existing wood poles and proposed transmission towers could be seen under bare earth conditions, specific to alternative 5, for lands within DEWA and along the APPA alignment (defined at 1,000 feet wide).

TABLE 60: ALTERNATIVE 5 VISIBILITY USING ZVI BARE-EARTH TERRAIN MODELING (ESTIMATED IN ACRES)

Pole / Tower Height	Number of poles/ towers within DEWA	Potential Visibility from within DEWA	Potential Visibility from MDSR	Potential Visibility from APPA
Existing 65- to 85-foot poles along the alternative 5 alignment	11	13,849	432	2,183
Proposed 195 foot monopole (towers as sampled)	5	17,131	1,325	5,991

Overall Alternative 5 Impacts

Activity during deconstruction and construction would adversely affect visual quality as described in the "Common to All Action Alternatives" section. Under alternative 5, impacts would be greatest where the transmission line would cross APPA because it would also be intersected by an access road. Impacts related to operations and maintenance of the transmission line would be the same as for alternative 4. Overall, alternative 5 would result in impacts on visual resources.

Cumulative Impacts

Cumulative impacts inside the study area would result in adverse impacts on visual resources as described previously in the "Cumulative Impacts" section. When the impacts on visual resources as a result of alternative 5 are combined with other past, present, and reasonably foreseeable projects in the study area, an overall cumulative adverse impact would be expected.

The past, present, and reasonably foreseeable projects identified along the length of APPA would produce adverse cumulative impacts on the trail as explained in the "Cumulative Impacts" section. When the

impacts on visual resources as a result of alternative 5 are combined with other projects that affect APPA, an overall adverse cumulative impact would be expected.

Conclusion

The impacts on visual resources at the KOPs under alternative 5 would be the same as described for alternative 4 where the alignments coincide. Adverse impacts under alternative 5 in the study area would affect APPA. The transmission line corridor and structures would be clearly visible under alternative 5 and the presence of two sets of structures would increase the adverse impact on aesthetics and scenery, lasting the life of the project. Construction-related and maintenance impacts would be localized and of short duration. When combined with the impacts on visual resources under alternative 5, the effects of past, present, and reasonably foreseeable future projects would result in adverse cumulative impacts on visual resources inside the study area, and adverse cumulative impacts specifically on APPA.

For the same reasons described for alternative 4 above, the adverse impacts of alternative 5 also have potential to be significant. As stated for alternative 4, permanent adverse impacts would occur to the parks' scenic resources from the visual intrusion of new, nearly 200-foot towers and substantial vegetation clearing of the ROW. Topography and vegetation cover do no screen the visual intrusion on the scenic landscape from almost 200-foot tall towers. These impacts are permanent for the life of the line and cannot be mitigated. The applicant's project is one component of a larger regional plan by the RTO to enhance systems reliability. Other component projects of this plan have already affected, and would continue to affect APPA, especially in the areas of scenic resources, as well as other National Parks in their paths. The scenic resources of the APPA visitor would be degraded because this project would contribute cumulatively to the adverse impacts cause by the infrastructure projects along the entirety of the trail.

Public attention surrounding this project is high. There is likely to be a high degree of controversy over any effects on park resources that are particularly popular with the public, such as scenery, visitor use and experience, rare and unique communities, cultural landscapes, and historic structures, for any of the alternatives. The inherent uncertain nature of predicting the true degree of some of these impacts would likely heighten this controversy.

Allowing impacts to visual resources is contrary to typical NPS practice of improving scenic conditions by removing non-conforming features and may establish precedent for future actions. As with the other action alternatives, alternative 5 may establish precedent for future actions because it would reverse the trend of improving visitor experience and scenic values by removing non-conforming features. Thus, the NPS believes that alternative 5 would result in significant adverse impacts to visual resources.

SOUNDSCAPES

This section evaluates the impacts of noise associated with the proposed alternatives on park soundscapes. The effects of these impacts on people and wildlife are evaluated in the "Visitor Use and Experience," "Landscape Connectivity, Wildlife Habitat, and Wildlife," and "Special-status Species" sections.

METHODOLOGIES

The analysis of impacts for soundscapes assesses the potential impacts associated with constructing, operating, and maintaining the proposed transmission lines along the alternate alignments being evaluated as part of this EIS. The analysis also includes the potential impact associated with decommissioning the existing transmission line as part of the action alternatives.

The methodology used to assess soundscape impacts in this document is consistent with NPS *Management Policies 2006* (NPS 2006a) and Director's Order 47: *Soundscape Preservation and Noise Management* (NPS 2000a). The NPS Natural Sounds and Night Skies Division is currently working to establish standards and protocols for acoustic studies in national parks. This work includes establishing acoustic zones in each park unit based on vegetation, land cover, topography, elevation, and climate. Acoustic zones are areas in which these attributes are similar; therefore, they may have similar natural sound sources, sound levels, and propagation and attenuation properties. At this time, acoustic zones have not been established for the parks in the study area. The soundscapes research and analysis conducted for this EIS did not establish acoustic zones in DEWA, but did establish a baseline condition for the purposes of assessing the impacts of the proposed action.

Resource Systems Group, Inc. conducted background sound level monitoring between October 7 and November 14, 2010, to establish a baseline condition for soundscapes near the proposed alternatives. The data gathered included ambient sound levels (natural and existing), sources of sound, and frequency of human-generated sources of sound. This baseline was compared to predicted sound levels and the propagation of sound modeled for the proposed alternatives to identify potential impacts on the soundscape. The level of impact was assessed based on the type of sound introduced (including the frequency, magnitude, and duration), the degree of change from existing conditions, and the management objectives for the location.

Construction Activities: The analysis estimates that 6,400 feet (1.2 miles) from construction activities is the distance at which construction sound would decrease to the existing background sound levels. The sound from construction equipment can vary from intermittent to fairly continuous. Assuming that a truck (90 dBA), scraper-grader (87 dBA), moveable crane (82 dBA), tractor (85 dBA), and two power saws (78 dBA) are operating in the same area, peak construction period sound would generally be about 93 dBA at 50 feet from the construction site (USEPA 1971). Assuming a sound level decrease of approximately 7.5 dBA for every doubling of distance from the sound source across a soft surface such as vegetation (Caltrans 1998, 27), peak construction sound would be approximately 40 dBA at a distance of 6,400 feet (1.2 miles) from the source. This is close enough to the background sound levels in the study area that it would be barely perceptible or not perceptible at all (see the discussion of sound level monitoring in chapter 3).

Operations: The APEs for soundscapes over the life of the project was determined using sound propagation modeling. As detailed in appendix A of *Soundscapes Summary Report* (DEA 2010c), the predicted transmission line sound levels of the proposed alternatives were calculated using an empirical formula developed by the Bonneville Power Administration based on measurements of existing power lines. The following design assumptions for the proposed alternatives were used for the calculation:

- radius of conductor = 0.019 meters
- radius of bundle = 0.264 meters
- conductors per bundle = 3
- distance between conductors in a bundle = 0.457 meters
- conductor height above ground = 8.2 meters
- voltage = 500 kV
- configuration of phases = vertical

Terrain models developed for each alternative were used to estimate the propagation of transmission line sound moving away from the alternatives. The Cadna A acoustical modeling software used for this

analysis takes into account the source sound power levels, surface reflection and absorption, atmospheric absorption, geometric divergence, meteorological conditions, walls, barriers, berms, and terrain. The resulting sound level isolines (noise contours) surrounding the proposed alternatives show that the sound from the proposed transmission lines would decrease to the existing background sound levels within 350 feet from the centerline of the alternatives. This distance would be much less for some alternatives, as discussed in the "Impacts of the Alternatives on Soundscapes" section. This analysis was performed in the fall of 2010 using the alternative alignments that were current at that time. Since then, some refinements to the alternative alignments have been made. Consequently, the results presented in this section may slightly overestimate the area in specific management zones that would be affected by noise associated with the operation of the proposed alternatives.

Maintenance Activities: Maintenance operations are conducted at various times of the year for selective clearing or for repairing damaged transmission lines, resulting in periodic, temporary sources of sound. Routine inspection and maintenance of the transmission lines is accomplished by vehicular access from access roads. Pickup trucks and chainsaws are examples of equipment that may be used in maintenance activities. The area potentially affected by these activities would be similar to the area that would be affected by construction noise. However, the impacts of maintenance differ in that their duration would be much more brief and the impacts would recur periodically.

Context: Resource-specific context for assessing impacts on soundscapes includes:

- the undeveloped nature of the parks protects the natural soundscapes and buffers against non-natural, human-caused sounds, creating oases from civilization and urbanization
- natural sounds and escape from every-day noise is an important component of the visitor experience and is anticipated by visitors
- other sources of sound, as mentioned in chapter 3, include animals, wind, and water rushing (natural sounds); aircraft, vehicular traffic, people, and gunshots during hunting season (human-produced sound).

STUDY AREA

The geographic study area for soundscapes, similar to other resources, is divided as inside the study area and outside the study area. Inside the study area, areas where noise associated with the proposed action could be heard above the existing background sound levels were assessed for direct effects on the soundscape. The maximum distance out from the centerline where operations noise would be audible is 350 feet. For construction sound, potential direct effects on the soundscape were evaluated within 6,400 feet of construction activities. Outside the study area, the potential indirect effects of the proposed action were generally evaluated based on the types of noise-sensitive receptors that could be near the alignments.

CUMULATIVE IMPACTS COMMON TO ALL ALTERNATIVES

Actions inside and outside the parks can affect the ability of visitors to experience the natural sounds that compose the natural soundscape of the parks. Inappropriate human-generated sound (noise) can adversely affect park resources or values, including, but not limited to, natural soundscapes, cultural resources, wildlife, and visitor use and experience. For this EIS, human-generated sounds that were recorded above the natural ambient sound levels in the parks were considered along with the past, present, and reasonably foreseeable activities that would have beneficial or adverse impacts on soundscapes in the parks and inside and outside the study area. Overall, inappropriate sounds associated with past, present, and reasonably foreseeable actions inside and outside the parks would have an adverse impact on the natural soundscape, as described here.

Sound level monitoring was conducted for this EIS at six different sites representing a variety of settings, including remote ridgetop areas, accessible areas adjacent to the Delaware River, visitor use areas, and wetland areas. Human-generated sound was audible at all these sites, which suggests that much of the natural soundscape is currently affected by human-generated sound to some degree. Sources of human-generated sound recorded during the monitoring period include visitors/hikers, vehicular traffic, gunshots, construction equipment, sirens, car doors, dogs, aircraft overflights, and ORVs.

Human-generated sound in DEWA is audible 10% to 60% of the daytime hours, depending on the monitoring location. The existing ambient sound levels were within 3 dBA of the natural ambient sound levels at all of the monitoring sites. This 3 dBA difference would be barely perceptible to the human ear.

Projects Inside the Study Area

A variety of completed, current, and future activities inside the parks may have effects on soundscapes due to sound associated with road rehabilitation, vegetation clearing/burning, and utilities installation, upgrades, and maintenance. These projects would not result in lasting changes to the soundscape. No projects inside the study area would have cumulative impacts on soundscapes.

Projects Outside the Study Area

Outside the study area, current and reasonably foreseeable projects that would result in adverse cumulative impacts on soundscapes include the following development projects: airport improvements, the high speed passenger train from northeastern Pennsylvania to New York City, and the Alpine Rose Auto Racetrack. Airport and passenger rail improvements outside the study area might affect soundscapes if the improvements led to an increase in noise from increased flights and passenger rail trips, resulting in an adverse impact. However, the magnitude of this possible increase is unknown. Beneficial impacts would occur due to the expiration of commercial use on US Route 209 in 2015, because a reduction in noise levels in that area would occur due to the prohibition of commercial truck traffic. However, an overall population increase expected in the study area would lead to more passenger traffic on this road. The beneficial impacts of the expiration of commercial use on US Route 209 are not expected to offset the adverse impacts expected from a possible increase in noise from increased flights, passenger rail trips, and additional passenger motor vehicle traffic. Therefore, overall cumulative impacts outside the study area would be adverse, but the intensity of these impacts is unknown.

IMPACTS OF THE ALTERNATIVES ON SOUNDSCAPES

Common to All Alternatives

Outside the Study Area: Outside the study area, regardless of which alternative is selected, the transmission line could pass through Carbon, Lackawanna, Luzerne, Monroe, Northampton, Pike, and Wayne counties in Pennsylvania and Morris, Sussex, and Warren counties in New Jersey. A wide variety of land uses would be traversed. Where more undeveloped rural lands exist, such as along Rattlesnake Ridge, existing ambient sound levels may be similar to those measured in DEWA. The residential and urban areas on the west side of the parks are likely to have higher ambient sound levels. In these areas, the noise associated with the transmission lines would not likely be audible.

Outside the study area under the no-action alternative, existing ambient sound levels would remain unchanged. Impacts on soundscapes would be similar to those described for inside the study area. Human-generated noise associated with maintenance activities would have intermittent adverse impacts on the soundscape. The impacts associated with the action alternatives would be similar to those in the study area. There would be impacts from the decommissioning of the existing line and from construction

and maintenance activities. There would be adverse soundscape impacts within 350 feet of the alignment centerline from the noise associated with the continued operation of the existing transmission line. The cumulative impacts from past, present, and reasonably foreseeable projects on the natural soundscape outside the study area are unknown. When the indirect impacts on soundscapes as a result of activities outside the study area are combined with other past, present, and reasonably foreseeable projects outside the study area, the overall cumulative impact would be expected to be adverse.

Alternative 1: No Action

Baseline sound level monitoring shows that the sound associated with the existing transmission line is not audible over the existing background sound levels. There would be no increase in the existing ambient sound levels, which would continue to range from 34 to 48 dBA in the daytime. The soundscape would continue to include a mix of natural and human-generated sounds. There would be no construction activities along the transmission line alignment inside the study area.

The operation of the existing transmission line would require periodic vegetation maintenance every year at a minimum, including the clearing of vegetation in the ROW. Temporary disturbance to the soundscape from these activities would continue. Access roads in the ROW would also require periodic maintenance to provide access for system repairs and maintenance. Sound from equipment such as pickup trucks and chainsaws would continue to be audible periodically. The sound levels associated with these activities may be audible within approximately 6,400 feet of the sound source, which would affect approximately 11.8% of the natural zone in DEWA. Areas as much as 3,200 feet from the alignment may experience temporary sound level increases of more than 13 dBA, which would be consistently audible. Sound levels would increase less than 5 dBA at approximately 6,400 feet from the alignment, which would be barely detectable. Human-generated noise associated with maintenance activities would continue to have intermittent adverse impacts on the soundscape.

Cumulative Impacts

No projects inside the study area would have cumulative impacts on soundscapes, as described previously in the “Cumulative Impacts Common to All Alternatives” section. However, human-generated noise associated with maintenance activities during operation of the existing transmission line would have impacts on the soundscape. Therefore, cumulative soundscape impacts from alternative 1 would be adverse.

Conclusion

Alternative 1, the no-action alternative, would result in the continued operation and maintenance of the existing B-K Line route. Intermittent adverse impacts on soundscapes would continue inside the study area due to maintenance activities associated with continued operation of the existing transmission line. There would be no cumulative impact on the soundscape associated with alternative 1.

Considering the intensity of the impacts of alternative 1 in the context of the purposes for which these parks were established and are managed, the adverse impacts of alternative 1 on soundscapes are not considered to be significant. The existing line does not interfere with the natural sounds of the area in which the line is located. Although there are adverse impacts associated with periodic maintenance of the existing line, the disturbance to the natural soundscapes from vehicles and machinery would be temporary and intermittent; these impacts do not result in significant impacts.

Common to All Action Alternatives

Mitigation Measures: Mitigation measures would be implemented to reduce construction-related impacts on soundscapes and are taken into consideration in the impact analysis. Mitigation measures are described in appendix F.

Removal of Existing Structures: All action alternatives (2, 2b, 3, 4, and 5) include the removal of all or a portion of the B-K Line as described in chapter 2.

Construction Activities: Under all action alternatives, temporary disturbance to the soundscape would be expected from noise associated with construction activities, including the decommissioning of the existing B-K Line. Of the 56,606 acres of natural zone areas in DEWA, 11.8% would be affected by this action. As discussed in chapter 3, the sound associated with construction activities could be audible within approximately 6,400 feet of the sound source. Areas as much as 3,200 feet from the alignment could experience sound level increases of more than 13 dBA, which would be consistently audible. Sound levels would increase less than 5 dBA at approximately 6,400 feet from the alignment. Sound-control devices and muffled exhaust would be installed on all construction equipment and vehicles, respectively, which would help reduce noise during construction.

As shown in table 61, between 11.8% and 26.3% of the surrounding natural zone in DEWA would be temporarily affected assuming ground-based construction activity. Alternatives 3, 4, and 5 would also affect between 11% and 24.2% of the surrounding special use zone designated as nonfederal public land. If helicopters are used at times during construction, sound levels would be higher and a larger area would be affected as compared with ground-based construction activity. Construction disturbance would occur throughout most of the daytime hours (12 hours per day), six days a week for as long as eight months.

TABLE 61: SOUNDSCAPE IMPACTS FROM CONSTRUCTION ACTIVITIES

	Construction Activity	Maximum Natural Zone Affected (%)	Maximum Special Use Zone Affected (%)
Alternatives 2, 2b	Decommissioning and construction of transmission line	11.8	N/A
Alternative 3	Decommissioning and construction of transmission line	26.3	24.2
Alternatives 4, 5	Decommissioning and construction of transmission line	18.9	11

Adverse soundscape impacts would result from activities associated with decommissioning the existing transmission line and the construction of new transmission lines for all action alternatives, with the most severe impacts occurring under alternative 3. These impacts would last for as long as eight months. However, the construction would be confined to the locations of the transmission line features and the construction noise would not occur over the entire length of the alignment for the full eight months. Impacts would be minimized by sound control devices placed on construction equipment.

Operation of Transmission Lines: Existing ambient sound levels were measured at 36 to 37 dBA along the alternative alignments, as identified in table 62. The exception is near the Watergate Recreation Site, where the existing ambient sound level along the alternative 2 and 2b alignment was measured at 48 dBA. Although no monitoring was conducted adjacent to the Delaware River for alternatives 3, 4, and 5, it is anticipated that the sound level where the alignments cross the river would be similar to the river crossing location along alternative 2 and 2b, which was measured at 48 dBA.

TABLE 62: SOUNDSCAPE IMPACTS FROM THE OPERATION OF TRANSMISSION LINES

Alternative	Existing Ambient Sound Levels (dBA)	Maximum Natural Zone Affected (%)	Maximum Special Use Zone Affected (%)	Noise Levels at C/L (dBA)	Distance from C/L Where Noise Levels Reach 40 dBA (Feet)	Distance from C/L Where Noise Levels Reach 35 dBA (Feet)
Alternatives 2, 2b	36–37[a]	0.47	N/A	44	150	350
Alternative 3	36	0.07	1.28	44	150	300
Alternatives 4, 5	37	0.13	N/A	44	130	350

C/L = centerline; N/A = not applicable.

a. Except near the Watergate Recreation Site, where the existing ambient sound level was measured/estimated at 48 dBA.

Inside the study area, the operation of the proposed transmission line for all action alternatives would affect less than 0.5% of the surrounding natural zone in DEWA, as identified in table 62. This is considered a small area of disturbance. The operation of the proposed transmission line along the alternative 3 alignment would also affect a maximum of 1.28% of the surrounding special use zone designated as nonfederal public land. This is considered a small area of disturbance.

The noise from the proposed transmission line could reach 44 dBA directly at the centerline of the alignments during unfavorable weather conditions (see table 62). For alternatives 2, 2b, 3, 4, and 5, this represents a 7 to 8 dBA increase from existing ambient sound levels, which would be readily detectible to the human ear. Within 130 to 150 feet of the alignment centerlines, transmission line noise would reduce to 40 dBA (see table 62). This represents a 3 to 4 dBA increase from ambient sound levels for alternatives 2, 2b, 3, 4, and 5, which is barely perceptible to the human ear. These conditions would occur approximately 14% of the time. Approximately 86% of the time (during fair weather conditions), the noise from the proposed transmission line would not be audible over the existing background sound levels. Within 300 to 350 feet of the alignment centerlines, transmission line noise would reduce to 35 dBA (see table 62), which would not be audible because it would be below the existing background sound levels for all action alternatives. These conditions would occur approximately 14% of the time. Under all action alternatives, the direct effects of the proposed transmission line operation would result in adverse impacts to soundscapes.

Maintenance of Transmission Lines: Under all action alternatives, temporary disturbance to the soundscape would be expected from noise associated with periodic maintenance activities, including the clearing of vegetation in the ROW. Access roads in the ROW would also require periodic maintenance to provide access for repairs and maintenance. Noise from equipment such as pickup trucks and chainsaws would be audible periodically. Noise levels associated with these activities would be similar to those described above for construction activities. This disturbance would be expected every year or as deemed necessary by the applicant.

Alternative 2

The adjacent townships of Middle Smithfield in Pennsylvania and Hardwick in New Jersey do not have sound ordinances applicable to the proposed action. Therefore, no conflicts with local ordinances are anticipated.

As stated in the “Common to All Action Alternatives” section above, there would be adverse soundscape impacts from decommissioning of the existing line and from construction and maintenance activities under alternative 2. With the implementation of mitigation measures to reduce construction noise as

described in appendix F, construction-related impacts would be minimized. Some readily detectable noise associated with the continued operation of the new double 500-kV transmission line would be expected within 350 feet of the alignment centerline (see table 62).

Cumulative Impacts

No projects inside the study area would have cumulative impacts on soundscapes, as described previously in the "Cumulative Impacts Common to All Alternatives" section. However, human-generated noise associated with decommissioning of the existing line and construction and maintenance of the new 500-kV line under alternative 2 would have adverse impacts on the soundscape. Therefore, cumulative impacts from alternative 2 would be adverse.

Conclusion

Inside the study area, adverse soundscape impacts would result from disturbance during decommissioning, construction, and maintenance activities. Some readily detectable adverse impacts on the soundscape would be expected within 350 feet of the alignment centerline (see table 62) from the operation of the line. Cumulative impacts are expected due to the adverse effects to the soundscape associated with construction and operation of alternative 2.

As described in the "Elements Common to All Action Alternatives" section above, adverse impacts to soundscapes from alternative 2 and the other action alternatives would result from activities associated with decommissioning the existing transmission line and the construction of new transmission lines. These impacts would last for as long as eight months. However, the construction would be confined to the locations of the transmission line features and the construction noise would not occur over the entire length of the alignment for the full eight months. There would be no conflict with local sound ordinances. Sound control devices placed on construction equipment would be used to help minimize adverse impacts. Once construction is completed, operation of the new transmission line would result in very little change in ambient noise levels from existing conditions. There may be persistent adverse impacts on trail users who walk directly under the line due to increased noise for a distance of up to 350 feet crossing the centerline in unfavorable weather conditions. This adverse impact would be of short duration, lasting only as long as it took to cross that distance.

Permitting the project would adversely affect multiple protected resources inside the parks, in some instances irreversibly. Allowing such adverse effects in order to facilitate private infrastructure expansion would be contrary to NPS practice and principle of protecting and improving these resources, and of removing incompatible infrastructure to do so. This could establish a precedent that may invite similar proposals by other applicants in the future, and create an expectation of like treatment for those proposals; it may make it difficult to deny such proposals. DEWA and APPA both contain numerous other utility crossings, which makes the risk of such precedent particularly concerning for these parks. Furthermore, as units of the national park system, wherein all parks are entitled to equal protection, creating such a precedent could have ramifications for parks nationwide. The location of this particular crossing through the center of DEWA could make such a precedent even more potent. Installing the S-R Line on this alignment may invite future utilities proposing to follow the same route. For these reasons, alternative 2 would not likely result in significant impacts.

Alternative 2b

The alternative 2b alignment follows the same route as the alternative 2 alignment, along the existing B-K Line. The alternative 2b towers would be the same height as the alternative two towers, although two additional towers would be required for alternative 2b. The addition of two towers for alternative 2b

would not measurably change the expected impacts. Thus, the adverse impact of alternative 2b would be the same as alternative 2.

Cumulative Impacts

The cumulative impacts under alternative 2b would be the same as those described for alternative 2, adverse, when combined with the other past, present, and reasonably foreseeable projects inside the study area.

Conclusion

Alternative 2b would result in adverse impacts on soundscapes inside the study area from the operation of the line. Cumulative impacts are expected due to the adverse effects to the soundscape associated with construction and operation of alternative 2b.

Similar to alternative 2, adverse impacts to soundscapes from alternative 2 and the other action alternatives would result from activities associated with decommissioning the existing transmission line and the construction of new transmission lines. These impacts would last for as long as eight months. However, the construction would be confined to the locations of the transmission line features and the construction noise would not occur over the entire length of the alignment for the full eight months. There would be no conflict with local sound ordinances. Sound control devices placed on construction equipment would be used to help minimize adverse impacts. Once construction is completed, operation of the new transmission line would result in very little change in ambient noise levels from existing conditions. There may be persistent adverse impacts on trail users who walk directly under the line due to increased noise for a distance of up to 350 feet crossing the centerline in unfavorable weather conditions. This adverse impact would be of short duration, lasting only as long as it took to cross that distance. The adverse impacts on soundscapes under alternative 2b are not considered to be significant.

Like the other action alternatives, alternative 2b has potential for significant impacts associated with the precedent set by permitting a proposed transmission line that would adversely affect multiple protected resources inside the parks. The results of this action would be contrary to NPS practice and principle of protecting and improving these resources and would potentially establish a precedent that may invite similar proposals by others and make it difficult for the NPS to deny such proposals.

Alternative 3

The adjacent townships of Smithfield in Pennsylvania and Blairstown in New Jersey do not have sound ordinances applicable to the proposed action. Therefore, no conflicts with local ordinances are anticipated.

As stated in the “Common to All Action Alternatives” section above, there would be adverse soundscape impacts from the decommissioning of the existing line and from construction and maintenance activities. Because sound associated with operation of the existing B-K Line is not audible over existing background sound levels as described under alternative 1, removal of the line would not provide benefits to the soundscape. With the implementation of mitigation measures to reduce construction noise as described in appendix F, construction-related impacts would be minimized. Some readily detectable adverse impacts would be expected within 300 feet of the alignment centerline (see table 62) from the noise associated with the continued operation of the new double 500-kV transmission line.

Cumulative Impacts

No projects inside the study area would have cumulative impacts on soundscapes, as described previously in the "Cumulative Impacts Common to All Alternatives" section. However, human-generated noise associated with decommissioning of the existing line and construction and maintenance of the new 500-kV line under alternative 3 would have readily detectable impacts on the soundscape. Therefore, cumulative impacts from alternative 3 would be adverse.

Conclusion

Inside the study area, adverse soundscape impacts would result from disturbance during decommissioning, construction, and maintenance activities. Some readily detectable impacts on the soundscape would be expected within 300 feet of the alignment centerline during operation and maintenance (see table 62). Adverse cumulative impacts are expected due to the soundscape impacts associated with construction and operation of alternative 3.

The adverse impacts on soundscapes under alternative 3 are somewhat worse than the other action alternatives because construction noise could affect a potentially larger area due to the length of the line within the parks; however, these adverse impacts are not considered to be significant for the same reasons described above.

Like the other action alternatives, alternative 3 has potential for significant impacts associated with the precedent set by permitting a proposed transmission line that would adversely affect multiple protected resources inside the parks. The results of this action would be contrary to NPS practice and principle of protecting and improving these resources and would potentially establish a precedent that may invite similar proposals by others and make it difficult for the NPS to deny such proposals.

Alternative 4

Construction activities between the hours of 6:00 p.m. and 8:00 a.m. would violate the Stroud Township noise ordinance if construction-related sound exceeds the limits. The Upper Mount Bethel Township also has an ordinance that may be applicable to the proposed action, but specific information was not available from the jurisdiction.

As stated in the "Common to All Action Alternatives" section above, there would be adverse soundscape impacts from the decommissioning of the existing line and from construction and maintenance activities. Because sound associated with operation of the existing B-K Line is not audible over existing background sound levels as described under alternative 1, removal of the line would not provide benefits to the soundscape. With the implementation of mitigation measures to reduce construction noise as described in appendix F, construction-related impacts would be minimized. There would be some readily detectable adverse impacts from the noise associated with the continued operation of the new double 500-kV transmission line within 350 feet of the alignment centerline (see table 62).

Cumulative Impacts

No projects inside the study area would have cumulative impacts on soundscapes, as described previously in the "Cumulative Impacts Common to All Alternatives" section. However, human-generated noise associated with decommissioning of the existing line and construction and maintenance of the new 500-kV line under alternative 4 would have readily detectable impacts on the soundscape. Therefore, cumulative impacts from alternative 4 would be adverse.

Conclusion

Inside the study area, adverse soundscape impacts would result from temporary disturbance during decommissioning, construction, and maintenance activities. Some readily detectable adverse impacts on the soundscape would be expected within 350 feet of the alignment centerline (see table 62) during operation and maintenance; however, no measureable change to the natural soundscape would be expected as a result of operation of the line under alternative 4. Adverse cumulative impacts are expected due to the soundscape impacts associated with construction and operation of alternative 4.

As described for alternative 2 above, the adverse impacts on soundscapes under alternative 4 are not considered to be significant. Construction activities would have to be coordinated with local ordinances to avoid conflicts.

Like the other action alternatives, alternative 4 has potential for significant impacts associated with the precedent set by permitting a proposed transmission line that would adversely affect multiple protected resources inside the parks. The results of this action would be contrary to NPS practice and principle of protecting and improving these resources and would potentially establish a precedent that may invite similar proposals by others and make it difficult for the NPS to deny such proposals.

Alternative 5

Inside the study area, the alignment for alternative 5 would follow the same route through DEWA and APPA as alternative 4, with the exception of the portion of the B-K Line from the Bushkill Substation to the western boundary of DEWA. The adverse impacts of alternative 5 on soundscapes would be the same as those described for alternative 4.

Cumulative Impacts

The cumulative impacts under alternative 5 would be the same as those described for alternative 4, adverse, when combined with the other past, present, and reasonably foreseeable projects inside the study area.

Conclusion

Similar to the other action alternatives, there would be adverse effects due to noise generated from the construction of alternative 5; however, no measurable change to the soundscapes of the parks would be expected as a result of operation of the line. Cumulative impacts are expected due to the adverse effects to the soundscape associated with construction and operation of alternative 5.

As described for alternative 2 above, the adverse impacts on soundscapes under alternative 5 are not considered to be significant. Construction activities would have to be coordinated with local ordinances to avoid conflicts.

Like the other action alternatives, alternative 5 also has potential for significant impacts associated with the precedent set by permitting a proposed transmission line that would adversely affect multiple protected resources inside the parks. The results of this action would be contrary to NPS practice and principle of protecting and improving these resources and would potentially establish a precedent that may invite similar proposals by others and make it difficult for the NPS to deny such proposals.

VISITOR USE AND EXPERIENCE

This section evaluates impacts on visitor use and experience. Impacts were determined by considering the effect of the existing conditions and the proposed construction and operation of the transmission lines on the overall use of recreational opportunities provided by the parks and the resulting experience visitors have while visiting the parks.

METHODOLOGIES

Visitors use a variety of park resources based on personal goals and interests, and the feeling they experience during their visit is the result of multiple actions and encounters. This analysis considers how the proposed alternatives would affect how people use park lands, as well as how the alternatives would alter visitors' experiences. Although several factors contribute to the quality of experience, the proposed actions would affect visitor use and experience primarily through visual and noise disruptions. Therefore, this analysis incorporates the findings from the "Soundscapes" and "Visual Resources" sections of this chapter to help determine how impacts on those park resources would affect visitor use and experience.

Aesthetic value is an important consideration in the management of recreation settings, especially where most people expect a natural-appearing landscape with limited evidence of "unnatural" disturbance of landscape features (USFS 1995, F-1). Scenic qualities can affect park visitors, residents of the local area or nearby communities, and a broader constituency who may either occasionally visit the parks or simply have an interest in their scenic qualities (USFS 1995, 3-3).

Landscapes are viewed to varying degrees from different locations, and subsequently differ in their importance (USFS 1995, 4-8). Visual impacts on visitor experience would depend on viewer exposure (which includes physical location, number of viewers, and view duration) and viewer sensitivity (which includes activity and awareness, personal values, and the cultural significance of a scene) (FHWA n.d., 97). Sometimes, only small numbers of people view certain landscapes (viewer exposure), but they may have high concern for scenic quality and high expectations of outstanding scenic beauty (viewer sensitivity). When associated with other related experience opportunities, such as introspection or spiritual quests, these landscapes have even higher scenic importance and value. Other natural resource values, such as wilderness, wildlife, or old-growth vegetation (cultural significance), may raise the importance of scenic quality and landscape settings (USFS 1995, 4-4). The particular activity in which people are engaged may encourage them to look at the landscape, such as nature photography, or distract them from doing so, such as driving during bad weather. A response by the viewer to a change can also be affected by expectations or awareness of the change, such as individual preconceptions about the landscape or an unexpected landscape transition (FHWA n.d., 69). In addition, the longer a view would be seen, the higher the impact. For example, motorists driving under a cleared canopy opening would be exposed to the change for a very short period, experiencing only a fleeting glimpse or a peripheral view of the effect. Hikers resting at an overlook along APPA would be exposed to a change for several minutes or longer. In assessing impacts on visitor use and experience, the analysis considers the duration of viewer exposure and viewer sensitivity based on location and activity, as described earlier. The types of activities in which visitors would likely engage at certain locations were used to estimate the duration of the activity as well as potential viewer sensitivity.

Visual impact research identifies the following factors that influence how people are affected by visual change (USFS 1995, 4-4, 4-7), which were incorporated into the analysis based on the location of visitors at specific sites in relation to the proposed actions:

- Landscapes seen close up are more visually sensitive than those seen in muted detail from greater distances.
- When people view landscapes at middleground distances, they often view them more coherently and in better context with their surroundings than they do foreground landscapes.
- When people view middleground landscapes that are evenly textured, human activities that dominate natural form, line, or texture create noticeable contrast.
- Scenic values increase as the terrain provides longer views, particularly where clean air allows for viewing crisp detail.
- Seasonal differences may affect viewer sensitivity; "leaf-on" and "leaf-off" conditions in deciduous forests will modify landscape visibility.
- Areas with important scenic features, such as national parks, attract a higher percentage of people with high concern for scenic quality.

As described in the "Affected Environment" chapter, most DEWA recreation sites exist in park development zones, which include intensive visitor use areas (NPS 1987, 16–21). These areas are surrounded by lands zoned as natural, with a resource management subzone that includes natural and human-made features that have contributed to the scenic diversity of the area. Impacts within or extending into the natural zone, where all lands and resources are to be maintained to enhance scenic diversity and other values, would result in higher impact intensities than those confined to the development zone. Therefore, this analysis considers the zone in which visitor activities take place to further determine the level of impact.

Inappropriate sound can also adversely affect park visitor experiences. Visitors usually have high expectations regarding a national park experience. The impacts of inappropriate sound on visitor experience are especially evident where visitor expectations include solitude, serenity, tranquility, contemplation (as in wilderness), or a completely natural or historic environment. Because exposure to significant and constant levels of noise in urban and/or suburban settings is part of daily life for many people, a degraded natural soundscape would not provide visitors with a contrasting environment, which national parks are generally assumed to provide, and would represent a direct impact on visitor experience. To the extent that noise might displace animals from viewing areas, for example, it could indirectly impact visitor experience by precluding visitors from enjoying the sights and sounds of wildlife. Locations where visitors would expect characteristics of solitude, as described earlier, were considered in this analysis as having higher impacts than locations focused on more group-centered recreation.

Resource-specific context for assessing impacts to visitor experience includes

- Visitors to national parks have high expectations for a high quality experience
- APPA is world renowned for hikers and can be a once-in-a-lifetime trip
- There are few large national parks in the east and DEWA, APPA, and the MDSR are uniquely accessible to millions of people (within a day's drive)
- DEWA, APPA, and MDSR are an "oasis" offering an opportunity for solitude and escape from urbanized life that is rare in this part of the east coast

- The visitor base is exceptionally diverse, consisting of local, regional, national and international visitors, including both first-time and repeat users, with the duration of stays ranging from day-use to multi-day trips
- The parks offer a wide diversity of experiences available to visitors: hunting, paddling, hiking, camping, sightseeing, historic buildings and settings, agricultural practices and remnants of settlement of the valley and past ways of life

STUDY AREA

The study area for visitor use and experience is the same as described for the "Visual Resources" section in chapter 3.

CUMULATIVE IMPACTS COMMON TO ALL ALTERNATIVES

For this EIS, actions inside and outside the parks can affect visitor use and experience by offering additional or improved opportunities for recreational pursuits and experiences, such as replacing a boat launch. Conversely, opportunities could be degraded or eliminated by activities such as expanding or relocating a gas pipeline or adding cell phone towers near a recreation site. Completed, current, and future activities that could have beneficial or adverse impacts on visitor use and experience in the parks, inside and outside the study area, are summarized below, with anticipated impacts identified. A full list of cumulative projects can be found in appendix H. Under the discussion of each alternative, the impacts associated with these projects were analyzed in conjunction with the impacts expected for the alternatives.

Projects Inside the Study Area

Inside the study area, projects that would result in adverse impacts on visitor use and experience include the following utility projects: the PADOT SR 2001 road project, the repair of failing Watergate Dam #10, the US Route 209 Raymondskill Creek Bridge rehabilitation, the Delaware River Joint Toll Bridge Commission Delaware River bridge projects, the Tennessee Gas Line Proposal, the Columbia Gas Transmission Company pipeline increase, the DEWA prescribed-burn program, the DEWA hazard fuel reduction program, and existing utility towers within 5 miles. These projects would adversely affect visitor experience by lessening the natural feel of the parks and would affect visitor use through construction or other impacts that would inhibit easy access to recreation for visitors to the parks. Illegal activities, such as arson, vandalism, and trespassing, would also have adverse impacts on visitor use and experience. Licenses and permits for special use and incidental business/commercial visitor permits may affect visitor use and experience, and could be adverse for other visitors near the permitted activities.

Several cumulative development and utility projects inside the study area would have beneficial impacts on visitor use and experience, including the following: Smooth Ride Initiatives, US Route 209 road improvements, Sustainable Comfort Stations, the Pocono Environmental Education Center, New Jersey Swim Beach (Turtle Beach), hazardous structure demolition/deconstruction, the Kittatinny Point Visitor Center storm recovery, the Kittatinny Point Boat Launch replacement, the river campsite restoration of flood-damaged sites, the APPA relocation near the Columbia Gas pipeline crossing, and the Metropolitan Edison removal of unused power poles and transformers. These projects would improve facilities and resources available to visitors in the parks. Licenses and permits for special use and incidental business/commercial visitor permits may affect visitor use and experience, and the impacts would be beneficial for the permit recipients.

Although some projects would provide beneficial impacts that would positively affect visitor use and experience, the beneficial impacts would not outweigh the adverse impacts from the above-mentioned projects. Cumulative impacts on visitor use and experience inside the study area would be adverse.

Projects Outside the Study Area

Outside the study area, projects that would result in adverse impacts on visitor use and experience include the following utility and development projects: the PPL proposal for a 138/12-kV substation, the Tennessee Gas Line proposal, the Columbia Gas Transmission Company pipeline increase, Marcellus shale natural gas drilling, the Blue Mountain Ski Resort community-scale wind turbine, airport improvements, the Alpine Rose Racetrack, and wind turbines in northeastern Pennsylvania. These projects would result in adverse impacts from construction, the restriction of access, and the destruction of the natural feel of the parks and of the resources used by visitors. County and township open space and conservation plans would have beneficial impacts on visitor use and experience.

Although some projects would provide beneficial impacts that would positively affect visitor use and experience, the beneficial impacts would not outweigh the adverse impacts from the above-mentioned projects. Cumulative impacts on visitor use and experience outside the study area would be adverse.

Projects Specifically Affecting APPA

For APPA, the geographic range for cumulative impacts is Maine to Georgia, and includes any interruption in wilderness experience (roads, bridges, ROWs). The trail is already experiencing substantial impacts from other actions. Although some visitors use APPA for day hiking, the impacts for long-distance hikers is also considered for the entire length of APPA. For regional hikers, only projects within 20 miles of the S-R Line project are considered. Projects closer to the S-R Line are weighted heavier in the analysis. Projects along APPA are concentrated between northern Virginia and New Hampshire.

The development and utility projects listed above, particularly the Marcellus shale drilling and Columbia and Tennessee pipelines, would also adversely affect APPA. The resource management and restoration plans and activities would offer beneficial effects. Additional adverse impacts would result from activities planned along the entire length of the trail, including 317 antennas greater than 200 feet tall (e.g., cable television, communication towers) located within five miles of APPA (the vast majority, 113, are in Pennsylvania; Virginia has the next highest at 59; New Jersey has 9); 63 pipelines (the vast majority, 28, are in Pennsylvania; Massachusetts has the next highest at 14; New Jersey has 1); and 94 electrical power lines (the vast majority, 34, are in Virginia; Pennsylvania has the next highest at 17; New Jersey has 4). In addition, approximately 1,500 transportation infrastructure facilities, including local roads, park roads, highways and interstates, and railroads, are in (or proposed for development in) the vicinity of APPA. The majority, 316, are in Virginia, with Pennsylvania the next highest at 228. New Jersey has 85 proposed activities.

IMPACTS OF THE ALTERNATIVES ON VISITOR USE AND EXPERIENCE

Common to All Alternatives

Outside the study area: Regardless of which alternative is selected, the transmission line could pass through Carbon, Lackawanna, Luzerne, Monroe, Northampton, Pike, and Wayne counties in Pennsylvania and Morris, Sussex, and Warren counties in New Jersey. The clearing, construction, and vegetation maintenance activities outside the study area would be consistent with those described in the analysis of each alternative. Because the NPS cannot dictate where the line would actually go, the direct

impacts from the construction and maintenance of the transmission line outside the study area cannot be determined. Additionally, the specific resources that would be affected by the transmission line outside the study area cannot be identified until the route is chosen by the applicants.

Outside the study area, people would continue to recreate in those areas described in chapter 3. Where the transmission line corridor had been established prior to creation of the recreation area, repeat visitors would have developed a tolerance for the presence of the facility. New visitors to sites near the transmission line corridor may be more affected by the unexpected presence of the line in a recreational setting. Impacts would also vary based on the type of recreation area visited and on the activities supported. As indicated in chapter 3, the transmission line would cross a variety of different types of recreation areas, offering various recreational uses and resulting experiences. Under the action alternatives, a wider ROW, taller structures, and additional access roads would likely have more impact on people seeking solitude and naturalness than to those engaged in off-roading on drivable trails. Adverse impacts to visitors recreating outside the study area would result from construction and ongoing maintenance activities. The intensity would depend on the location and duration of the activity, season and time of week, and visitor sensitivity.

Outside the study area, views from APPA would be affected during the approach to the transmission line, as described under "Common to All Action Alternatives." Depending on the route outside the study area, the transmission line could cause visual impacts, especially if the line causes disruptions to the middleground, creating a noticeable contrast and affecting how visually coherent the landscape would appear to visitors

Indirect adverse impacts to recreationists outside the study area from vegetation clearing, the construction of the transmission line, the operation and maintenance of the transmission line, and vegetation maintenance would occur.

Alternative 1: No Action

Under the no-action alternative, the existing transmission line ROW would not be widened. Visitors would experience no new sound impacts, because sound associated with the existing transmission line is currently not audible over the existing background sound levels, and there would be no increase in existing ambient sound levels. Visitors to DEWA and APPA segments in the study area have been exposed to views of the existing transmission line since the line was established. Although repeat visitors, particularly those who return to favorite recreation sites, may accept the presence of the transmission corridor and lines, new visitors may be adversely affected by their existence. It is also possible that repeat visitors currently avoid locations where the lines are most obvious, such as the Watergate Recreation Site. New visitors to sites like the Watergate Recreation Site may experience an unfavorable impression of DEWA due to the close proximity and visual intrusion of the existing structures. However, visitation to DEWA has steadily risen, demonstrating a 5% increase from 1999 to 2009 (NPS 2010ae). In addition, 96% of DEWA river users are satisfied overall with park facilities, services, and recreational opportunities (University of Idaho 2009).

Hikers using APPA may expect a different type of experience from those recreating at DEWA, specifically an experience that is focused more on being close to nature and enjoying the views along the trail (Manning et al. 2000). As described in the "Visual Resources" section in chapter 3, hikers would experience adverse effects from the abrupt vegetation opening created by the alternative 1 alignment's cleared ROW for about 400 to 500 feet, as well as the close presence of two large galvanized steel lattice tower structures, before reentering the woods. The presence of the towers would diminish the sense of naturalness experienced by walking the trail through settings primarily undisturbed by large, human-made structures. However, the clearing would also provide views to the east and west, which some hikers may

experience as a benefit. Despite the presence of such structures and clearings, the number of long-distance hikers has nearly doubled from the 1990s (3,283) through the 2000s (6,302) (ATC 2009), indicating increasing interest in hiking the trail. Although an increased number of hikers on APPA, particularly long-distance hikers, would be affected, there would be no changes from existing conditions.

The operation of the existing transmission line would require periodic maintenance, including the clearing of vegetation in the ROW. Access roads in the ROW would also require periodic maintenance to provide access for repairs and maintenance to the system. All maintenance activities have the potential to adversely affect visitor use and experience near the actions due to noise and visual intrusions. These impacts would be more intense for hikers expecting solitude and a sense of naturalness. Most visitors would likely be unaware of the maintenance activities. There would be no noticeable change to visitor use and experience from operation of the existing transmission line.

Cumulative Impacts

Cumulative impacts on visitor use and experience inside the study area would be adverse, as described previously in the "Cumulative Impacts Common to All Alternatives" section. When the adverse impacts on visitor use and experience as a result of alternative 1 are combined with other past, present, and reasonably foreseeable projects in the study area, an overall adverse cumulative impact would be expected.

Conclusion

Alternative 1, the no-action alternative, would result in the continued operation and maintenance of the existing transmission line. Impacts in the study area would result primarily from the continued visual impacts of the existing transmission line. Noise and visual intrusions would result in slight impacts during maintenance activities. The continued operation of the existing transmission line would result in minimal impacts. Overall adverse cumulative impacts on visitor use and experience would be expected inside the study area.

The scenic character within the area traversed by the existing line is composed of mostly undeveloped, contiguous tracts of forest. Buffered from human development and encroachment, this stretch of the Appalachian Trail, perched atop the Kittatinny Ridge, is known for the solitary and wilderness-like experience it offers. Likewise, the Walpack Bend, just upstream of the transmission line crossing, is the most natural and least developed section of the MDSR. This area has the least evidence of human occupancy and influence making it a popular river destination because it offers an experience of solitude and exceptional scenic quality. Alternative 1 would result in some adverse impacts on visitor experience but would not change these unique characteristics of the area. The existing line was present when the parks and MDSR were established and thus, was part of the existing conditions. Also, the existing transmission line and ROW is virtually invisible from most places and at most times of the year because it is screened by topography or it is surrounded by forest 30 to 40 feet taller than the 85 foot towers. The no-action alternative would not establish any precedent for future actions with significant effects. To the extent it represented a decision in principle about future actions, it would favor the continuation of the status quo, which is not precedent setting in the context of the NPS system, whose primary goal is preservation for future generations. The actions under alternative 1 would be in keeping with the parks' enabling legislations, NPS *Management Policies 2006*, and all other applicable federal and state laws. Any cumulative impacts to resources would remain adverse primarily from other actions taken outside the study area. Considering the intensity of the impacts of alternative 1 in the context of the purposes for which these parks were established and visitor expectations of the national park experience, the impacts of alternative 1 on visitor experience are not considered to be significant.

Common to All Action Alternatives

Mitigation Measures: Mitigation measures would be implemented to reduce impacts on visitor use and experience and are taken into consideration in the impact analysis. Mitigation measures are described in appendix F.

Removal of Existing Structures: All action alternatives (2, 2b, 3, 4, and 5) include the removal of all or a portion of the B-K Line described in chapter 2. During the removal and disposal of existing structures, visitors would experience adverse noise and visual impacts from the creation of access roads, the transportation of construction equipment to and from the decommissioning sites, the removal of the crane pads and equipment at wire pulling locations, the removal and disassembly of lattice towers, and grading activities. Possible helicopter use would result in additional noise and visual impacts. As the decommissioned route returns to natural conditions, vegetation would fill the corridor, which would gradually disappear over time. Although some visitors may prefer the views the transmission line ROW opening would provide, returning the corridor to natural conditions would enhance the natural environment that most visitors enjoy. The elimination of the visual impact of the existing transmission line would result in a primarily beneficial impact on visitor experience.

Project Construction and Components: Adverse impacts would result from the construction of the new facilities, including grading activities to create level pads for tower sites, the construction of foundations, and the construction of steel towers, including wire installation. New pulling and splicing sites, as well as new construction staging locations, would further affect visitors due to noise and visual disruptions. Some existing roads, new access roads, and spur roads would require clearing and grading. Upon completion of the transmission lines, all roads except the spur roads would be permanently maintained. During construction, visitors may also experience temporary road closures or reroutes, which could cause delays or the inability to access and use preferred recreation sites. To help minimize these effects, construction activities would be coordinated with NPS and other managers of affected recreation areas to avoid peak visitor use periods and notify visitors of construction. Prior to construction, a media strategy/notification plan would be developed to notify local residents and visitors of closures (see appendix F).

Because some of the ROW expansion is necessary for construction safety and maneuverability, after construction is completed a portion of the corridor along the ROW would be allowed to revegetate. Only the width of the ROW necessary to maintain access roads and the transmission line would continue to be maintained. Such revegetation would take many years and would indirectly benefit visitor use and experience by potentially creating a visual screen in some locations and restoring a sense of naturalness, including restored wildlife habitat. Similarly, mitigation measures to minimize impacts on natural resources as described in chapter 2 would benefit park visitors' experience of those resources.

Under all action alternatives, devices placed on transmission line conductors (wires) to deter birds would increase the visibility of the lines by making the conductors more prominent. This could increase the level of adverse impacts where visitors would be visually exposed to these devices. The impact would vary based on the location, activity, and viewer sensitivity. For example, drivers passing underneath the lines may not notice the devices. Visitors relaxing at an overlook along APPA would be more affected, increasing the overall level of impact.

The addition or improvement of access roads and spur roads called for under all action alternatives could result in ORV and dirt bike use, which is illegal in the parks. Such use would result in increased noise, which would adversely affect visitor experience. This engine noise would be incompatible with the natural, park-like setting. In addition, visitors could see damage to vegetation and scars from these vehicles, and would potentially see the roads being used in this manner. The presence of these vehicles and their resulting damage would also decrease the possibility of wildlife sightings. These impacts would

increase the level of impacts on visitor experience of the parks, and may influence visitors' use of the parks, because they may avoid such areas. To help minimize these effects, an off-highway vehicle / all-terrain vehicle (OHV/ATV) deterrent plan would be developed prior to construction activities, and temporary access roads would be permanently closed and revegetated to discourage such use (see appendix F).

As noted in chapter 3, many river users would pass below the transmission line under all action alternatives. Kittatinny Point, at the southern end of DEWA and downstream of the proposed transmission lines, is a popular river trip endpoint (Blotkamp et al. 2010, 48). The presence of the taller towers, thicker lines, and bird diverters (depending on the type used) would be seen not only as boaters pass below the wires, but during the approach from farther upstream. Under alternatives 3, 4, and 5, two sets of transmission lines would be visible. Sixty-four percent of DEWA visitors surveyed in 2010 indicated that power line expansion through DEWA and MDSR would detract from their park experience. For these reasons, changes proposed under the action alternatives would adversely affect the visitor experience of many boaters.

Similarly, visitors hiking long sections of trails, including APPA from both inside and outside DEWA boundaries, would be exposed to intermittent views of the transmission line during their approach to it. The towers would be taller, the ROW wider (with the exception of alternative 2b), and, in the case of alternatives 3, 4, and 5, two sets of transmission lines would be seen. The transmission lines would be more noticeable than existing conditions, so they would be seen from greater distances during the approach and would have a greater impact due to their larger presence. Therefore, the adverse impact on the "linear" experience of hiking a trail, especially APPA, would vary in intensity depending on visitor sensitivity and environmental conditions (e.g., leaf-on or leaf-off).

As noted in chapter 3, hunting is allowed throughout DEWA and is not concentrated in any particular area in relation to the proposed alternatives. Because hunters enjoy the natural aesthetics of their surroundings, they would experience similar impacts to other visitors. The canopy openings created by the transmission line would benefit some wildlife species but harm others. For example, some small game species may prefer canopy openings, depending on habitat (e.g., riparian areas), whereas deer prefer edge habitat but not direct openings. However, cleared openings are generally not suitable for hunting deer, because hunters would be visible to game. In addition, waterfowl hunters may not want to fire overhead toward the transmission lines and would therefore avoid these areas. As a result, widening the ROW would decrease the area's suitability for hunting. The most extensive impacts would result from deconstruction and construction activities. Natural quiet is important for hunters, particularly bow hunters. Noise from deconstruction and construction activities would frighten game from the area and degrade the naturalness of the hunting experience. Noise impacts would be greater under alternatives 3 and 4, which include the deconstruction of the existing B-K Line, the deconstruction of the existing transmission line along the alternative 3 or 4 corridor, and the construction not only of the S-R Line, but of the parallel replacement lines along the alternative 3 or 4 corridor. During these activities, hunters could choose to hunt in other parts of DEWA, possibly leading to crowding, which has been identified by 43% of all hunters as "unsatisfactory" in the park (Penn State 1989, 75). Once the existing B-K Line was revegetated under alternatives 3 and 4, beneficial impacts would result from increased habitat, improved habitat connectivity, and restored naturalness.

The NPS is mandated to preserve natural, historic, and scenic resources in perpetuity for the benefit and enjoyment of the public. Adverse impacts resulting from the action alternatives that would endure for the period of analysis would diminish the parks' ability to meet this mandate.

Under all action alternatives, adverse impacts on visitor experience may affect visitors to the extent that they do not return. This may be particularly true if access to a specific destination is closed during

deconstruction/construction activities. There is no way of knowing the degree to which this could occur, making the impact unquantifiable.

Alternative 2

As noted in chapter 3, the Delaware River is one focal point of DEWA, and 26% of visitors engage in some type of canoeing, kayaking, or tubing on the river as part of their visit. Nearly 170,000 visitors canoe the river annually. In addition, 16% of visitors engage in fishing. The alternative 2 alignment would follow the existing transmission line, which crosses the river. Visual simulations indicate a substantial change to views for river users, resulting from higher structures and additional, thicker conductors. Because paddling, floating, and fishing the river is popular, many visitors would be affected. Boaters would pass below the transmission line quickly, but the line would be seen in the distance for some time during the approach, detracting from the naturalness of the setting (see "Common to All Action Alternatives" above). This would be particularly true for paddlers, whose approach is slower than motorboats. Corona noise, which is not heard from the existing line, would be heard during bad weather days as described in chapter 3 of the "Soundscapes" section. Motorboating is allowed on the river, but speeds are limited to 10 mph, helping to keep noise minimal and retain a sense of naturalness. Anglers fishing from the shore may avoid the transmission line crossing, but several other shoreline fishing options exist. For these reasons, overall visitor satisfaction would begin to decline, because visitors would be aware of the change and the duration of the impact would be prolonged. However, visitors may still recreate in this manner along the river, but may choose to recreate in different areas.

Construction vehicles would use River Road to access work sites. River Road could also be used if detours were needed during construction, increasing congestion. Bushkill, a small town just outside NPS boundaries that provides access to DEWA, is also the location of the Bushkill Substation, where alternatives 2, 2b, 3, and 4 would connect before changing direction. Visual simulations show a considerable visual change at Bushkill under alternative 2. The towers would be much more visible due to a substantial height increase and three rows of conductors. Although Bushkill is a commercial area, the sight of the large structures may diminish visitors' initial impressions of DEWA before turning onto River Road or continuing along US Route 209 into the park. Many visitors would be affected by the visual change, which would be continuous and may change some critical characteristics of the desired visitor experience. During bad weather events, corona noise would increase while approaching and traveling under the line, as described earlier. Motorists would not likely notice the noise, but pedestrians would. Although adverse impacts on visitor experience would occur, visitor use of this area is not likely to change because the location is a main entrance to DEWA.

Expanding the ROW and building new and/or clearing existing access roads would adversely affect scenic motoring and cycling on Old Mine Road near mile marker 11, where the existing transmission line currently creates an abrupt opening in the vegetation canopy. This opening would be larger under alternative 2 due to the expanded ROW. The historical integrity of this section of the road would be additionally diminished, which would further affect the experience for visitors focused on historical landscapes. Impacts on cyclists, who would pass through the opening more slowly than motorists, would be greater. During unfavorable weather conditions, cyclists would also experience a 7 to 8 dBA increase in noise levels to 44 dBA as a result of corona noise as they pass directly under the centerline, which motorists would not likely hear. Within 150 feet of the centerline, this noise would decrease to 40 dBA, which is barely perceptible to the human ear (see the "Soundscapes" section for more information). During unfavorable weather conditions, adverse noise impacts on cyclists, who would represent few DEWA visitors, would be slight and detectable but intermittent. The impact on visitor use and experience would be limited. Overall visitor satisfaction would remain constant, and visitors would continue to recreate in this manner. Motorists would either be unaware of the impacts or would experience them as slight but detectable. The experience would be fleeting, lasting only a few seconds.

Visitors hiking or mountain biking the McDade Trail would experience a wider canopy opening where alternative 2 would cross the trail. Currently the canopy opening is difficult to distinguish standing on the trail below. Removing the existing B-K Line and constructing the new one would create an abrupt canopy opening where one barely exists. The existing B-K Line is visible when approaching it from the south, but the structures only slightly clear the treetops. Visual simulations show a substantial change resulting from taller structures, which would be much more visible and would raise the conductors above the treetops, where they would also be clearly visible. Upon approaching the corridor, visitors would experience a 3 to 4 dBA increase in corona noise — a barely perceptible impact — within 150 feet of the centerline during unfavorable weather conditions compared to existing ambient sound levels. Corona noise would increase another 4 dBA (a 7 to 8 dBA total increase compared to existing ambient sound levels) as they pass directly under the centerline. These adverse impacts would be greater on hikers, who would pass more slowly under the transmission line than cyclists. Because the structures would be visible on the approach to the crossing, the duration of the visual impact would be more prolonged than if only visible at the crossing. However, the linear nature of the trail means that visitors may experience impacts on views as they approach the transmission line from a distance, as described under "Common to All Action Alternatives." The presence of access roads would also increase noise and visual impacts compared to existing conditions. However, because these effects would occur primarily during unfavorable weather conditions and the numbers of hikers and cyclists would decrease at those times, the effect on visitor use and experience would be limited and visitors would likely continue using this trail.

Visitors who use Community Drive in the area near McDade Trail would also be affected where the transmission line would cross the road. The towers would be taller and the line would be more visible, particularly where the corridor would be cleared and widened.

The S-R Line corridor would not be visible or audible from Bushkill Access. Visitors would experience noise from the nearby road and from boat launching activities, particularly motorboats. Visitors who come to the area during winter to watch bald eagles would not be affected by any visual intrusion, even during the leaf-off season. No impacts are expected on visitors using this recreation site.

Widening the ROW and adding new or clearing existing access roads would affect Watergate Recreation Site, where the existing B-K Line abuts the southern boundary of the area and can be clearly seen from many vantage points in the site. Trees that currently partially screen views of the corridor and structures would be removed. The corridor would be more visible along hills to the east and west. If the existing large lattice towers were replaced with single tubular structures, visual quality may improve, because the existing towers currently occupy sizable amounts of space. However, the new towers would be substantially taller and would rise above the treetops, which would be more obvious from various vantage points at this site. Noise from the transmission line would be audible by an increase of 3 to 4 dBA within 150 feet of the lines during unfavorable weather conditions. The trail to the Upper Glen parking lot starts below the existing transmission line. Due to the obvious presence of the transmission line at the trailhead, some visitors may choose not to hike this trail, particularly those who believe there are health risks associated with exposure to transmission lines (see the "Human Health and Safety" section for a discussion of this issue). Visitors who hike this trail from Watergate Recreation Site to the Upper Glen would experience a 7 to 8 dBA noise increase directly under the transmission centerline during unfavorable weather conditions. Visitors hiking this trail from the Upper Glen parking lot to the south would experience an abrupt canopy opening after walking past the natural setting created by a creek and wooded area. Visual impacts would also be permanent for visitors to the Upper Glen trail, potentially changing some critical characteristics of the desired visitor experience. Visitors would be aware of the change, which may affect their decisions to recreate there.

The S-R Line would not be visible or audible from the trail that is used to access the Van Campen Glen Picnic Site. However, due to its proximity to the Watergate Recreation Site, Van Campen Glen may

experience additional use, and potentially crowding, if visitors relocate to a nearby area less affected by the presence of the transmission line. In addition, visitors hiking from Van Campen Glen to the Watergate Recreation Site would be adversely affected by the wider, abrupt canopy opening after following the heavily wooded trail. The intensity of these impacts would vary depending on the time of year and week (e.g., peak vs. nonpeak visitation, leaf-on vs. leaf-off). Van Campen Glen would be adversely affected by construction in the area and visitors may avoid Van Campen Glen during that time. Adverse impacts would vary during construction depending on the season, the day of the week, the location, the extent of construction closure, and the sensitivity of visitors.

Visitors hiking the Hamilton and Pioneer trails currently experience an abrupt opening in the canopy where the B-K Line crosses the trail. The opening currently creates a bright, sunny break in an otherwise shaded and tree-lined walk, and the cleared corridors can be seen east and west. The corridors would be even more visible if the ROW is widened. Widening the ROW and adding new or clearing existing access roads would increase the effect of this irregularity. Large lattice towers are currently close to both trails. Replacing these towers with single tubular structures may improve visual quality, because the existing towers currently occupy sizable amounts of space. The new towers would be substantially taller, which would make those in the middleground and background more obvious. As noted in “Methodologies” in this section, human activities in middleground landscapes can create a more noticeable contrast. During unfavorable weather conditions, corona noise would increase by 3 to 4 dBA to 40 dBA within 150 feet of the lines, increasing again to 44 dBA directly under the transmission centerline. Compared to existing conditions, impacts would be detectable but would not appreciably change the experience for visitors. Visitors would likely continue to use these trails although adverse impacts would occur.

The wider ROW and new access road would affect the Hamilton River campsites by intruding into the wooded camping area. The wider ROW and road would also more clearly indicate the presence of the transmission line compared to existing conditions and would detract from the natural camping experience for overnight boaters who use this site. This would be particularly true during unfavorable weather conditions, when noise from the line would be detectable 150 feet from the centerline, although 40 dBA is barely perceptible to the human ear. This would also be true when the access roads are in use by the applicants. Views across the river from the campsite would change as a result of the wider ROW and taller structures. The intrusion of the line into the campsite may influence boaters to bypass this campsite in favor of one in a more natural setting. In addition, several Hamilton River campsites would have to be permanently closed because of expansion of the transmission line. This would reduce the number of available campsites along the river and impact a very popular camping location. Visitors would have to use other locations. The change would be persistent at this location, and visitors would be aware of the change.

Visitors using the Rivers Bend campground would be affected where the alternative 2 alignment would be visible. A view from an overlook through the trees at the southern end of the campground that provides views of the Walpack Bend region and downstream would also include the ROW. Visitors who do not visit this overlook would not be affected.

The existing B-K Line is minimally visible from Millbrook Village, although it can be seen from the parking lot and the entrance to the village near the Wagon Wheel shop. Visual simulations show that the higher towers would raise the conductors, making them visible to the south against the sky and background vegetation. No noise would be heard from the conductors, which would be more than 0.5 mile away. Visitors would hear noise from nearby roads and other people, particularly during NPS-sponsored historical events. Visiting historic sites is a popular visitor activity at DEWA, and the presence of the conductors would detract from the historical setting of the village. The level of adverse impacts would depend on visitor sensitivity level. The presence of a modern structure in a historical setting would

noticeably alter visitor enjoyment, and thus their experience, of the area. However, the change to visitor experience at this location would not likely affect the use of this area.

Where the alternative 2 alignment would cross APPA, hikers would experience adverse effects from taller towers, more conductors, a wider ROW, and new or cleared existing access roads. The expanded ROW would clear an additional 50 to 200 feet beyond existing conditions. As shown in the visual simulation in the "Visual Resources" section in chapter 3, replacing the large lattice towers with single tubular structures would improve visual quality at this location to a slight degree, because the existing towers currently occupy sizable amounts of space. The absence of the large lattice towers would also improve views by removing foreground visual clutter at this location. However, the simulation provides a snapshot in time from one specific viewpoint. As noted in "Methodologies" in this section, people are more visually sensitive to landscapes seen close up. The increased height of the new towers would adversely affect visitors as they approach the transmission line during their hike, as described under "Common to All Action Alternatives." The wider ROW, taller towers, and more noticeable conductors would result in an adverse effect on hikers approaching the transmission line. Overall, there would be a slight benefit to visitor experience at the specific simulation viewpoint due to increased visibility, but these impacts would be offset by the adverse impacts in other locations along the trail approaching the alternative 2 alignment. During unfavorable weather conditions, noise from the conductors under alternative 2 would be barely audible within 150 feet of the lines, increasing again to 44 dBA directly under the transmission centerline. Visitor use of the trail would not change.

Human activity during deconstruction and construction near recreation sites would adversely affect visitors' experience and possibly affect the use of certain areas, as described in the "Common to All Action Alternatives" section. Under alternative 2, construction impacts would be most apparent along NPS 602 (Millbrook-Blairstown Road) and Old Mine Road in New Jersey. Affected sites potentially include Van Campen Glen, Upper Glen, Hamilton and Pioneer trails, the Watergate Recreation Site, and Millbrook Village. Deconstruction and construction activities would be coordinated with NPS events at Millbrook Village to avoid access issues to the extent practical. Impacts would also depend on the extent to which deconstruction and construction activities could be seen or heard, as well as the location of spur roads. As described in the "Soundscapes" section, sound levels could increase by more than 13 dBA in areas as far as 3,200 feet from the activity, resulting in an adverse impact during most of the daytime hours when deconstruction and construction activities would take place. Such an impact, particularly during peak season for visitors, would adversely affect visitor experience, and may cause visitors to use different recreational sites. However, many visitors are attracted to specific recreational locations in DEWA and regularly return to those locations rather than visiting other park areas. Such visitors may choose to avoid the park altogether during deconstruction and construction activities if their favorite site is affected, noticeably altering visitor use and experience. Mitigation measures to avoid peak visitor use periods and notify visitors of construction activities and closures would help minimize these impacts.

Impacts related to the maintenance of the transmission line would be similar to alternative 1. However, access roads would be cleared, compacted, and possibly widened under alternative 2, resulting in a slight change from existing conditions.

Cumulative Impacts

Cumulative impacts on visitor use and experience inside the study area would be adverse, as described previously in the "Cumulative Impacts Common to All Alternatives" section. When the adverse impacts on visitor use and experience as a result of alternative 2 are combined with other past, present, and reasonably foreseeable projects in the study area, an overall adverse cumulative impact would be expected. Alternative 2 would contribute an appreciable adverse increment to the overall cumulative impact.

Conclusion

In the study area, alternative 2 would result in impacts to visitor use and experience, with the most intense impacts at Watergate Recreation Site. Visitors would experience overall adverse impacts where the transmission line crosses APPA, although some benefits would be expected from the removal of visual clutter. Impacts related to deconstruction and construction would be localized, particularly related to noise; however, visitors would experience negative effects from construction noise. Ongoing maintenance activities would be of limited duration and in specific locations. Cumulative impacts inside the study area would be adverse. The reduction of resources in the region surrounding the parks would increase their scarcity and sensitivity inside the parks, where they are afforded special protections.

Alternative 2 would cross in the center part of DEWA, including the MDSR. In general, this area is one of the most undeveloped areas of the park, containing large swaths of contiguous mature forest, few manmade intrusions, unique geological formations, a globally significant rare plant community, and abundant opportunities for solitude. This part of the park is a particularly sensitive area because it contains high concentrations of many important and unique natural features. These characteristics attract visitors and it consequently plays host to a large proportion of DEWA users. It also crosses close to a unique river feature, the Walpack Bend, which is a premier visitor attraction in DEWA. The location of the crossing in DEWA makes it visible from distant high points like APPA. For APPA, the alternative would transit through what is now a very natural and relatively unspoiled viewshed provided by these undeveloped lands below it.

Alternative 2 would result in considerable, and in some cases, severe adverse impacts on visitor experience. Installation of new taller towers would introduce a noticeable visual intrusion that would diminish scenic quality. The presence of large and obtrusive infrastructure in a relatively undeveloped zone would be a distraction and detract from the experience visitors seek when coming to the parks. The visual change would affect a relatively large area, a large number of users, and would exist for the life of the project. It would degrade the regionally unique and unusual wilderness-like viewshed for APPA that DEWA and MDSR provide. This, in turn, would have adverse impacts on the MDSR through degradation of the scenic values for which the river was designated. Construction activities would result in temporary closures of trails, roads, and the MDSR, and permanent closures of river campsites, which would interrupt and limit visitor’s access and experience in the park and compound safety management challenged during the busy season. Impacts related to construction activities would be of short duration but one-time visitors who were impacted by river closures or construction noise may have their experience of the MDSR forever diminished.

The Organic Act and the parks’ enabling legislations mandate that these resources are protected in perpetuity. DEWA and APPA were created for their unique scenic characteristics and offerings which are specifically identified in the legislation that created the parks. The parks offer solitary experiences, isolated from human encroachment. Impacts are more acute because the parks provide uninterrupted naturalness in a developed region. Public attention surrounding this project is high. There is likely to be a high degree of controversy over any effects on park resources that are particularly popular with the public, such as scenery, visitor use and experience, rare and unique communities, cultural landscapes, and historic structures, for any of the alternatives. The inherent uncertain nature of predicting the true degree of some of these impacts would likely heighten this controversy. Additionally, construction at this particular location in DEWA is likely to accentuate the controversy due to the unique characteristics presented here and high visitor traffic to the area.

Permitting the project would adversely affect multiple protected resources inside the parks, in some instances irreversibly. This could establish precedent that may invite similar proposals by other applicants in the future, and create an expectation of like treatment for those proposals; it may make it difficult to

deny such proposals. DEWA and APPA both contain numerous other utility crossings, which makes the risk of such precedent particularly concerning for these parks. Furthermore, as units of the national park system, wherein all parks are entitled to equal protection, creating such a precedent could have ramifications for parks nationwide. The location of this particular crossing through the center of DEWA could make such a precedent even more potent. Installing the S-R Line on this alignment may invite future utilities proposing to follow the same route. The applicant's project is one component of a larger regional plan by the RTO to enhance system reliability. Other component projects of this plan have already affected, and would continue to affect APPA, especially in the areas of scenic resources and visitor use and experience, as well as other national parks in their paths.

Overall, the significance of the impact of alternative 2 is a result of two considerations: the particularly resource-rich area through which the alternative crosses and the potential to inflict harm to those resources because of the magnitude and duration of the adverse impacts. Although it is true that not all impacts can be predicted with great certainty, in the context of the purpose and significance for which DEWA, APPA, and MDSR were established and NPS mandates to specifically preserve the natural, cultural, and scenic resources within them, additional precautions are warranted when considering risks to these resources, many of which are of national importance. Similarly, certain resources are non-renewable, which makes any impacts to them all the more serious because they cannot be replaced if lost. And some resources are under threat by other actions and outside pressure, which in the context of the function of the parks as an "oasis" or refuge within the highly developed east coast, elevates the need to preserve and protect these scarce, sensitive resources. For these reasons, the environmental consequences of alternative 2 would be significant.

Considering the intensity of the impacts discussed above in the context of the purposes for which the three national park units were established and the high expectations of visitors as to the type of experience they should have in these places, the NPS believes that alternative 2 would result in significant adverse impacts on visitor use and experience because of the intrusion of the taller towers into the natural environment and loss of other resources which would appreciably diminish key aspects of the parks that visitors come to enjoy.

Alternative 2b

The alternative 2b alignment would follow the same route as alternative 2, and all towers would be the same height, although two additional towers would be required. The width of the ROW would not change from existing conditions. Although no visual impacts would result from a wider ROW, adverse impacts on visitor use and experience would be similar to those described for alternative 2 due to increased tower height and thicker conductors. Adverse impacts related to noise would also be similar to alternative 2, as described in the "Soundscapes" section.

Adverse impacts on DEWA would be similar to alternative 2. Impacts on APPA would also be similar to alternative 2 due to the taller towers and more noticeable conductors, even though the ROW width would be narrower in some sections, specifically at McDade Trail and Community Drive in Pennsylvania, more than 2 miles from APPA. Ongoing maintenance activities would be of limited duration and in specific locations. Adverse impacts would result from construction and ongoing maintenance activities.

Cumulative Impacts

Cumulative impacts on visitor use and experience inside the study area would be adverse, as described previously in the "Cumulative Impacts Common to All Alternatives" section. When the adverse impacts on visitor use and experience as a result of alternative 2b are combined with other past, present, and reasonably foreseeable projects in the study area, an overall adverse cumulative impact would be

expected. Alternative 2b would contribute an appreciable adverse increment to the overall cumulative impact.

Conclusion

Inside the study area, alternative 2b would result in similar impacts to alternative 2. Impacts on APPA would also be similar to those under alternative 2 even though the ROW width would be narrower in some sections, specifically at McDade Trail and Community Drive in Pennsylvania, more than 2 miles from APPA. Adverse impacts to visitor use and experience would result from construction and ongoing maintenance activities. Overall cumulative impacts inside the study area would be adverse.

Alternative 2b would cross DEWA in one of the most undeveloped areas of the park, which contains high concentrations of many important and unique natural features. The features of this area draw visitors and play host to a large proportion of DEWA users. Alternative 2b would also cross close to a unique river feature, the Walpack Bend, which is a premier visitor attraction in DEWA. The location of the crossing in DEWA would make it visible from distant high points like APPA. For APPA, the alternative would transit through what is now a very natural and relatively unspoiled viewshed provided by these undeveloped lands below it.

Alternative 2b would result in considerable, and in some cases, severe adverse impacts on visitor experience. During construction, visitors would experience negative effects from construction noise, temporary closures of trails, roads, and the MDSR, and permanent closures of river campsites, which would interrupt and limit visitor access and experience in the park and compound safety management challenges during the busy season. Impacts related to construction activities would be of short duration but one-time visitors who were impacted by river closures or construction noise may have their experience of the MDSR forever diminished. The new taller towers would be a distraction and would detract from the experience visitors seek at the parks. The visual change would affect a relatively large area, a large number of users, and would exist for the life of the project. It would degrade the regionally unique and unusual wilderness-like viewshed for APPA that DEWA and MDSR provide. However, the adverse impacts of alternative 2b may be somewhat less severe than alternative 2 because the ROW width would be narrower in at McDade Trail and Community Drive in Pennsylvania. Maintaining a narrower ROW width may help to mask some of the intrusiveness of the taller towers from some vantage points but does not substantially reduce the severity of the adverse impacts to visitor use and experience.

The impacts of any of the action alternatives have potential to be significant because of the high public attention surrounding this project. The natural, cultural, scenic, and recreational resources of DEWA and APPA are held in public trust and visitors come to the parks to experience these resources. Allowing impacts to these resources is contrary to typical NPS practice of improving scenic conditions by removing non-conforming features and may establish precedent for future actions. The applicant's project is one component of a larger regional plan by the RTO to enhance system reliability. Other component projects of this plan have already affected, and would continue to affect APPA, especially in the areas of scenic resources and visitor use and experience, as well as other national parks in their paths.

Overall, the significance of the impact of alternative 2b is a result of two considerations: the particularly resource-rich area through which the alternative crosses and the potential to inflict harm to those resources because of the magnitude and duration of the adverse impacts. Although it is true that not all impacts can be predicted with great certainty, in the context of the purpose and significance for which DEWA, APPA, and MDSR were established and NPS mandates to specifically preserve the natural, cultural, and scenic resources within them, additional precautions are warranted when considering risks to these resources, many of which are of national importance. Similarly, certain resources are non-renewable, which makes any impacts to them all the more serious because they cannot be replaced if lost. And some resources are under

threat by other actions and outside pressure, which in the context of the function of the parks as an "oasis" or refuge within the highly developed east coast, elevates the need to preserve and protect these scarce, sensitive resources. For these reasons, the environmental consequences of alternative 2b would be significant.

Considering the intensity of the impacts discussed above in the context of the purposes for which the three national park units were established and the high expectations of visitors as to the type of experience they should have in these places, the NPS believes that alternative 2b would result in significant adverse impacts on visitor use and experience because of the intrusion of the taller towers into the natural environment and loss of other resources which would appreciably diminish key aspects of the parks that visitors come to enjoy. Public attention surrounding this project is high. There is likely to be a high degree of controversy over any effects on park resources that are particularly popular with the public, such as scenery, visitor use and experience, rare and unique communities, cultural landscapes, and historic structures, for any of the alternatives. The inherent uncertain nature of predicting the true degree of some of these impacts would likely heighten this controversy. Additionally, construction at this particular location in DEWA is likely to accentuate the controversy due to the unique characteristics presented here and high visitor traffic to the area.

Alternative 3

Visual simulations indicate a substantial change to views for river users where alternative 3 would cross the Delaware River resulting from taller structures and additional, thicker conductors, as well as the second set of structures. Because paddling, floating, and fishing the river is so popular, many visitors would be affected (see "Common to All Action Alternatives," above). Views of the riverbank on the New Jersey side would change dramatically due to the 90-degree bend to the northeast that would be included at that location. That bend and the continuation of the existing transmission line beyond it currently cannot be seen, but the corridor and structures (for the S-R Line and the replaced transmission/distribution line) would be clearly visible under alternative 3. As with alternative 2, the line would also be seen in the distance by boaters for some time during the approach, detracting from the naturalness of the setting. Corona noise would be heard during bad weather days as described earlier. This noise is not currently heard from the existing line. For these reasons, overall visitor satisfaction may begin to decline because visitors would be aware of the change, and the duration of the impact would be persistent. However, people would continue to recreate in this manner. Anglers fishing from shore may avoid the transmission line crossing, but other opportunities exist throughout the parks. Overall, adverse impacts to visitor use and experience would occur.

The existing transmission line that the alternative 3 alignment would follow cannot currently be seen from Turtle Beach. Visual simulations of the proposed line show a barely perceptible change in the distance. Visitors would be unaware of the change. Similarly, the alternative 3 alignment would not be visible from Poxono Access or Ricks Rocks. No impacts are expected at these locations.

The alternative 3 alignment would cross River Road just north of Hialeah Picnic Site. Visual simulations show the impact of a wider ROW and taller structures along the hillside to the west. Motorists driving on River Road may not notice the change to the hillside as much as passengers would, because motorists typically focus on the road while driving. Minimal changes are expected where the lines would cross the road.

The existing ROW traverses Worthington State Forest in DEWA and, like alternative 2, would be widened an additional 50 to 100 feet. Alternative 3 would cross Old Mine Road in Worthington State Forest with similar impacts on motorists and cyclists as described for alternative 2. Visual simulations show substantial changes due to widening the ROW and erecting taller structures. Upon crossing the road,

the alignment would take an almost 90-degree bend to the northeast, which currently is not visible to motorists and cyclists approaching from the south. The wider ROW under alternative 3 would make this bend visible, exposing the wider corridor and taller structures that would continue up a hill beyond it, changing the visitor experience. This increased exposure due to the wider ROW would also make the towers on the hillside, which currently cannot be seen, visible. Noise impacts during unfavorable weather conditions would be similar to those experienced under alternative 2. As described for alternative 2, cyclists would be more affected by the visual and auditory impact than motorists. The duration of the impact would be fleeting for motorists, and more prolonged, but still intermittent, for cyclists. However, visitors would continue to recreate in this manner.

Soon after visitors begin hiking or mountain biking north of the McDade trailhead from the Hialeah Picnic Site, the existing transmission line that the alternative 3 alignment would follow becomes barely visible on the hillside to the west. Visual simulations of the Hialeah Picnic exit road, which is close to McDade Trail in this area, show a substantial change resulting from the wider ROW and taller structures, which would be clearly visible across an open crop field as the line crosses the hillside. These impacts represent a new visual intrusion visible from the trail. Because the structures would be visible until visitors reach a wooded area, the duration of the visual impact would be more prolonged than if only visible at the crossing. Similarly, the linear nature of the trail means that visitors may experience adverse impacts on views as they approach the transmission line from a distance, as described under “Common to All Action Alternatives.”

Currently, farther along McDade Trail, the existing canopy clearing is obvious, creating a bright, sunny opening in a heavily wooded area. The opening provides views of the river, which cannot otherwise be seen after starting from the trailhead at Hialeah Picnic Site. A wider ROW would enlarge this clearing and provide more expansive views. Visual simulations show that the view across the river would change considerably because the 90-degree bend that the route would take just east of Old Mine Road would become clearly visible. Visitors looking across the river from this opening would see structures for both the S-R Line and the replaced transmission/distribution line.

Noise impacts at this location would be similar to those experienced under alternative 2. These impacts would occur in unfavorable weather conditions and would be greater on hikers, who would pass more slowly under the transmission line, than cyclists. The presence of access roads would also increase noise and visual impacts compared to existing conditions, thereby adversely affecting visitor experience, although visitors would continue to recreate in this manner, they may choose to use other sections of the McDade Trail to avoid the adverse impacts from the transmission line and access roads.

In addition to the impacts from paddling or floating the river described below, river users camping at campsite #106, which is adjacent to McDade Trail and the river (although open only to river users), would likely experience adverse impacts from alternative 3 at the campsite. These impacts would be similar to those shown in visual simulations for campsites at the Walters Tract river campsites. Again, the 90-degree bend in the transmission line on the east side of the river would create a more pronounced impact because the corridor and structures would be more visible compared to existing conditions. However, the impact would only be visible to the north from the edge of the river. Upon reaching the campsite, the transmission line would be behind (upstream of) boaters. In the campsite, vegetation surrounding the site would block views of the line, which would also be too distant to be audible. The visual impact would be intermittent from this site, and would not appreciably limit the visitor experience. Visitors would continue to use this campsite. Impacts at the Hialeah Island campsites would be similar because alternative 3 would be upstream from the campsites, primarily visible from the edge of the river.

Although McDade Trail originates at the Hialeah Picnic Site, the existing transmission line that the alternative 3 alignment would follow cannot be seen due to distance and substantial vegetation that blocks

views. Therefore, no impacts are expected on visitors using this picnic area. As visitors leave the picnic area, the transmission line would be visible to the north, as described earlier for McDade Trail. Drivers would not likely see the new transmission line, as it would be out of their line of sight. But passengers looking to the north would see it for a short time. Therefore, only some visitors would be affected, and the effect would be slight but adverse.

Similar impacts would be expected at Hialeah Air Park just north of Smithfield Beach. Although the alternative 3 alignment would be farther south, visual simulations show a dramatic change at the air park. The experience of some visitors flying model planes or watching the activity would be adversely affected. The visual change would be persistent, although the transmission lines would not be audible from this location. Visitors would continue to recreate in this manner. Impact intensity would vary depending on visitor sensitivity to and awareness of the visual change.

The alignment for alternative 3 would be visible from vantage points along APPA. Where the alternative would cross the trail, two sets of structures would be visible. The corridor would be more visible in the distance compared to existing conditions due to the wider ROW and taller structures of the S-R Line, as well as the presence of two parallel lines. Impacts would vary based on viewer sensitivity. Visitors would likely be adversely affected by the visual change in the distance, and scenic values increase with longer views. Changes in visitor experience would be detectable but would not appreciably limit the experience.

At the future APPA relocation site in DEWA, the existing transmission line in the alternative 3 alignment cannot currently be seen. Visual simulations show that a taller tower and conductors would be clearly visible in the distance, creating a new visual intrusion where one had not previously existed, thereby changing the desired visitor experience. However, visitor use of the trail would continue.

Raccoon Ridge is a vantage point along APPA just north of the transmission line crossing. The towers and conductors would be clearly visible where none exist under current conditions. The change would represent a large, human-made intrusion into a predominantly natural viewscape, noticeably altering the experience for most, if not all, APPA hikers.

Farther north, the alternative 3 alignment would closely parallel APPA for approximately 2.5 miles on the east side of DEWA. APPA follows a high ridgeline in this area, and the existing transmission line that the alternative 3 alignment would follow is below the ridge but visible from the trail. This transmission line would be placed parallel the new S-R Line, remaining visible in conjunction with the S-R Line under alternative 3. Many locations along the trail provide wide openings from which the existing transmission line can be seen for several miles to the north and south. Visual simulations show a dramatic and substantial change resulting from the wider ROW, taller structures, and dual sets of structures. The taller towers would raise the conductors considerably higher, making them far more visible compared to existing conditions. Trail hikers would be exposed to this change for the duration of their journey through the area. The change would noticeably alter the visitor experience, and hikers, particularly long-distance hikers, would be highly aware of and sensitive to the change. Overall visitor satisfaction along this area of the trail would likely markedly decline. However, visitor use of the trail would not change. The result would be an adverse impact on visitor experience.

Human activity during deconstruction and construction in proximity to recreation areas would adversely affect the visitor experience and possibly affect the use of certain areas, as described in the “Common to All Action Alternatives” section. Impacts would also depend on the extent to which deconstruction and construction activities could be seen or heard, as well as the location of spur roads. Deconstruction and construction impacts would be of longer duration under alternative 3 because the B-K Line would be removed, the existing structures along the alternative 3 alignment would be removed prior to construction of the S-R Line, and the existing line would be replaced. Therefore, alternative 3 would require two

deconstruction activities (the B-K Line and the existing alternative 3 line) and two separate construction activities (the S-R Line and the replacement of the existing alternative 3 line). These activities would affect large sections of the study area, and would be most apparent where the line would cross McDade Trail. As described for alternative 2, sound levels could increase by more than 13 dBA in areas as far as 3,200 feet from construction activity. Visitors using McDade Trail may not become aware of the adverse impact until they reach the crossing. It is therefore unlikely that visitors would avoid hiking or mountain biking the trail. Impacts on the visitor experience of these trail users would result where the transmission line would cross McDade Trail. During construction the affected portions of the McDade Trail would be closed to visitors. Mitigation measures to avoid peak visitor use periods and notify visitors of construction activities and closures would help minimize these impacts.

Impacts related to the maintenance of the transmission line would be similar to those under alternative 2, although more access roads would be created under alternative 3. In addition, two lines would need to be maintained under alternative 3. The presence and use of new permanent access roads may adversely affect visitors, but the effect would be slight, localized, and intermittent. Visitor use and experience would not measurably change.

Cumulative Impacts

Inside the study area, the adverse impacts resulting from alternative 3 were evaluated in the context of other projects in the region mentioned in the "Cumulative Impacts Common to All Alternatives" section. Similar to alternative 2, the primarily beneficial impacts expected in the study area would not be sufficient to offset the impacts expected in DEWA from other actions, such as possible increased crowding. These impacts would be combined with the mostly visual impacts resulting from a wider ROW, taller structures, and dual sets of structures under alternative 3, which would be adverse in DEWA. The resulting adverse cumulative impacts in DEWA would be adverse.

Cumulative impacts on visitor use and experience inside the study area from other past, present, and reasonably foreseeable projects would be adverse, as described previously in the "Cumulative Impacts Common to All Alternatives" section. When the adverse impacts on visitor use and experience as a result of alternative 3 are combined with the other projects in the study area, an overall adverse cumulative impact would be expected. Alternative 3 would contribute an appreciable adverse increment to the overall cumulative impact.

Conclusion

Inside the study area, the 90-degree bend the line would take at Old Mine Road would affect views from several vantage points, affecting many visitors. The alternative 3 alignment would also create new visual intrusions at Raccoon Ridge along APPA, and would be seen from other vantage points along the trail. Most of the adverse impacts on APPA would occur where the alternative 3 alignment would parallel the trail for approximately 2.5 miles. Two sets of structures would be constructed in the expanded ROW, increasing the visual impact. Construction-related adverse impacts would occur from impacts on soundscapes based on location. Multiple deconstruction/construction activities would occur. Maintenance impacts would be the same as alternative 2. Overall cumulative impacts inside the study area would be adverse.

Alternative 3 is likely to have more severe adverse impacts than the other action alternatives because the configuration of the line increases the number of vantage points affected and creates new visual intrusions in areas that do not currently have such intrusions. Alternative 3 would cross public lands administered by state and federal entities, providing a diversified visitor experience and many recreational opportunities. DEWA, MDSR, APPA, and Worthington State Forest are refuges from the densely populated East Coast

as the centerpieces for some of the largest continuous protected lands on the East Coast within a day's drive for millions of people. The unique topography and geology of Kittatinny Ridge, Delaware River Riparian Corridor, and the mature undisturbed Eastern Hemlock forests are the cornerstones of the geography in this region, providing a unique scenic setting through which alternative 3 would cross. The cultural landscape and National Register eligible APPA was designated to provide a wilderness-like experience and an opportunity for escape and solitude. Likewise the MDSR, designated under the Wild and Scenic Rivers Act, and the Delaware River Water Trail offer a parallel experience of solitude along the Delaware River.

The construction of an additional line with taller towers would adversely impact the scenic nature of APPA, DEWA, and MDSR which is counter to their enabling legislation and mandates to protect scenery. The route that alternative 3 follows bisects and parallels both the MDSR and the Kittatinny Ridge, which APPA traverses, with a significant change in visibility as a result of the ROW expansion, taller towers, and additional lines compared to the existing condition. Because of the route up the Kittatinny Ridge, the visibility of the tall towers would be greatly increased along the MDSR, and would be visible from the McDade Trail and popular recreational sites like Smithfield Beach and Hialeah Air Park, and the scenic drives and cultural landscapes of Old Mine Road in New Jersey and River Road in Pennsylvania. The visual impacts from alternative 3 would be experienced by a large number of visitors due to the concentration of recreational facilities within sight of the transmission line corridor.

Construction impacts such as noise and temporary closures of trails, roads, and the MDSR would be of relatively short duration. However, these temporary closures would affect a large number of visitors, making traversing the park difficult and denying access to a heavily used area of the MDSR and popular visitor use sites, such as Smithfield Beach. The adverse impacts of alternative 3 on visitor use and experience could be offset by the beneficial impacts of removing the existing B-K Line and restoring the natural habitat at the heart of DEWA and MDSR and reducing the number of crossing of APPA. The restoration would also have beneficial impacts to the recreational sites, roads, and trails within DEWA, the MDSR, and APPA. However, overall the beneficial impacts of the removal of the existing line do not outweigh the severe negative impacts of visual intrusion of the expanded line paralleling the MDSR and APPA.

It is unknown how the addition of another transmission line would impact visitor use patterns in DEWA, APPA, and MDSR. Visitors would likely continue to use these parks however they may choose to recreate in other areas away from the transmission lines. This could negatively impact the visitation to the parks as a whole or put increased pressure and resource impacts on other areas of the parks.

The impacts of any of the action alternatives have potential to be significant because of the high public attention surrounding this project. The natural, cultural, scenic, and recreational resources of DEWA and APPA are held in public trust and visitors come to the parks to experience these resources. Allowing impacts to these resources is contrary to typical NPS practice of improving scenic conditions by removing non-conforming features and may establish precedent for future actions. The applicant's project is one component of a larger regional plan by the RTO to enhance system reliability. Other component projects of this plan have already affected, and would continue to affect APPA, especially in the areas of scenic resources and visitor use and experience, as well as other national parks in their paths.

Public attention surrounding this project is high. There is likely to be a high degree of controversy over any effects on park resources that are particularly popular with the public, such as scenery, visitor use and experience, rare and unique communities, cultural landscapes, and historic structures, for any of the alternatives. The inherent uncertain nature of predicting the true degree of some of these impacts would likely heighten this controversy.

In considering the intensity of the impacts in the context of the purposes for which the three park units were established and the high expectations of visitors as to the type of experience they should have in these places, alternative 3 would likely result in significant adverse impacts on visitor use and experience. The severity of these impacts is likely to be greater than the other action alternatives because alternative 3 would result in a greater number of intrusions, including new intrusions, and would likely affect a larger number of visitors because of the concentration of popular visitor attractions.

Alternative 4

Because alternative 4 would originate at the Bushkill Substation, impacts on the Bushkill area would be as described for alternative 2.

Resort Point Overlook, Point of Gap Overlook, and Arrow Island Overlook along the Delaware River in the southern end of DEWA would not be affected by the alternative 4 alignment, which would not be visible from these locations. Similarly, neither would the Kittatinny Point Visitor Center. Across the highway, Red Dot (Tammany) Trail climbs 1,250 feet in 1.5 miles, providing views of Mount Minsi and the Delaware Water Gap. Although Mount Minsi would block views of much of the alignment, visual simulations show that the alignment would be clearly visible east of the mountain. Under existing conditions, the current transmission line is barely visible, if at all. Red Dot (Tammany) Trail is a demanding hike; the sweeping views are the reward for a difficult effort. Visitor experience would be diminished by the intrusion of the alternative 4 corridor in the viewshed, and the change would be persistent. Visitors who often hike this trail would notice the change, although overall visitor satisfaction would remain constant and visitors would continue to hike this trail. Therefore, adverse impacts on visitor experience would occur.

Visitors hiking APPA north of the river would not be exposed to views of the alternative 4 alignment. Visitors hiking the trail south of the river would not be affected by alternative 4 until reaching the transmission line crossing. The wider ROW would be a considerable and noticeable change, particularly in views to the northwest. Taller structures would be substantially higher than the existing wood towers, which would be removed and replaced. The change would be clearly detectable, but would not appreciably alter the visitor experience. The use of the trail would not change. Adverse impacts on visitor experience would occur.

Farther south along APPA, Lunch Rocks and Nelson Overlook provide views from high vantage points. At both locations, the existing transmission line that the alternative 4 alignment would follow is barely perceptible. The view from Lunch Rocks would change substantially as the wider ROW would create a far more visible corridor, and the taller towers would be clearly seen from the ridgetop in the middleground. Disruptions to the middleground may create a noticeable contrast and would affect how visually coherent the landscape would appear to visitors. The impact would affect the majority of the viewing area. At Nelson Overlook, the view would be affected primarily by the larger corridor, although it would not fill the entire viewframe. In both cases, the change would represent a new visual intrusion into the viewscape and would create adverse impacts to visitor experience.

The southern section of Karamac Trail is in DEWA adjacent to Worthington State Forest and begins at the traffic light on Old Mine Road. Visitors use the trail to access the river and spend time on the rocks. The existing transmission line that the alternative 4 alignment would follow is on the west side of the Delaware River and cannot currently be seen from the Karamac trailhead. However, it is visible at the terminus of the trail at the river, where hikers spend more time. Under alternative 4, one tower and conductors would be visible across the river. The remainder of the line would be obscured by vegetation. Visitors would either be unaware of the impact, or the impact would be slight and detectable. Few to

some visitors would be affected, but the change would not appreciably limit critical characteristics of the visitor experience. Visitors would continue to use this trail.

Human activity during deconstruction and construction near recreation sites would adversely affect visitor experience and possibly affect the use of certain areas, as described in the "Common to All Action Alternatives" section. Impacts would depend on the extent to which deconstruction and construction activities could be seen or heard, as well as the location of spur roads. Under alternative 4, construction impacts would be most apparent where the line would be close to APPA. The access road would veer east outside the ROW and would cross APPA about 600 feet from the transmission line. This would represent two crossings of the trail under alternative 4. As described for alternative 2, sound levels could increase during construction by more than 13 dBA in areas as far as 3,200 feet from the activity. In addition, more visitors would be adversely affected because there would be two rounds of deconstruction activities and two rounds of construction activities, which may not be conducted simultaneously and would affect visitors in different locations. Visitors hiking APPA may not become aware of the impact until they reach the crossing and access road. Because the access road would be several hundred feet from the transmission line, impacts related to construction and maintenance would be greater. Noise impacts on these trail users would occur where the alternative would cross APPA. Despite these impacts on visitor experience, visitors would continue to use this trail. Mitigation measures to avoid peak visitor use periods and notify visitors of construction activities and closures would help minimize these impacts.

Adverse impacts related to maintenance of the transmission line would be the same as for alternatives 2 and 3.

Cumulative Impacts

Cumulative impacts on visitor use and experience inside the study area would be adverse, as described previously in the "Cumulative Impacts Common to All Alternatives" section. When the adverse impacts on visitor use and experience as a result of alternative 4 are combined with other past, present, and reasonably foreseeable projects in the study area, an overall adverse cumulative impact would be expected. Alternative 4 would contribute an appreciable adverse increment to the minimum overall cumulative impact.

Conclusion

Adverse impacts would occur at the Red Dot (Tammany) Trail and Karamac Trail. However, most of the adverse impacts under alternative 4 in the study area would affect APPA. Two sets of structures would be built in the ROW, increasing the visual impacts. Construction-related impacts and maintenance impacts would be the same as alternative 3. Overall cumulative impacts inside the study area would be adverse.

The adverse impacts of alternative 4 on visitor experience would be less severe than the other action alternatives because there would be fewer areas affected by the intrusion of the power line; however, the impacts of alternative 4 are still likely to be significant. Visitor experience would be diminished by construction noise and activities, including closures of trails and roads, although these would be temporary and of varying intensity depending on distance. Visitor experience would be permanently diminished by the intrusion of the alternative 4 corridor in these viewsheds, especially APPA. The abrupt opening of the cleared ROW and the intrusion of transmission line towers would likely be intense and would diminish the sense of naturalness in areas where visitors specifically go to escape such intrusions, such as the Appalachian Trail and the difficult hike to the Red Dot Trail. Topography and vegetation cover would not screen the visual intrusion on the scenic landscape. The overall experience of the APPA visitor would be degraded because this project would contribute cumulatively to the adverse impacts

caused by infrastructure projects along the entirety of the trail. In both cases, the change would represent a new visual intrusion into the viewscape and would create adverse impacts to visitor experience.

Several important benefits would occur from removing the B-K Line as a part of mitigation for construction of alternative 4. Alternative 4 would move large infrastructure to the margins of DEWA, would remove an existing transmission line ROW and associated infrastructure from the center of DEWA, and would completely remove the river crossing of the MDSR, enhancing the scenic and recreational qualities. The benefits to APPA could outweigh the adverse impacts to DEWA.

Public attention surrounding this project is high. There is likely to be a high degree of controversy over any effects on park resources that are particularly popular with the public, such as scenery, visitor use and experience, rare and unique communities, cultural landscapes, and historic structures, for any of the alternatives. The inherent uncertain nature of predicting the true degree of some of these impacts would likely heighten this controversy. Additionally, the applicant's project is one component of a larger regional plan by the RTO to enhance system reliability. Other component projects of this plan have already affected, and would continue to affect APPA, especially in the areas of scenic resources and visitor use and experience, as well as other national parks in their paths.

Considering the intensity of the impacts discussed above in the context of the purposes for which the three national park units were established and the high expectations of visitors as to the type of experience they should have in these places, the NPS believes that alternative 4 would likely result in significant impacts on visitor use and experience because the proposed transmission line collectively detracts from the overall visitor experience of APPA and results in new intrusions into a natural environment that would appreciably diminish key aspects of the parks that visitors come to experience. Alternative 4 offers the potentially significant benefits of completely removing a utility line crossing of the MDSR plus removing and restoring the existing ROW through an especially sensitive area of DEWA, which could outweigh the negative impacts of this alternative.

Alternative 5

Adverse impacts on visitor use and experience would be the same in the study area as described for alternative 4.

Cumulative Impacts

Cumulative impacts under alternative 5 would be the same as those under alternative 4. Alternative 5 would contribute an appreciable adverse increment to the minimum overall cumulative impact.

Conclusion

Adverse impacts would occur at the Red Dot (Tammany) Trail and Karamac Trail. However, as with alternative 4, most of the adverse impacts under alternative 5 in the study area would affect APPA. Two sets of structures would be built in the ROW, increasing the visual impacts. Construction-related impacts and maintenance impacts would be the same as alternative 3. Overall, cumulative impacts inside the study area would be adverse.

The adverse impacts of alternative 5 on visitor experience would be less severe than the other action alternatives because there would be fewer areas affected by the intrusion of the power line; however, the impacts of alternative 5 are still likely to be significant. Visitor experience would be diminished during construction by noise and temporary closures of trails and roads. Visitor experience would be permanently diminished by the intrusion of the alternative 5 corridor in these viewsheds and the expanded

ROW width. These changes would diminish the sense of naturalness in areas where visitors specifically go to escape such intrusions, such as the Appalachian Trail and the difficult hike to the Red Dot Trail. Topography and vegetation cover would not screen the visual intrusion on the scenic landscape. The overall experience of the APPA visitor would be degraded; this project would contribute cumulatively to the adverse impacts caused by infrastructure projects along the entirety of the trail.

Several important benefits would occur from removing the B-K Line as a part of mitigation for construction of alternative 5. Alternative 5 would move large infrastructure to the margins of DEWA, would remove an existing transmission line ROW and associated infrastructure from the center of DEWA, and would completely remove the river crossing of the MDSR, enhancing the scenic and recreational qualities. The benefits to APPA could outweigh the adverse impacts to DEWA.

Public attention surrounding this project is high. There is likely to be a high degree of controversy over any effects on park resources that are particularly popular with the public, such as scenery, visitor use and experience, rare and unique communities, cultural landscapes, and historic structures, for any of the alternatives. The inherent uncertain nature of predicting the true degree of some of these impacts would likely heighten this controversy. Additionally, the applicant's project is one component of a larger regional plan by the RTO to enhance system reliability. Other component projects of this plan have already affected, and would continue to affect APPA, especially in the areas of scenic resources and visitor use and experience, as well as other national parks in their paths.

Considering the intensity of the impacts discussed above in the context of the purposes for which the three national park units were established and the high expectations of visitors as to the type of experience they should have in these places, the NPS believes that alternative 5 would likely result in significant impacts on visitor use and experience because the proposed transmission line collectively detracts from the overall visitor experience of APPA and results in new intrusions into a natural environment that would appreciably diminish key aspects of the parks that visitors come to experience. Alternative 5 offers the potentially significant benefits of completely removing a utility line crossing of the MDSR plus removing and restoring the existing ROW through an especially sensitive area of DEWA, which could outweigh the negative impacts of this alternative.

WILD AND SCENIC RIVERS

The Wild and Scenic Rivers Act of 1968 calls for the protection of specific U.S. rivers that "possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values" (16 USC § 1271). This policy is to preserve selected rivers "in their freeflowing condition to protect the water quality of such rivers and to fulfill other vital national conservation purposes" (16 USC § 1271). These rivers are to be protected "for the benefit and enjoyment of present and future generations" (16 USC § 1271). The MDSR and the land adjacent to it have been identified as a component of the national wild and scenic rivers system to be administered by the Department of the Interior, specifically the NPS (16 USC § 1274; 16 USC § 1281). Wild and scenic rivers administered by the NPS are part of the national park system, and are subject to all laws, regulations, and policies applicable to that system (NPS n.d.b). The DEWA GMP states that, although the national recreation area and the scenic and recreational river have separate origins, they are considered an integrated whole for the purposes of park planning. As a scenic and recreational river, MDSR must be managed in accordance with the Wild and Scenic Rivers Act.

Section 10(a) directs managers to "protect and enhance" the values for which these rivers are designated (16 USC § 1281(a)). The "protect and enhance" language of Section 10(a) is interpreted in the Secretaries' Guidelines as "a non-degradation and enhancement policy for all designated river areas, regardless of classification." See Secretaries' Guidelines, Section III, "Management." The Interagency

Guidelines interpret Section 10(a) as a "non degradation and enhancement policy for all designated river areas, regardless of classification."

The Wild and Scenic Rivers Council advises that Section 10c of the Wild and Scenic Rivers Act requires the NPS to use their general statutory authorities to protect wild and scenic river values, meaning that it shall be administered in such manner as to protect and enhance the values which caused it to be included in [the wild and scenic rivers] system without … limiting other uses that do not substantially interfere with public use and enjoyment of these values. In such administration primary emphasis shall be given to protect [the area's] aesthetic, scenic, historic, archeological, and natural features (16 USC § 1281(a)).

METHODOLOGIES

The analysis of impacts on MDSR was based on a qualitative assessment of how the proposed alternatives would affect those values for which the river was designated, specifically those identified by the Wild and Scenic Rivers Act as having primary emphasis: aesthetic, scenic, historic, archeological, and natural features, including water quality. These resources are further defined in chapter 3 as water resources, scenery, recreation, wildlife, and vegetation. In addition, this analysis considers the protection and enhancement of MDSR for the benefit and enjoyment of the public, as called for under the act. Therefore, this analysis refers to those sections of this chapter that address these resources and values.

Resource-specific context for assessing impacts on the MDSR includes the following:

- The Wild and Scenic Rivers Act protects rivers that possess "outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values" and preserves their free-flowing condition for the benefit and enjoyment of present and future generations, echoing the Organic Act.
- Wild and scenic rivers administered by the NPS, such as the MDSR, are part of the national park system, and are subject to all laws, regulations, and policies applicable to that system. The DEWA GMP states that, although the national recreation area and the scenic and recreational river have separate origins, they are considered an integrated whole for the purposes of park planning.
- MDSR must be managed in accordance with the Wild and Scenic Rivers Act; Section 10(a) of the Act states that each component of the system "shall be administered in such manner as to protect and enhance the values which caused it to be included in [the wild and scenic rivers] system without … limiting other uses that do not substantially interfere with public use and enjoyment of these values. In such administration primary emphasis shall be given to protect [the area's] aesthetic, scenic, historic, archeological, and natural features."
- Section 10c of the Wild and Scenic Rivers Act requires the NPS to use their general statutory authorities to protect wild and scenic river values which includes not only the river itself, but adjacent lands.

STUDY AREA

The study area for this topic includes the entire 40-mile designated segment of the MDSR, all of which flows within DEWA. The analysis under Section 10c of the Wild and Scenic Rivers Act includes lands adjacent to the river because the scenic values that fall under Section 10c review are associated with lands outside the immediate corridor of the river.

CUMULATIVE IMPACTS

Past, present, and reasonably foreseeable future actions within the park could affect the values for which the river was designated. The addition of roads, clearing of vegetation, or enhancement of environmental resources could have an effect on the river's values and the public's experience of the river. Projects outside the park would be less likely to affect the scenic or recreational values of the river, unless the effects are extensive; for example, a dam upstream of DEWA would likely compromise the qualities of the river that made it eligible for classification under the Wild and Scenic Rivers Act. Completed, current, and future activities that would have beneficial or adverse impacts on MDSR inside and outside the study area are summarized below. A full list of projects considered for the cumulative impacts analysis can be found in appendix H. Under each alternative, projects within and outside the study area that may contribute to cumulative effects on MDSR in addition to the actions described under the proposed alternative, are described and analyzed.

Projects Inside the Study Area

The primary emphasis for the protection of MDSR includes the area's aesthetic, scenic, historic, archeological, and natural features. See the "Visual Resources," "Cultural Resources," and "Visitor Use and Experience" cumulative impacts sections for actions that could affect those specific values of the recreational river, as well as enjoyment of those values. Activities that would affect the qualities that the Wild and Scenic Rivers Act emphasizes for protection, as well as the ability of visitors to enjoy those qualities (addressed under separate impact topics), include the following:

Projects that would have an adverse effect on aesthetic and scenic qualities include the Columbia Gas pipeline crossing, the Columbia Gas Transmission Corporation pipeline expansion, the Tennessee Gas Line proposal, and communications tower development. The following projects would affect aesthetic and scenic characteristics inside the study area by improving aesthetics through restoration and preservation and diminishing aesthetics in the short term through construction and staging activities: the Kittatinny Point Visitor Center storm recovery, the Delaware River bridge projects, and the improvement of the Delaware Water Gap Toll Bridge. Several projects would cause a change in the significance of archeological resources inside the study area through restoration of architectural resources, other structures, and recreational sites. These projects include the stabilization and repair of damaged structures, the New Jersey Swim Beach (Turtle Beach), the river campsite restoration of flood-damaged sites, and the McDade Trail realignment. The beneficial impacts on park facilities from actions within DEWA undertaken by the NPS would have more relevance under this topic than under "Visitor Use and Experience," particularly those actions adjacent to the river, such as restoration of river campsites. These actions include the New Jersey Swim Beach (Turtle Beach) and the river campsite restoration of flood-damaged sites.

Projects Outside the Study Area

Outside of the study area, the Marcellus Shale natural gas drilling and residential and commercial development in contributing watersheds could result in adverse impacts on the river through degradation of water quality. Beneficial impact on the river from conservation of resources would result from county and township open space and conservation plans and Pike County agricultural security leases.

IMPACTS OF THE ALTERNATIVES ON THE MIDDLE DELAWARE SCENIC RIVER

Alternative 1: No Action

Under the no-action alternative, the existing B-K Line ROW would not be widened. The features and attributes of MDSR would not change compared to existing conditions. According to the applicant's project website, the existing transmission line was built in the 1920s (PSE&G 2010b), prior to the designation of MDSR and DEWA. Therefore, alternative 1 would not further affect the values for which the river was designated.

The operation of the existing transmission line would require periodic maintenance, including clearing vegetation within the existing ROW. Access roads within the existing ROW would also require periodic maintenance to provide access for repairs and maintenance. These activities would not be visible from the river corridor and BMPs would minimize impacts such as erosion and sedimentation from vegetation management and access road maintenance. The existing line crossing of the MDSR would continue to conflict with the natural scene in that section of river but to no greater extent than what existed at the time that the MDSR was designated. The public would continue to enjoy the river as it has since the river's designation.

Cumulative Impacts

Because no impacts would occur on MDSR under alternative 1, there would be no cumulative impacts on MDSR under alternative 1.

Conclusion

Alternative 1, the no-action alternative, would result in the continued operation and maintenance of the existing transmission line. No additional impacts on MDSR are expected. Therefore, there would be no cumulative impacts on MDSR under alternative 1.

Because alternative 1 would not change existing conditions with regard to the MDSR, alternative 1 would have no potential for significant impacts on the MDSR.

Common to All Action Alternatives

For all action alternatives, the existing B-K Line within the park boundaries would be removed to the extent feasible as described in chapter 2, and the existing corridor would be allowed to revegetate, ultimately returning to forested habitat over the long term. Under any of the action alternatives some ROW expansion is necessary for construction safety and maneuverability, after which, a portion of the corridor along the ROW would be allowed to revegetate. Only the width of the ROW necessary to maintain access roads and the transmission line would be maintained. Such revegetation would indirectly reduce adverse impacts to the aesthetic and scenic qualities of MDSR by potentially creating a visual screen that would restore a sense of naturalness, albeit limited to some degree in some locations.

Alternative 2

Alternative 2 would result in widening the existing B-K Line ROW through DEWA and MDSR for approximately 4.3 miles. The existing structures and lines would be removed and replaced with new towers and lines as described in chapter 2, resulting in a permanent loss of vegetation along the existing ROW. An additional 50 to 200 feet beyond the width of the existing ROW would be required to construct, operate, and maintain the new transmission line. Adverse impacts would occur primarily on

scenic qualities. Adverse impacts on historic structures and on archeological and natural resources would occur as described under these respective topics. Therefore, many of the values for which the river was designated would be perceptibly changed. As indicated in the "Visitor Use and Experience" section, visual simulations demonstrate a substantial change to views for river users as a result of taller structures and additional, thicker conductors. The presence of the taller towers, thicker and more numerous lines, and bird diverters would be seen not only as boaters pass below the wires, but as they approach from both upstream and downstream directions. Bird diverters would increase the visibility of the transmission lines. Boaters would see this, in addition to the conductors crossing the river, in the distance approaching from either direction, detracting from the scenic quality of the setting and thereby interfering with enjoyment of the river's features and recreation benefits. Visitors using river campsites within sight of the lines would be impacted for the duration of their stay at the campsite. The visual intrusion of the lines would detract from the scenic quality of the otherwise natural setting. Because paddling, floating, and fishing the river is so popular, many visitors would be affected, which would diminish public enjoyment of the river's features and outdoor recreation benefits from what visitors experience today. The adverse impact to the visual qualities of the river would extend beyond the river itself and would be experienced by visitors who view the river from locations beyond the immediate crossing, representing a change that would affect a relatively large area and large number of visitors. For these reasons, adverse impacts to wild and scenic rivers would occur.

The preparation of existing access roads and construction staging areas would result in the additional loss and disturbance of natural areas along the existing ROW. The closest access road is approximately 1,000 feet from MDSR in Pennsylvania and approximately 500 feet from MDSR in New Jersey. It is possible that an additional 1.9 miles of access roads outside the ROW, as well as temporary spur roads, may be required, although none are anticipated to be visible from MDSR. The alternative 2 alignment would cross MDSR generally perpendicularly at only one location before continuing to the Susquehanna and Roseland substations. The corridor for alternative 2 would not follow the river nor would it be in proximity to the river along these routes. Therefore, there would be no impacts outside the study area other than those discussed in the "Cumulative Impacts Common to All Alternatives" section.

Cumulative Impacts

Within the study area, the impacts resulting from alternative 2 were evaluated in combination with other projects mentioned in the "Cumulative Impacts" section above. Additional clearing of corridors for new or expanded pipelines and the proliferation of communication towers could further degrade the scenic qualities of the MDSR. The possibility of future water quality degradation from Marcellus Shale natural gas development and other land use changes exists and would further impact the values of the MDSR. Beneficial impacts would occur as a result of land protection, restoration, and enhancement projects within and outside the parks; however, it is unlikely that these beneficial impacts would substantially reduce the adverse impacts from other development projects that would continue, particularly those affecting water quality.

Conclusion

The impacts on MDSR from alternative 2 would result in visual changes that would adversely affect a relatively large area, a large number of users, and would exist for the life of the project. Impacts related to construction activities would be of short duration when compared to the life of the project but one time visitors who were impacted by river closures or construction noise may have their experience of the MDSR forever diminished. The reduction of resources in the region surrounding the parks would increase their scarcity and sensitivity inside the parks, where they are afforded special protections. Alternative 2 would contribute to the cumulative adverse impact.

Alternative 2 would result in significant long-term degradation of the scenic values for which the river was designated, which would be contrary to the directives in section 10(a) of the Wild and Scenic Rivers Act to "protect and enhance" those values which caused the river to be included in the system. Alternative 2 would cross in the center part of DEWA, including the MDSR. In general, this area is one of the most undeveloped areas of the park, containing large swaths of contiguous mature forest, few man-made intrusions, unique geological formations, a globally significant rare plan community, and abundant opportunities for solitude. The presence of large and obtrusive infrastructure in a relatively undeveloped zone would be a distraction that would detract from the experience visitors seek when coming to the parks. It would degrade the regionally unique and unusual wilderness-like viewshed the MDSR provides. Large structures also introduce non-conforming elements to the parks' cultural landscapes and historic sites affected by this alignment and detract from the characteristics that qualify them for protection. This, in turn, would have adverse impacts on the MDSR through the degradation of the scenic values for which the river was designated. The visual change would affect a relatively large area and a large number of users. A crossing at this location poses high risk for irreparable damage to significant ecological communities and drastic scenic degradation.

Permitting the project would adversely affect multiple protected resources inside the parks, in some instances irreversibly. Allowing such adverse effects in order to facilitate private infrastructure expansion would be contrary to NPS practice and principle of protecting and improving these resources, and of removing incompatible infrastructure to do so. This could establish precedent that may invite similar proposals by other applicants in the future, and create an expectation of like treatment for those proposals; it may make it difficult to deny such proposals. DEWA and APPA both contain numerous other utility crossings, which makes the risk of such precedent particularly concerning for these parks. Furthermore, as units of the national park system, wherein all parks are entitled to equal protection, creating such a precedent could have ramifications for parks nationwide. The location of this particular crossing through the center of DEWA could make such a precedent even more potent. Installing the S-R Line on this alignment may invite future utilities proposing to follow the same route.

Overall, the significance of the impact of alternative 2 is a result of two considerations: the particularly resource-rich area through which the alternative crosses and the potential to inflict harm to those resources because of the magnitude and duration of the adverse impacts. Although it is true that not all impacts can be predicted with great certainty, in the context of the purpose and significance for which DEWA, APPA, and MDSR were established and NPS mandates to specifically preserve the natural, cultural, and scenic resources within them, additional precautions are warranted when considering risks to these resources, many of which are of national importance. Similarly, certain resources are non-renewable, which makes any impacts to them all the more serious because they cannot be replaced if lost. And some resources are under threat by other actions and outside pressure, which in the context of the function of the parks as an "oasis" or refuge within the highly developed east coast, elevates the need to preserve and protect these scarce, sensitive resources. Considered in the context of the values for which the MDSR was designated and is managed, the NPS believes that alternative 2 would likely have significant impacts on the MDSR.

Alternative 2b

The alternative 2b alignment would follow the same route as alternative 2. All towers would be the same height as under alternative 2, but two additional towers would be required. As in alternative 2, taller towers would create more adverse visual and noise impacts compared to existing conditions (see the "Visual Resources" and "Soundscapes" sections for discussions related to those topics). Adverse impacts on historic, archeological, and natural features would occur as described for alternative 2. Therefore, many of the values for which the river was designated would be perceptibly changed as a result of taller

structures and additional, thicker conductors compared to existing conditions; creating an overall adverse impact.

Cumulative Impacts

Cumulative impacts for alternative 2b would be the same as expected under alternative 2.

Conclusion

The impacts on MDSR from alternative 2b would result in visual changes that would adversely affect a relatively large area, a large number of users, and would exist for the life of the project, similar to alternative 2. Impacts related to construction activities would be of short duration when compared to the life of the project but one time visitors who were impacted by river closures or construction noise may have their experience of the MDSR forever diminished. The reduction of resources in the region surrounding the parks would increase their scarcity and sensitivity inside the parks, where they are afforded special protections. Alternative 2b contributes to the cumulative adverse impact.

Alternative 2b would result in significant long-term degradation of the scenic values for which the river was designated, which would be contrary to the directives in section 10(a) of the Wild and Scenic Rivers Act to “protect and enhance” those values which caused the river to be included in the system. Alternative 2b would cross in an area of contiguous mature forest, few manmade intrusions, unique geological formations, a globally significant rare plan community, and abundant opportunities for solitude. The presence of large and obtrusive infrastructure in a relatively undeveloped zone would be a distraction that would detract from the experience visitors seek when coming to the parks, and would degrade the regionally unique and unusual wilderness-like viewshed the MDSR provides. Alternative 2b would have adverse impacts on the MDSR through the degradation of the scenic values for which the river was designated. The visual change would affect relatively large area and a large number of users. A crossing at this location poses high risk for irreparable damage to significant ecological communities and drastic scenic degradation.

The natural, cultural, scenic, and recreational resources of DEWA and APPA are held in public trust and visitors come to the parks to experience these resources. Allowing impacts to these resources is contrary to typical NPS practice of improving scenic conditions by removing non-conforming features and may establish precedent for future actions. The applicant’s project is one component of a larger regional plan by the RTO to enhance system reliability. Other component projects of this plan have already affected, and would continue to affect APPA, especially in the areas of scenic resources and visitor use and experience, as well as other national parks in their paths.

Overall, the significance of the impact of alternative 2b is a result of two considerations: the particularly resource-rich area through which the alternative crosses and the potential to inflict harm to those resources because of the magnitude and duration of the adverse impacts. Although it is true that not all impacts can be predicted with great certainty, in the context of the purpose and significance for which DEWA, APPA, and MDSR were established and NPS mandates to specifically preserve the natural, cultural, and scenic resources within them, additional precautions are warranted when considering risks to these resources, many of which are of national importance. Similarly, certain resources are non-renewable, which makes any impacts to them all the more serious because they cannot be replaced if lost. And some resources are under threat by other actions and outside pressure, which in the context of the function of the parks as an “oasis” or refuge within the highly developed east coast, elevates the need to preserve and protect these scarce, sensitive resources. Considered in the context of the values for which the MDSR was designated and is managed, the NPS believes that alternative 2b would likely have significant impacts on the MDSR.

Alternative 3

Inside the study area the alternative 3 alignment would cross MDSR using an existing transmission line ROW that would be expanded from its current 100-foot width by an additional 50 to 100 feet. Similar to alternative 2, adverse impacts would occur primarily on scenic qualities. Adverse impacts on historic structures and archeological and natural resources would occur as described under these respective topics. Therefore, many of the values for which the river was designated would be perceptibly changed. The S-R Line and the replaced transmission/distribution lines would cross the river perpendicularly, but on the New Jersey side of DEWA both sets of parallel transmission lines would turn sharply northeast, paralleling the river for approximately 1 mile. The presence of two sets of structures close to MDSR would increase the adverse impact on aesthetics and scenery. As noted in the "Visitor Use and Experience" section, views of the riverbank and the Kittatinny Ridge on the New Jersey side would change dramatically due to this 90-degree bend. The transmission line corridor and structures would be clearly visible under alternative 3. Bird diverters would increase the visibility of the transmission lines. Boaters would see this, in addition to the conductors crossing the river, in the distance approaching from either direction, detracting from the scenic quality of the setting and thereby interfering with enjoyment of the river's features and recreation benefits. Visitors using river campsites within sight of the lines would be impacted for the duration of their stay at the campsite. Visitors to the popular river access sites and swimming beaches along that section of river would also have the scenic quality of the setting degraded. The change would extend beyond the river itself and would impact visitors who view the river from locations beyond the immediate crossing, representing a change that would affect a relatively large area. The adverse visual impacts from alternative 3 would be experienced by a greater number of visitors than other alternatives due to the concentration of recreational facilities within sight of the transmission line corridor.

Alternative 3 would require the development of new access roads and temporary spur roads; however, views from the river would likely be protected by existing trees, and access roads would not be placed closer than 200 feet to the river. All roads except for temporary spur roads would be permanently maintained.

As with alternative 2, there would be no impacts to MDSR from outside the study area other than those discussed in the "Cumulative Impacts Common to All Alternatives" section.

Cumulative Impacts

Cumulative impacts would be similar to alternative 2. Slight differences would result from the additional aesthetic and scenic impacts expected under alternative 3 due to the 90-degree bend the two sets of transmission lines would make on the east side of the river, exposing more of the corridor and structures to view.

Conclusion

Adverse impacts on MDSR scenic resources from alternative 3 would occur, and the visual change would affect a relatively large area and affect a large number of visitors. The decommissioning and restoration of the B-K Line alignment would enhance the values of the MDSR along that section of river but those benefits would be negated by the impacts to scenic values along Alternative 3.

Alternative 3 would result in significant long-term degradation of the scenic values for which the river was designated which is contrary to the directives in section 10(a) of the Wild and Scenic Rivers Act to "protect and enhance" the values that caused the river to be included in the system. The MDSR, designated under the Wild and Scenic Rivers Act, and the Delaware River Water Trail offer a parallel

experience of solitude along the Delaware River. The largely intact Delaware River riparian corridor within DEWA, rare in the highly developed east, contributes to a functioning floodplain that helps protect the qualities of the river that contribute to its designation as the MDSR. This large, undisturbed area of high-quality riparian habitat provides crucial habitat to migratory birds, as noted above, as well as other important breeding and foraging habitat for a variety of wildlife. The eastern hemlock forests are a unique ecosystem, found in specific locations along the slopes adjacent to the Delaware River, that support plant and animal communities not found anywhere else because of the specific combination of shading, temperature, and soil characteristics created by the dense hemlock growth.

The construction of an additional line with taller towers would adversely impact the scenic nature of MDSR, which is counter to their enabling legislation and mandates to protect scenery. The route of alternative 3 up the Kittatinny Ridge would greatly increase the visibility of the tall towers. It is unknown how the addition of another transmission line would impact the visitor use patterns. Visitors would likely continue to use the river, however, they may choose to recreate in other areas away from the transmission lines. This could negatively impact the visitation to the parks as a whole or put increased pressure and resource impacts on other areas of the parks.

The natural, cultural, scenic, and recreational resources of DEWA and APPA are held in public trust and visitors come to the parks to experience these resources. Allowing impacts to these resources is contrary to typical NPS practice of improving scenic conditions by removing non-conforming features and may establish precedent for future actions. The applicant's project is one component of a larger regional plan by the RTO to enhance system reliability. Other component projects of this plan have already affected, and would continue to affect APPA, especially in the areas of scenic resources and visitor use and experience, as well as other national parks in their paths.

The removal of the B-K Line would have beneficial impacts to Wild and Scenic Rivers by restoring the natural habitat to the heart of DEWA and MDSR and reducing the number of crossing of APPA. Overall, the beneficial impacts of the removal of the existing line do not outweigh the significant negative impacts of visual intrusion of the expanded line paralleling the MDSR and APPA.

In the context of the values for which the MDSR was designated and is managed, alternative 3 would likely result in significant adverse impacts on the MDSR, similar to the impacts that would likely result from alternatives 2 and 2b. Unlike alternatives 2 and 2b, alternative 3 offers some significant benefits from the removal and restoration of the especially sensitive and scenic area where the B-K Line currently exists. However, these benefits do not offset the negative impacts that would occur as a result of the alternative 3 route.

Alternative 4

The transmission lines for both alternatives would cross the Delaware River just outside DEWA, and thus outside the boundary of MDSR. The river has no special designation where it would be crossed by the alignments for alternative 4. A beneficial impact would result from decommissioning and restoring the B-K Line, which does cross MDSR. However, the transmission lines for alternative 4 may be visible by some people from the southernmost end of MDSR, which could adversely affect the aesthetic and scenic qualities of MDSR. This adverse impact would be localized and would occur along a stretch of river where the scenic values are already compromised by existing transportation corridors.

Approximately 1.73 miles of new access and spur roads would be required under these alternatives, including 0.67 mile outside DEWA and APPA boundaries. However, these roads would not be located near the river. No impacts are expected on MDSR as a result of construction of these access roads.

For the remainder of the proposed route outside the study area, the alternative 4 alignment would follow different routes. As with alternatives 2, 2b, and 3, there would be no impacts outside the study area other than those discussed in the "Cumulative Impacts Common to All Alternatives" section.

Cumulative Impacts

Within the study area the beneficial and possibly negative impacts related to aesthetic and scenic values under alternatives 4 and 5 were evaluated in the context of the effects of other projects in the region as mentioned in the "Cumulative Impacts" section above. When combined with the impacts expected under alternatives 4 and 5, cumulative impacts would likely remain adverse due to activities in the surrounding area that impact visual qualities. Alternatives 4 and 5 do not contribute to the adverse cumulative impact in any substantial way.

Conclusion

The alignment for alternative 4 would not cross MDSR. Several significant benefits would occur from removing the B-K Line as a part of mitigation for the construction of alternative 4. These benefits may balance the adverse effects of construction operation, and maintenance of alternative 4. For example, alternative 4 would move large infrastructure to the margins, would remove an existing transmission line ROW and associated infrastructure from the center of DEWA, and would completely remove the river crossing of MDSR, improving its scenic and recreational qualities. Wetlands, floodplains, and forest would be restored (53 acres total), creating larger patches on contiguous habitat and reducing fragmentation in the core of the park. Additionally, an incompatible feature crossing the landscape would be moved to the southern extent of the DEWA boundary, reducing the total number of cultural and historic structures adversely affected by the double-circuit 500-kV transmission line. It is possible that under alternative 4, the transmission line may be seen from the MDSR boundary by some people but adverse impacts would be minimal in comparison to transportation corridors that exist next to that segment of river.

The natural, cultural, scenic, and recreational resources of DEWA and APPA are held in public trust and visitors come to the parks to experience these resources. Allowing impacts to these resources is contrary to typical NPS practice of improving scenic conditions by removing non-conforming features and may establish precedent for future actions. The applicant's project is one component of a larger regional plan by the RTO to enhance system reliability. Other component projects of this plan have already affected, and would continue to affect APPA, especially in the areas of scenic resources and visitor use and experience, as well as other national parks in their paths.

Compared to the other action alternatives, the impacts of alternative 4 are primarily beneficial. Under alternative 4, the river crossing of the MDSR would be completely removed and this especially scenic and sensitive area of the MDSR would be restored to natural conditions. In the context of the values for which the MDSR was designated and is managed, these beneficial impacts are potentially significant.

Alternative 5

Adverse impacts on wild and scenic rivers would be the same in the study area as described for alternative 4.

Cumulative Impacts

Cumulative impacts under alternative 5 would be the same as those under alternative 4. Alternative 5 would not contribute to the adverse cumulative impact in any substantial way.

Conclusion

The alignment for alternative 5 would not cross the MDSR. Several significant benefits would occur from removing the B-K Line as a part of mitigation for the construction of alternative 5. These benefits may balance the adverse effects of construction operation, and maintenance of alternative 5. For example, alternative 5 would move large infrastructure to the margins, would remove an existing transmission line ROW and associated infrastructure from the center of DEWA, and would completely remove the river crossing of MDSR, improving its scenic and recreational qualities. Wetlands, floodplains, and forest would be restored (53 acres total), creating larger patches on contiguous habitat and reducing fragmentation in the core of the park. Additionally, an incompatible feature crossing the landscape would be moved to the southern extent of the DEWA boundary, reducing the total number of cultural and historic structures adversely affected by the double-circuit 500-kV transmission line. It is possible that under alternative 5, the transmission line may be seen from the MDSR boundary by some people but adverse impacts would be minimal in comparison to transportation corridors that exist next to that segment of river.

The natural, cultural, scenic, and recreational resources of DEWA and APPA are held in public trust and visitors come to the parks to experience these resources. Allowing impacts to these resources is contrary to typical NPS practice of improving scenic conditions by removing non-conforming features and may establish precedent for future actions. The applicant's project is one component of a larger regional plan by the RTO to enhance system reliability. Other component projects of this plan have already affected, and would continue to affect APPA, especially in the areas of scenic resources and visitor use and experience, as well as other national parks in their paths.

Compared to the other action alternatives, the impacts of alternative 5 would be primarily beneficial. Under alternative 5, the river crossing of the MDSR would be completely removed and this especially scenic and sensitive area of the MDSR would be restored to natural conditions. In the context of the values for which the MDSR was designated and is managed, these beneficial impacts would be potentially significant.

PARK OPERATIONS

This section discusses the impacts of the proposed S-R Line alternatives, including the no-action alternative, on management and operations of the parks. The operations and management of the parks include the following departments: the Division of Visitor Management and Resource Protection, the Maintenance Division, the Resource Management and Science Division, and the Interpretation Education and Partnership Division.

METHODOLOGIES

Impacts on park operations are assessed with regard to staffing and annual operating budget. Elements of the alternatives could change the parks' existing staff requirements and budgetary expenditures.

The evaluation of impacts on park operations focuses on the number of staff members available to perform management practices, the ability of park staff to protect and preserve resources given current funding and staffing levels, and the projected need for additional staff time and materials in relationship to accomplishing additional tasks under each of the alternatives.

The impact analysis is based on the current description of park operations presented in "Chapter 3: Affected Environment" of this document. The required level of effort is discussed in terms of "full-time equivalents," or FTEs, which represent the hours worked by staff. One full-time equivalent equals 2,080

hours, the equivalent of one person working full-time year-round, or two part-time staff each working six months of the year.

Indirect impacts outside the study area are not addressed for park operations.

Topic-specific context for assessing impacts to park operations includes the following:

- Parks must operate within the constraints of the unit-specific budget and number of staff positions that have been allocated by congress and the NPS Director's office.
- DEWA and APPA are large parks with extensive operational activities that must be covered with available staff and budget.
- The diversity of resources and facilities contained within the parks and their linear nature increases the complexity of operations because of the variety of resources and visitor experiences that must be managed over a wide area.

STUDY AREA

The study area for park operations includes all areas of the parks that may be affected by the proposed alternatives.

CUMULATIVE IMPACTS COMMON TO ALL ALTERNATIVES

Park operations include several facets of work in the parks, such as maintenance of facilities, interpretation, and resource protection. Numerous projects throughout the parks also affect park operations due to management, staffing, and budgeting requirements and the need to coordinate with entities that may be managing those efforts. It is likely that additional past, present, and reasonably foreseeable projects in the parks would have cumulative impacts on park operations because of the diversity of projects and responsibilities of the parks. Actions inside and outside of the parks can affect park operations, but actions outside the study area would not have an impact on park operations, and therefore are not included. Past, present, and reasonably foreseeable projects inside the study area (inside the parks) that would have beneficial or adverse impacts on park operations are listed below and discussed under each alternative as applicable. These projects were taken from the entire list of cumulative projects for the S-R Line that can be found in appendix H. Cumulative impacts were then determined by combining the impacts of the alternative being considered with the impacts from the projects listed below. An overall cumulative impact analysis was determined for each alternative and is presented at the end of the impact analysis discussion for each alternative.

Projects Inside the Study Area

Inside the study area, cumulative projects or activities that would result in adverse impacts on park operations include the following: the Metropolitan Edison vegetation management and tree removal; the Columbia Gas Transmission Company pipeline increase; illegal activities, including arson, vandalism, hunting, and trespassing (requiring law enforcement response); and the licensing and permitting of special events and incidental business / commercial visitor permits. These activities would result in adverse impacts on park operations due to the increases in park staff, staff time, and budget that may be required. Beneficial impacts would result from the Smooth Ride Initiatives project, the expiration of the commercial use of US Route 209 in 2015, and the demolition/deconstruction of hazardous structures. These projects would result, or have resulted, in a reduced need for law enforcement. While some of these projects may have reduced the need for law enforcement to focus on specific issues, they have not reduced the need for law enforcement to address numerous other significant issues faced by law

enforcement every day in the park. Overall, cumulative impacts on park operations inside the study area would be adverse.

IMPACTS OF THE ALTERNATIVES ON PARK OPERATIONS

Alternative 1: No Action

Under the no-action alternative, the operations and maintenance of the parks would continue to include the following programs/divisions: the Division of Visitor Management and Resource Protection (includes law enforcement), the Resource Management and Science Division, and the Maintenance Division.

Although the maintenance of vegetation is performed by the applicant, natural resource staff in the Resource Management and Science Division would monitor and oversee maintenance activities in the existing ROW. Existing staff would be used for these monitoring tasks.

The maintenance of vegetation on an annual basis could result in an increase in ORV traffic in the cleared ROW. Law enforcement staff would increase patrols in the maintenance area to curb illegal ORV use and to protect visitors. Existing law enforcement staff would be responsible for these patrols because new staff members would not be hired.

During the vegetation maintenance of the existing ROW, the interpretation, education, and partnerships staff in the visitor centers would be responsible for communicating the news of any temporarily closed trails, roads, or areas to park visitors. Closures may also be communicated through the parks' websites.

If trails, roads, or other park areas are closed temporarily for the vegetation maintenance of the existing ROW, personnel in the Maintenance Division would be responsible for posting closure notices and barricading or fencing off these closed areas. There is a potential that maintenance staff may assist in monitoring the maintenance activities performed by the applicant. It would be the responsibility of law enforcement to enforce this closure, which could impact the ability of law enforcement staff to focus on other responsibilities, including the primary duties of protecting the park visitors and resources.

Overall, park staff would be responsible for monitoring the vegetation maintenance activities, but the maintenance would not be conducted on a regular basis. In addition, there would be no change in the number of park staff and no change to the parks' budgets because it is assumed that the applicant would be responsible for the costs associated with the NPS managing the permit. Annual vegetation maintenance activities would not have a noticeable or measurable impact on park operations.

Cumulative Impacts

Cumulative impacts on park operations inside the study area from past, present, and reasonably foreseeable projects would be adverse, as described previously in the "Cumulative Impacts Common to All Alternatives" section. When the impacts on park operations as a result of alternative 1 are combined with other projects in the study area, an overall adverse cumulative impact would be expected. Alternative 1 would not alter the level of impact.

Conclusion

Overall, there would be adverse impacts on park operations associated with the no-action alternative. The parks' staff would have few responsibilities associated with the transmission line; therefore, no additional staff would be hired. During maintenance activities, some staff members would be on site to monitor the activities of the applicant. Staff would also be responsible for communicating the news of any temporary

closures to the parks' visitors at the visitor centers, through the parks' websites, or by posting closure signs and fencing in affected areas. There would be impacts because maintenance activities would only occur on an annual basis. In addition, the parks' role in the vegetation maintenance would not affect the parks' or divisions' budgets because it is assumed that the applicant would be responsible for the costs associated with the NPS managing the permit. When the impacts on park operations as a result of alternative 1 are combined with other past, present, and reasonably foreseeable projects in the study area, an overall adverse cumulative impact would be expected.

If the NPS takes no action, the only change would be the result of the applicant's new vegetation management standards, leading to more clearing of vegetation within the ROW than is the case now or has been the case historically. Under current ROW vegetation management activities the applicant is cutting danger trees. The applicant defines danger trees as those that, in falling, would either strike the conductor or pass within the minimum conductor clearance, which is 10 feet for 500-kV transmission lines (PPL 2010a, 6). The applicant contends that they can cut danger trees on federal land outside their deeded right. Disagreement over this issue between the NPS and PPL resulted in a court settlement in August 2010. This controversy is not, strictly speaking, a public one over the effects of the applicant's actions, but is an area of disagreement that would remain unresolved under alternative 1.

The no-action alternative would not establish any precedent for future actions with significant effects. To the extent it represented a decision in principle about future actions, it would favor the continuation of the status quo, which is not precedent setting in the context of the NPS system, whose primary goal is preservation for future generations.

Alternative 1 would result in some adverse impacts on park operations associated with the continued operation and maintenance of the existing B-K Line; however, considering the intensity of the adverse impacts in the context of park operations, the impacts would not likely be significant.

Common to All Action Alternatives

Removal and Disposal of Existing Structures: The removal of the existing B-K Line would be expected to result in adverse impacts on park operations. Impacts would occur because some staff members would be involved with monitoring the removal activities and would be distracted from normal daily tasks and responsibilities. During the removal of the transmission line, Division of Visitor Management and Resource Protection staff would be responsible for communicating with park visitors about any trail, road, or park area closures related to the removal activities. Law enforcement would likely patrol these closed or affected areas and roads on a more regular basis. Maintenance Division staff would be responsible for posting signs or fencing off areas where park visitors would be restricted. Maintenance staff would also be needed on site to monitor the removal of the transmission line by the applicant. Resource Management and Science Division staff would be on site to monitor the removal of the transmission lines to ensure that no special-status plants or wildlife, sensitive habitats, or cultural resources are affected. In addition, to prevent these impacts, staff would assess or survey the area before removal activities begin. If the priorities of law enforcement staff are shifted to focus on the removal of the transmission lines, it would impact the division's responsibilities to protect park resources and visitors in other areas, particularly if the majority of the law enforcement staff were redirected to focus on this task. It may be necessary to hire one additional staff member for monitoring during the 10-week removal period. If a staff member is not hired, priorities among current staff members would change. Overall, impacts would occur because staffing would increase or staff priorities would change.

Alternative 2

Due to the length of the transmission line through the parks and the extensive access roads associated with alternative 2, it is anticipated that two to three new DEWA staff members would be hired under alternative 2 to assist in park responsibilities associated with construction and postconstruction monitoring. Under alternative 2, DEWA staff would be responsible for monitoring actions along APPA.

Prior to construction activities, Resource Management and Science Division staff would need to assess/survey the proposed ROW and access roads to ensure that no special-status species, sensitive habitats, or cultural resources are located in the construction area. If any potential resources of particular concern are found in the project area, resource specialists would oversee construction activities. If cultural resources are located, the artifacts would be removed and logged into the parks' museum collections. The increase in museum collections would add to park staff operations because this division is currently understaffed. Resource specialists would also ensure that mitigation measures are being implemented during construction.

During the construction of the transmission line, park staff, likely from the Maintenance Division or a park representative, would be needed to monitor construction activities during the eight-month construction period. Maintenance staff would also be responsible for posting signs or fencing at road and trail closures and ensuring safe conditions for park staff and visitors. Park maintenance staff would also increase inspections of the roads frequently used by the construction vehicles to monitor for eroded areas or damage to the road surface that may cause safety issues for the public. Visitor Management and Resource Protection Division staff would be responsible for communicating the news of trail closures and road closures to the public, answering the public's questions and concerns, and coordinating with the applicant and construction staff. Law enforcement would increase patrols in closed areas to ensure that no illegal activities are occurring and that visitors are abiding by temporary closures. If any incidents occur related to the construction activities, such as vehicle accidents, law enforcement would be required to report to the scene. Increasing patrols and responding to incidents within the construction would impact the responsibilities of law enforcement staff to perform their normal duties and would greatly impact operations. This operation would take at least half of the normally scheduled patrol staff and assign them to oversee this maintenance operation which would result in an overall reduction in the efficiency of the patrol function within the park.

The two to three new staff members proposed to be hired would assist with some tasks related to construction activities. However, priorities for current employees would shift or change during the eight-month construction period because some staff members would have responsibilities associated with construction. There would be no change to the parks' budgets because the applicant would be responsible for the costs associated with the NPS managing the permit.

Upon completion of the transmission line, park staff would monitor soil erosion along access roads; vegetation restoration, including the possible spread of invasive species; water quality in water bodies receiving eroded sediments; and illegal activities occurring along the access roads and ROW for up to five years. Staff would also monitor raptors for up to two years to ensure that mitigation measures intended to avoid impacts on raptors are being implemented and are effective. Additionally, the maintenance of vegetation by the applicant would occur annually at minimum for the period of analysis. Park staff or park representatives would be on site to monitor or oversee maintenance activities. It may be necessary for resource specialists to assess/survey the area prior to maintenance activities. Visitor Management and Resource Protection staff would communicate the news of any closures in the parks to visitors. Maintenance staff would be responsible for posting signs or fencing for temporarily closed areas. There is a potential that illegal activities, such as the use of ORVs, would increase after the completion of the transmission line; therefore, law enforcement would increase patrols of the new access roads and ROW

after construction and maintenance activities are complete. In order to perform these additional tasks, two to three new staff members would be hired for DEWA/MDSR. The new staff would perform these tasks along the affected areas of APPA.

Overall, adverse impacts on park operations would be expected. Impacts on park operations from construction-related activities would only last the duration of the construction period. Following construction, standard monitoring would last up to five years and the monitoring of maintenance activities would be required annually for the period of analysis. Adverse impacts would occur because an additional two to three staff members would be hired and the workloads and priorities of existing staff members would be altered for the duration of the construction activities. Tasks and roles among park divisions may be shifted to fill voids and park staff may rely more heavily on volunteers. Although the overall impacts on park operations would occur, there would be no change to the parks' or divisions' budgets because the applicant would be responsible for the parks' costs associated with the NPS managing the permit.

Cumulative Impacts

Cumulative impacts on park operations inside the study area from past, present, and reasonably foreseeable projects would be adverse, as described previously in the "Cumulative Impacts Common to All Alternatives" section. When the impacts on park operations as a result of alternative 2 are combined with other projects in the study area, an overall adverse cumulative impact would be expected. Alternative 2 would not alter the level of impact.

Conclusion

Inside the study area, adverse impacts on park operations would occur during the construction of the new transmission line and access roads. There would also be adverse impacts during postconstruction monitoring because two to three additional staff members would be hired and the workloads and priorities of current staff members would be altered. Tasks and roles among park divisions would be shifted to fill any voids and park staff may rely more heavily on volunteers. Additional tasks would include the monitoring of construction activities including closures, assessment for resources of particular concern in the study area, increased patrols by law enforcement, the monitoring of roads used by construction vehicles in the parks, the installation of closure signs throughout the parks, vegetation restoration, water quality monitoring, raptor monitoring, the monitoring of maintenance activities, ensuring the protection of resources from illegal access, ORV use, and spread of invasive species and monitoring the use of mitigation during construction and operation and maintenance phases of the line. All of these tasks would compound safety management already challenged during the busy seasons. When the impacts on park operations as a result of alternative 2 are combined with other past, present, and reasonably foreseeable projects in the study area, an overall adverse cumulative impact would be expected.

The adverse impacts of alternative 2 on park operations are likely to be severe. Even with additional staff, some of the duties of monitoring, patrols, and enforcement actions would fall on park staff and would be in addition to their normal duties, reducing the amount of time that staff can devote to other important park research, projects, and routine activities. Further, the need to ensure that the adverse impacts of construction and maintenance of the power line are minimized because of the high quality and sensitivity of the affected resources means that those duties may take precedence over other park projects and activities, resulting in important park work that may be delayed or not completed. Considering the intensity of these adverse impacts in the context of park operations, alternative 2 is likely to result in significant adverse impacts on park operations as a result of the additional workload that could interfere with normal park operations and result in park projects and activities being delayed or not completed.

Alternative 2b

Although the existing ROW under alternative 2b would not be widened, impacts on park operations would be the same as under alternative 2 because 5.3 miles of access roads would be constructed and monitoring efforts would still be substantial. It is anticipated that two to three new DEWA staff members would be hired under alternative 2b to assist in park responsibilities associated with construction and postconstruction monitoring.

During construction, park staff would be responsible for assessing or surveying construction areas prior to construction, monitoring construction activities, communicating information to park visitors, patrolling roads, and increasing enforcement in construction areas. During this period, adverse impacts on park operations would result.

Park staff would be responsible for postconstruction monitoring activities related to park resources, vegetation restoration, soil erosion, and maintenance activities. Law enforcement activities would include monitoring access roads for illegal activities, such as ORV use. Adverse impacts would be expected because an additional two to three staff members would be hired and existing staff workloads and priorities would change for the duration of construction activities. Tasks and roles among park divisions may be shifted to fill voids and park staff may rely more heavily on volunteers. Although there would be overall impacts on park operations, there would be no change to the parks' or divisions' budgets because the applicant would be responsible for the parks' costs associated with the NPS managing the permit.

Cumulative Impacts

Cumulative impacts on park operations inside the study area from past, present, and reasonably foreseeable projects would be adverse, as described previously in the "Cumulative Impacts Common to All Alternatives" section. When the impacts on park operations as a result of alternative 2b are combined with other projects in the study area, an overall adverse cumulative impact would be expected. Alternative 2b would not alter the level of impact.

Conclusion

Under alternative 2b, adverse impacts on park operations during and after construction would result, because an additional two to three staff members would be hired and existing staff workloads and priorities would change for the duration of the construction activities. Tasks and roles among park divisions may be shifted to fill voids and park staff may rely more heavily on volunteers. Although the impacts on park operations would occur, there would be no change to the parks' or divisions' budgets because the applicant would be responsible for the parks' costs associated with the NPS managing the permit. When the impacts on park operations as a result of alternative 2b are combined with other past, present, and reasonably foreseeable projects in the study area, an overall adverse cumulative impact would be expected.

Construction activities, the presence of heavy equipment, and alterations to typical traffic flow create greatly increased risks to visitor and staff safety. However, such impacts would be temporary. Proper management, advanced planning, and park staff expertise dealing with these types of disruptions would minimize these risks; properly managed risks to public safety are expected to be minimal. Operation of the line in areas where clearances are less than required by NERC standards would create a considerable fire hazard. Alternative 2b would be constructed within the existing ROW, which is only 100 feet wide in certain places and bordered by 60–80 foot high trees on both sides. NERC guidelines call for clearances between live wires and trees on the edge of the corridor that are greater than what the current ROW would offer. This would create the increased hazard of live wires contacting trees and sparking a forest fire.

Additionally, such an event would likely cause an outage of the line that would lead to loss of power to users downstream, which could create uncalculated health and safety issues.

The adverse impacts of alternative 2b would be the same as alternative 2; therefore, as described for alternative 2, alternative 2b would also likely result in significant adverse impacts on park operations as a result of the additional workload imposed on park staff that could interfere with normal park operations and result in park projects and activities being delayed or not completed.

Alternative 3

Similar to alternative 2, due to the length of transmission line through the parks and due to the construction of access roads, it is anticipated that two to three new DEWA staff members would be hired under alternative 3 to assist in park responsibilities associated with construction and postconstruction monitoring. Under alternative 3, DEWA staff would be responsible for monitoring actions along APPA.

During construction, adverse impacts on park operations would be the same as described above under alternative 2. Park staff would be responsible for assessing or surveying construction areas prior to construction, monitoring construction activities, communicating information to park visitors, patrolling roads, and increasing enforcement in construction areas.

After construction, adverse impacts would also be the same as alternative 2. Park staff would be responsible for postconstruction monitoring activities related to park resources, vegetation restoration, soil erosion, and maintenance activities. Law enforcement activities would include monitoring access roads for illegal activities, such as ORV use. Impacts would result because an additional two to three staff members would be hired and the workloads and priorities of existing staff members would change for the duration of the construction activities. If current law enforcement staff was away and less able to perform their normal patrol functions because of new responsibilities associated with monitoring the project, it could impact park operations, as rangers would be less able to focus on visitor safety and resource management. Tasks and roles among park divisions may be shifted to fill any voids, and other areas of work performed by park staff may rely more heavily on volunteers, though volunteers would not be involved in law enforcement duties. Although the overall impacts on park operations would occur, there would be no change to the parks' or divisions' budgets because the applicant would be responsible for the parks' costs associated with the NPS managing the permit.

Cumulative Impacts

Cumulative impacts on park operations inside the study area from past, present, and reasonably foreseeable projects would be adverse, as described previously in the "Cumulative Impacts Common to All Alternatives" section. When impacts on park operations as a result of alternative 3 are combined with other projects in the study area, an overall adverse cumulative impact would be expected. Alternative 3 would not alter the level of impact.

Conclusion

Alternative 3 would have adverse impacts on park operations during the construction period. Postconstruction monitoring would create adverse impacts, because an additional two to three staff members would be hired and the workloads and priorities of existing staff members would change for the duration of the construction activities. Tasks and roles among park divisions may be shifted to fill any voids and park staff may rely more heavily on volunteers. Although the impacts on park operations would occur, there would be no change to the parks' or divisions' budgets because the applicant would be responsible for the parks' costs associated with the NPS managing the permit. When the impacts on park

operations as a result of alternative 3 are combined with other past, present, and reasonably foreseeable projects in the study area, an overall adverse cumulative impact would be expected.

For the same reasons described for alternative 2, the adverse impacts of alternative 3 would also likely result in significant adverse impacts on park operations as a result of the additional workload imposed on park staff that could interfere with normal park operations and result in park projects and activities being delayed or not completed.

Alternative 4

It is anticipated that one new DEWA employee would be hired to assist in park responsibilities associated with construction and postconstruction monitoring under alternative 4. DEWA staff would be responsible for monitoring actions along APPA.

During the construction of the transmission line, the responsibilities of park staff would be the same as those described under alternative 2. However, adverse impacts on park operations would be less because the construction area inside the parks would be reduced. Park staff would be responsible for postconstruction monitoring activities related to park resources, vegetation restoration, soil erosion, and maintenance activities. Law enforcement activities would include monitoring access roads for illegal activities, such as ORV use. Adverse impacts on park operations after construction would occur because current levels of staffing would be increased by one employee and priorities may need to be changed among current staff. Although there would be overall adverse impacts on park operations under alternative 4, there would be no change to the parks' or divisions' budgets because the applicant would be responsible for the parks' costs associated with the NPS managing the permit.

Cumulative Impacts

Cumulative impacts on park operations inside the study area from past, present, and reasonably foreseeable projects would be adverse, as described previously in the "Cumulative Impacts Common to All Alternatives" section. When the impacts on park operations as a result of alternative 4 are combined with other projects in the study area, an overall adverse cumulative impact would be expected. Alternative 4 would not alter the level of impact.

Conclusion

Adverse impacts on park operations during the construction activities would still occur, although the transmission line would only traverse the parks for 1.5 miles. Shifts in staff workloads and staff would occur over a relatively short period. Additional staff responsibilities would include assessing the proposed site for special-status species, sensitive habitats, and cultural resources; monitoring construction activities; increasing law enforcement patrols; communicating with park visitors; installing closure signs; and assessing roads. Park staff would be responsible for postconstruction monitoring activities related to park resources, vegetation restoration, soil erosion, and maintenance activities. Law enforcement activities would include monitoring access roads for illegal activities, such as ORV use. Impacts on park operations would occur during this period. Overall there would be adverse impacts because current levels of staffing would be increased by one employee and current staff priorities may need to be changed. When the impacts on park operations as a result of alternative 4 are combined with other past, present, and reasonably foreseeable projects in the study area, an overall adverse cumulative impact would be expected.

The adverse impacts of alternative 4 on park operations would likely be severe but the severity of the impacts would be moderated because of the shorter time period that staff would need to engage in pre-

and post-construction activities related to the power line due to the shorter crossing of NPS lands and fewer sensitive resources present along the alternative 4 route. Considering the intensity of these impacts in the context of park operations, the adverse impacts of alternative 4 on park operations may not rise to the level of significant impacts.

Alternative 5

Under alternative 5, park staff would be responsible for monitoring 0.9 mile of the transmission line within park boundaries. Although the affected area under alternative 5 is slightly less (approximately 0.5 mile) than alternative 4, overall impacts would be the same.

Cumulative Impacts

Cumulative impacts on park operations inside the study area from past, present, and reasonably foreseeable projects would be adverse, as described previously in the "Cumulative Impacts Common to All Alternatives" section. When the impacts on park operations as a result of alternative 5 are combined with other projects in the study area, an overall adverse cumulative impact would be expected. Alternative 5 would not alter the level of impact.

Conclusion

Adverse impacts on park operations during the construction activities would occur. There would be adverse impacts on park operations after construction, because current levels of staffing would be increased by one employee and current staff priorities may need to be changed. Additional staff responsibilities would include assessing the proposed site for special-status species, sensitive habitats, and cultural resources; monitoring construction activities; increasing law enforcement patrols; communicating with park visitors; posting signs; assessing roads; and postconstruction monitoring. When the impacts on park operations as a result of alternative 5 are combined with other past, present, and reasonably foreseeable projects in the study area, an overall adverse cumulative impact would be expected.

Alternative 5 would have essentially the same adverse impacts as alternative 4; thus, as explained for alternative 4 above, the adverse impacts of alternative 5 on park operations may not rise to the level of significant impacts.

HUMAN HEALTH AND SAFETY

This section presents an evaluation of the alternatives as they relate to health and safety impacts on the parks' visitors and staff, as well as impacts on the health and safety of the general public located outside the parks' boundaries.

METHODOLOGIES

The analysis of impacts on health and safety considered visitors as well as the staff of the parks. The analysis primarily considered impacts during the construction and operation of the S-R Line, necessary access roads, and other associated activities as proposed under each alternative. Transporting construction equipment and towers on narrow local roads and park roads would affect public roads, including traffic and surrounding communities. Construction equipment would occupy more than one lane, large-radius turns would be a concern, and road closures would be likely to be extensive during construction. In addition, the use of the river would be stopped as necessary during the construction of the S-R Line for visitor safety.

Topic-specific context for assessing impacts to human health and safety includes the following:

- By their nature, national parks are public lands that provide public services to visitors.
- DEWA and APPA, like all national parks, are "working" parks that are mandated to provide a safe workplace for employees as well as the public.
- DEWA contains numerous in-holdings (privately owned and public-owned lands within the legislated boundary of the park) and local roads that are not owned by the NPS, which means that there is considerable movement between NPS lands and non-NPS lands and access to the park is not entirely under park control.

STUDY AREA

The study area for health and safety includes the S-R Line alternative corridors and any area outside the corridors where necessary pulling and splicing sites, staging areas, and access roads are proposed. Indirect impacts outside the study area would also be addressed, which includes the counties the specific alternative alignments would traverse.

CUMULATIVE IMPACTS COMMON TO ALL ALTERNATIVES

Health and safety is a high priority in the parks. Common problems with health and safety are related to injuries sustained in recreational activities and automobile accidents. Many projects in the parks are undertaken to improve health and safety conditions for visitors, staff, and volunteers. Actions inside and outside the parks could affect health and safety in the parks. Past, present, and reasonably foreseeable activities that would have beneficial or adverse impacts on health and safety inside the study area as well as outside the study area are listed below and discussed under each alternative as applicable. These projects were taken from a list of potential cumulative projects developed for the S-R Line that can be found in appendix H. Cumulative impacts were then determined by combining the impacts of the alternative being considered with the impacts from the projects listed below. This cumulative impact analysis was done for each alternative and is presented at the end of the impact analysis discussion for each alternative.

Projects Inside the Study Area

Inside the study area, cumulative projects that would result in beneficial impacts on health and safety for park visitors and staff include the following: New Jersey Swim Beach (Turtle Beach), the Kittatinny Point Boat Launch replacement, the storm recovery efforts at Kittatinny Point Visitor Center, the river campsite restoration of flood-damaged sites, the McDade Trail realignment, the Smooth Ride Initiatives 2006–2007, the US Route 209 road surface and health and safety improvements, the US Route 209 rehabilitation, the Pocono Environmental Education Center cabin replacement, the rehabilitation of Childs Park, the rehabilitation of Old Mine Road South, the repair of Watergate service road, the I-80 weigh station project, the rehabilitation of road bridges throughout the parks, the Delaware River bridge projects, the demolition and deconstruction of hazardous structures, and the stabilization and repair of damaged structures throughout the parks. The improvement projects throughout the parks would benefit the health and safety of visitors and staff over the long term. Benefits would result from reducing fire hazards and improving or restoring park structures, trails, and roads. Improvements throughout the parks would allow safe recreational opportunities for visitors. Adverse impacts may result during construction periods.

Cumulative adverse impacts on the health and safety of park visitors and staff would be likely during the construction of multiple utility projects in the parks. Utility projects inside the study area that might affect

health and safety include the following: the Metropolitan Edison vegetation management and tree removal, the Metropolitan Edison removal of unused power poles and transformers, the Columbia Gas Transmission Company pipeline increase, and the Tennessee gas line proposal. Construction equipment and associated activities would create safety hazards for staff and visitors. Visitors to the parks who participate in illegal activities may affect the health and safety of visitors and staff in the parks. Illegal activities include arson, vandalism, hunting, use of ORVs, and trespassing. Overall, adverse cumulative impacts on human health and safety would result from projects inside the study area.

Projects Outside the Study Area

Outside the study area, cumulative projects that would result in adverse impacts on the health and safety of park staff and visitors include the following road and utility projects: the Columbia Gas Transmission Company pipeline increase and Marcellus shale natural gas drilling. Construction activities and equipment would create safety hazards along roads and in communities. Additional adverse impacts from natural gas drilling would create potential impacts on human health from contamination of groundwater. Beneficial impacts on the health and safety of park staff and visitors outside the study area would result from the transportation improvements and replacements in Pennsylvania and New Jersey. Cumulative impacts on health and safety outside the study area would be adverse.

IMPACTS OF THE ALTERNATIVES ON HUMAN HEALTH AND SAFETY

Common to All Alternatives

Outside the Study Area: Outside the study area, regardless of which action alternative is selected, the transmission line could pass through Carbon, Lackawanna, Luzerne, Monroe, Northampton, Pike, and Wayne counties in Pennsylvania and Morris, Sussex, and Warren counties in New Jersey.

The construction of the transmission line outside the study area would be consistent with those activities described for inside the study area. Because the NPS cannot dictate where the line would actually go, the impacts from the construction of the transmission line outside the study area cannot be determined. However, it is likely that impacts would be similar to those described for inside the study area.

Potential safety hazards would include being in the vicinity of construction equipment and the potential for misuse or accidents. There is always the potential for individuals, including children, to access the area, especially if located in residential neighborhoods. An additional safety hazard would include the potential for the public to come into contact with hazardous materials that may leak from the construction equipment during operation or while parked.

Potential safety hazards outside the study area would exist during the transport of construction materials and equipment to and from the construction area. Large trucks hauling wide loads would transport materials along the local roads and highways. Many of the vehicles would use more than one lane and would make wide turns, creating potential safety hazards to other drivers and pedestrians. If construction vehicles travel along neighborhood/local roads, the safety of the public would be jeopardized.

During construction and operation, impacts on health and safety would occur from being in the vicinity of the construction equipment, potential contact with hazardous materials, the transport of construction materials and equipment to and from the construction area, and annual vegetation maintenance. Overall, there would be adverse impacts on health and safety outside the study area.

Cumulative impacts outside the study area would result in potential adverse impacts on human health and safety as described previously in the “Cumulative Impacts Common to All Alternatives” section. When

the impacts on human health and safety outside the study area are combined with other past, present, and reasonably foreseeable projects outside the study area, an overall cumulative adverse impact would be expected.

Alternative 1: No Action

Within the study area, human health and safety concerns would continue under current conditions. There would be no changes to the public roads throughout the parks under the no-action alternative; however, motor vehicle accidents would continue to be a concern for park staff and visitors. Additional safety concerns in the future could result from the existing 80-year old transmission line potentially deteriorating over time as it continues to age.

During maintenance activities, park staff (e.g., natural resource specialists) would be on site to monitor maintenance activities. To minimize impacts on park visitors, staff would discourage visitors from recreating in areas where maintenance is occurring. Impacts on park staff and visitors would be expected to be minimal during maintenance activities because the effects would be at low levels of detection and no appreciable or measurable effect on human health or safety would occur.

Overall, adverse impacts on human health and safety under the no-action alternative would occur inside the study area.

Cumulative Impacts

Cumulative impacts on human health and safety inside the study area from past, present, and reasonably foreseeable projects would be adverse, as previously described in the "Cumulative Impacts Common to All Alternatives" section. When the impacts on human health and safety as a result of alternative 1 are combined with other projects in the study area, an overall adverse cumulative impact would be expected. Alternative 1 would not alter the level of impact.

Conclusion

Inside the study area, adverse impacts on human health and safety would occur for park staff, visitors, and the general public. Under the no-action alternative, there would be no changes to the current transmission line and no construction or changes to roads. There would be no new traffic patterns associated with the transmission line, so no change to the number of accidents occurring would be expected. The existing transmission line has the potential to deteriorate over time due to its age. Maintenance activities by the applicant would occur on an annual basis and park staff would be on site to monitor these activities. Adverse impacts on visitors and the public would be minimized by discouraging the use of the areas being maintained. Overall, there would be adverse impacts on human health and safety under the no-action alternative. When the impacts on human health and safety as a result of alternative 1 are combined with other past, present, and reasonably foreseeable projects in the study area, an overall adverse cumulative impact would be expected; any cumulative impacts to resources would remain adverse primarily from other actions taken outside the study area.

The no-action alternative would not establish any precedent for future actions with significant effects. To the extent it represented a decision in principle about future actions, it would favor the continuation of the status quo, which is not precedent setting in the context of the NPS system, whose primary goal is preservation for future generations. In conclusion, the actions under alternative 1 would be in keeping with the parks' enabling legislations, NPS *Management Policies 2006*, and all other applicable federal and state laws.

Alternative 1 would have adverse impacts on human health and safety as a result of continuing operation and maintenance of the existing B-K Line but would not result in any changes to the existing adverse impacts. Considering the intensity of these impacts in the context of human health and safety, alternative 1 would not likely result in any significant adverse impacts on human health and safety.

Common to All Action Alternatives

Removal and Disposal of Existing Structures: Park staff would be on site to monitor the removal of the transmission line. A certified safety manager would be employed by the applicant during this period to ensure the safety of all park staff members, visitors, and the general public (PPL and PSE&G 2008, 15). The use of heavy construction equipment would create the risk of injuries for park staff and visitors near the removal areas or along haul routes. Access to areas associated with the removal of the existing lines would be prohibited to park visitors and the general public to reduce the risk of injuries occurring. A safety representative would also be stationed at removal areas near APPA to ensure the safety of hikers along APPA (PPL and PSE&G 2008, 14).

Accidents or injuries to park staff or visitors could occur as a result of the presence of large, heavy construction equipment. Impacts associated with the construction equipment would include the potential for contact with hazardous materials, such as the accidental release of gasoline, diesel fuel, oil, hydraulic fluid, and lubricants from vehicles or other equipment used in the removal process. In addition, improperly maintained equipment could leak fluids during operation or while parked. Impacts on human health and safety could occur from direct contact with these substances or from surface water and groundwater contamination due to runoff.

Construction equipment and materials needed for removal of the line would be stored at a staging area off park property. Additional impacts on human health and safety could occur during the transport of materials and equipment from the staging area to the transmission line removal area. The local roads and park roads are narrow, are typically only rated for loads less than 10 tons, are restricted to noncommercial traffic, and are subject to constant maintenance issues. The transport of large, heavy equipment would create safety hazards. Traffic control or closure would be necessary on some park roads during the removal of the transmission line and the roads could also physically deteriorate from the excess loads. Potential impacts on park visitors and the general public walking, bicycling, or driving along the roads could occur because construction equipment would occupy more than one lane and would have a wide turning radius. Impacts on the parks' staff would also occur because park staff members would travel the road in order to access the removal areas.

During the removal of the B-K Line, there would be adverse impacts on staff, visitors, and the general public. However, in the long term, beneficial impacts on health and safety would result because the possible risks or injuries associated with the deterioration of the existing 80-year old transmission line would no longer exist. After the removal of the transmission line, no impact on health and safety would be expected.

Removal of Vegetation: The removal of vegetation would create impacts on park staff, visitors, and the general public. Park staff would likely be on site to monitor vegetation removal. Potential impacts could include falling or tripping over downed vegetation, accidents related to large trees falling, and being in close proximity to construction equipment. Similar impacts on the general public and park visitors would occur if visitors do not respect park closures. During the removal of vegetation there would be adverse impacts on visitors, staff, and the general public.

Maintenance of Vegetation: Adverse impacts on the health and safety of park staff and visitors could occur during vegetation maintenance activities. Impacts would occur, but maintenance activities would

only occur once per year and impacts would be at such low levels of detection that no appreciable or measurable effect on human health or safety would occur. The potential for visitors to trip or fall over removed vegetation would also exist; however, to minimize these risks, visitors would be discouraged from recreating in the areas where maintenance is occurring. Park staff and/or the applicant would monitor maintenance areas to prevent the public from gaining access.

Helicopter Use: The use of a helicopter may be necessary for stringing the wires of the transmission line, as described in chapter 2. The use of a helicopter to construct the transmission line would create impacts on human health and safety. If park staff, visitors, or the general public are in the vicinity of incidents such as collisions with wires, conductors, and towers; engine or tail rotor failure at low altitudes; loss of tail rotor effectiveness; or potential bird strikes, injuries could occur. Other potential risks to health and safety from helicopter use would be related to mechanical failure, operational incidents, or collision. Impacts would result because mitigation measures would be implemented to reduce the risk of the above occurring; these mitigation measures are discussed in appendix F. Additional impacts related to the use of helicopters could occur when people on land are distracted by viewing the helicopters in the air. Incidents could include vehicle accidents, construction equipment incidents, or individuals tripping or falling. The high winds and noise generated by the helicopters flying at low levels could also create potential impacts on park staff, visitors, and the general public close to the construction areas.

Alternative 2

A certified safety manager would be employed through all construction phases to ensure the safety of visitors and the general public (PPL and PSE&G 2008, 15). Park staff would be on site to monitor construction activities. Impacts would result from park staff, visitors, and the public being in the vicinity of potential safety hazards associated with the use of construction equipment and the transport of construction materials to and from the construction area. Impacts would be expected to last the duration of the construction period, approximately eight months.

During the installation of the transmission line and access roads, the use of large pieces of construction equipment would be required, which would create safety hazards for park visitors, the general public, and specifically park staff. Park staff would be on site during the construction activities for monitoring purposes and would be surrounded by the operating equipment. Although park visitors would be discouraged from entering construction areas, the potential for incidents to occur may still exist if visitors do not respect park closures.

Additional adverse impacts on park staff, visitors to DEWA and MDSR, and the general public would result from the transport of construction materials and equipment to and from the construction area. As described above, the local roads and park roads that would be traveled are narrow, typically are only rated for loads less than 10 tons, are restricted to noncommercial traffic, and are subject to constant maintenance issues. Large, heavy equipment use would be a potential problem due to traffic control and physical deterioration from the excess loads. Transporting the large construction equipment as well as the new towers on park roads and public roads would be a safety concern. Construction equipment would occupy more than one lane, and the large-radius turns would also be a concern. Extensive road closures and traffic control may be necessary to minimize the risk of accidents occurring during the construction period. An additional safety concern for park staff and visitors to DEWA and MDSR would be boating traffic on the river during construction. During the stringing of the conductor across the Delaware River, there is a potential for accidents to occur. A safety watchman would be on the river during stringing operations to stop any boat traffic if an incident does occur or if conditions otherwise warrant (PPL and PSE&G 2008, 6).

Adverse impacts on park staff and visitors to APPA would be the same as those discussed for DEWA and MDSR; however, impacts would only affect one APPA crossing under alternative 2. Park staff would be on site to monitor the construction activities; however, the staff time needed for monitoring would be relatively limited because only one trail crossing is needed. Roads associated with APPA access would be less traveled by the large construction equipment and road closures and traffic control would only be needed for a short time. A safety representative would be stationed at the trail during any and all construction to maintain public safety (PPL and PSE&G 2008, 14).

Overall, inside the study area, adverse impacts on DEWA and MDSR staff and visitors and the general public would result from being in the vicinity of construction equipment, from the safety hazards of construction vehicles on roads, and from the hanging of wires across the Delaware River. Adverse impacts on APPA staff and visitors would result because the affected area would be small and the construction period in the APPA area would be relatively short. Therefore, there would be overall adverse impacts on human health and safety for all three parks under alternative 2.

Cumulative Impacts

Cumulative impacts on human health and safety inside the study area from past, present, and reasonably foreseeable projects would be adverse, as previously discussed in the "Cumulative Impacts Common to All Alternatives" section. When the impacts on human health and safety as a result of alternative 2 are combined with other projects in the study area, an overall adverse cumulative impact would be expected. Alternative 2 would not alter the level of impact.

Conclusion

Inside the study area, there would be adverse impacts on human health and safety for the general public and visitors and staff at DEWA and MDSR. Potential safety hazards would include incidents from being in the vicinity of the operation of construction equipment and the transport of construction materials and equipment to and from the construction area. Adverse impacts would occur on park staff because staff would be on site monitoring the construction activities and would also be involved in the road closures and road maintenance. Park visitors could be involved in incidents involving the large construction vehicles traveling on park roads. Adverse impacts on park staff and visitors at APPA would occur. When the impacts on human health and safety as a result of alternative 2 are combined with other past, present, and reasonably foreseeable projects in the study area, an overall adverse cumulative impact would be expected.

Alternative 2 would have create greatly increased risks to visitor and staff safety due to construction activities, the presence of heavy equipment, and alterations to typical traffic flow would. However, such impacts would be temporary. Proper management, advanced planning, and park staff expertise dealing with these types of disruptions would minimize these risks; properly managed risks to public safety are expected to be minimal. Thus, alternative 2 would not likely result in significant impacts to human health and safety.

Alternative 2b

Adverse impacts on human health and safety as a result of the construction of the proposed line would be similar to those under alternative 2. Adverse impacts would arise from safety hazards associated with use of construction equipment and the transport of construction materials to and from the construction area.

According to the NESC, transmission lines must be designed to provide adequate vertical clearance and to allow for adequate horizontal clearance at the edge of the ROW during high wind conditions. The safety

clearance required around the conductors is determined by normal operating voltages, conductor temperatures, short-term abnormal voltages, windblown swinging conductors, and contamination of the insulators. Conductor displacement as a result of high winds is termed "conductor blowout." The applicant determined that a ROW width of 99 feet is needed for the double 500-kV line (calculations are shown in appendix D). However, the NPS found that the applicant's calculations referred to voltages only up to 230 kV and failed to represent the required V-string clearance (21.5 feet from the structure's centerline). The NPS also noted that the required clearance for each side of the ROW should be 20 feet, not 17 feet as the applicant proposed (appendix D). Ultimately, the NPS found that constructing the proposed project according to the proposed plan for the 100-foot ROW would violate NESC safety guidelines. The minimum horizontal clearance to the edge of the ROW under high wind conditions in terms of conductor blowout was determined to be greater than 100 feet. Safety hazards could occur from the operation of the double 500-kV transmission line within the existing 100-foot ROW. If trees are not removed beyond the 100-foot ROW, the double 500-kV transmission line could create fire hazards, especially if a conductor blows out. These fire risks and safety code insufficiencies would create impacts on the health and safety of park staff, visitors, and the general public.

Overall there would be adverse impacts on human health and safety for all three parks under alternative 2b.

Cumulative Impacts

Cumulative impacts on human health and safety inside the study area from past, present, and reasonably foreseeable projects would be adverse, as previously discussed in the "Cumulative Impacts Common to All Alternatives" section. When the impacts on human health and safety as a result of alternative 2b are combined with other projects in the study area, an overall adverse cumulative impact would be expected. Alternative 2b would not alter the level of impact.

Conclusion

Inside the study area, adverse impacts on public health and safety for DEWA and MDSR staff, visitors, and the general public could result during the construction of the transmission line and access roads. Impacts on park staff and visitors at APPA would result due to the smaller area affected by construction. Additionally, adverse impacts on park staff and visitors could result during the operation of the transmission line due to safety hazards and potential fire hazards because of the insufficient horizontal clearance in the ROW. When the impacts on human health and safety as a result of alternative 2b are combined with other past, present, and reasonably foreseeable projects in the study area, an overall adverse cumulative impact would be expected.

Alternative 2b would create increased risks to visitor and staff safety due to construction activities, the presence of heavy equipment, and alterations to typical traffic flow create greatly increased risks to visitor and staff safety. However, such impacts would be temporary and would be greatly minimized through proper management, advanced planning, and park staff expertise dealing with these types of disruptions. These adverse impacts of alternative 2b on human health and safety would not likely be significant.

However, alternative 2b has additional risks to human health and safety because operation of the line in areas where clearances are less than required by NERC standards creates a considerable fire hazard. Alternative 2b would be constructed within the existing ROW, which is only 100 feet wide in places and bordered by 60 to 80-foot high trees on both sides. NERC guidelines call for clearances between live wires and trees on the edge of the corridor that are greater than the current ROW would offer. This creates the increased hazard of live wires contacting trees and sparking a forest fire. The degree of danger posed to human safety by operating the line with clearances that are below NERC standards is uncertain.

Additionally, such an event would likely cause an outage of the line that would lead to loss of power to users downstream, which could create uncalculated health and safety issues. Because of these risks, alternative 2b would have the potential to result in significant adverse impacts on human health and safety.

Common to Action Alternatives 3, 4, and 5

Under alternatives 3 through 5, the removal of the existing B-K Line would eliminate the generation of EMFs at the line's current location. Although there remains a lack of consensus in the scientific community with regard to the public health impacts associated with the EMF levels generated by transmission lines, there would be no impact on human health and safety from EMFs under these alternatives because there would no longer be transmission lines generating EMFs at this location. It is worth noting that the area where the B-K Line would be removed is largely non-residential.

Alternative 3

Adverse impacts on human health and safety would be similar to those under alternative 2, because the potential safety risks would be the same.

Overall, inside the study area adverse impacts on DEWA and MDSR staff and visitors and the general public would occur. Impacts on APPA staff and visitors would result but the affected area would be small and the construction period would be relatively short. Therefore, overall adverse impacts on human health and safety under alternative 3 would occur.

Cumulative Impacts

Cumulative impacts on human health and safety inside the study area from past, present, and reasonably foreseeable projects would be adverse, as discussed previously in the "Cumulative Impacts Common to All Alternatives" section. When the impacts on human health and safety as a result of alternative 3 are combined with other projects in the study area, an overall adverse cumulative impact would be expected. Alternative 3 would not alter the level of impact.

Conclusion

Inside the study area, adverse impacts on public health and safety for DEWA and MDSR staff, visitors, and the general public would occur during the construction of the transmission line and access roads. The adverse impacts of alternative 3 may be slightly less severe for park staff and visitors at APPA than alternative 2 because of the smaller area affected by construction. When the impacts on human health and safety as a result of alternative 3 are combined with other past, present, and reasonably foreseeable projects in the study area, an overall adverse cumulative impact would be expected.

Adverse impacts of alternative 3 on human health and safety would be similar to those under alternatives 2, 4, and 5 because the potential safety risks would be the same. Considering the intensity of the adverse impacts in the context of human health and safety, alternative 3 would not likely result in significant impacts to human health and safety because the risks would be minimized through proper management, advanced planning, and park staff expertise dealing with these types of disruptions.

Alternative 4

Under alternative 4, the transmission line would traverse fewer miles of land in the parks compared to alternatives 2 and 3; however, adverse impacts would be similar because the same safety hazards to park

staff, visitors, and general public would exist. Because alternative 4 does not cross MDSR, there would no safety concerns for boaters in the MDSR as a result of this alternative.

Overall, inside the study area adverse impacts on the health and safety of DEWA staff and visitors and the general public would result from being in the vicinity of construction equipment and from the safety hazards caused by construction vehicles on park roads. Adverse impacts on APPA staff and visitors would occur but the affected area would be small. Potential incidents in APPA would be the same as those in DEWA; however, the construction period would be relatively short. Therefore, overall adverse impacts on human health and safety for all three parks would occur under alternative 4

Cumulative Impacts

Cumulative impacts on human health and safety inside the study area from past, present, and reasonably foreseeable projects would be adverse, as previously discussed in the "Cumulative Impacts Common to All Alternatives" section. When the impacts on human health and safety as a result of alternative 4 are combined with other projects in the study area, an overall adverse cumulative impact would be expected. Alternative 4 would not alter the level of impact.

Conclusion

Inside the study area, adverse impacts on health and safety of DEWA staff and visitors and the general public would result. During the construction of the transmission line and access roads, park staff would be on site monitoring the construction activities. There would be adverse impacts on park staff and visitors at APPA in the small area affected. When the overall impacts on human health and safety as a result of alternative 4 are combined with other past, present, and reasonably foreseeable projects in the study area, an overall adverse cumulative impact would be expected.

Adverse impacts of alternative 4 on human health and safety would be similar to those under alternatives 2, 3, and 5 because the potential safety risks would be the same. The adverse impacts of alternative 4 may be slightly less severe than alternatives 2 and 3 because of the smaller area affected by construction. Considering the intensity of the adverse impacts in the context of human health and safety, alternative 4 would not likely result in significant impacts to human health and safety because the risks would be minimized through proper management, advanced planning, and park staff expertise dealing with these types of disruptions.

Alternative 5

Alternative 5 would follow the same route through DEWA and APPA as alternative 4 except it would not include the 0.6-mile portion that connects to the Bushkill Substation and travels to the western boundary of DEWA (along the existing B-K Line). Therefore, adverse impacts for alternative 5 would be the same as those described above for alternative 4.

Cumulative Impacts

Cumulative impacts on human health and safety inside the study area from past, present, and reasonably foreseeable projects would be adverse, as previously discussed in the "Cumulative Impacts Common to All Alternatives" section. When the impacts on human health and safety as a result of alternative 5 are combined with other projects in the study area, an overall adverse cumulative impact would be expected. Alternative 5 would not alter the level of impact.

Conclusion

Inside the study area, adverse impacts on the health and safety of DEWA staff and visitors and the general public would occur. During the construction of the transmission line and access roads, park staff would be on site monitoring construction activities. There would be adverse impacts on park staff and visitors at APPA in the small area affected. When the overall impacts on human health and safety as a result of alternative 5 are combined with other past, present, and reasonably foreseeable projects in the study area, an overall adverse cumulative impact would be expected.

Adverse impacts of alternative 5 on human health and safety would be similar to those under alternatives 2, 3, and 4 because the potential safety risks would be the same. The adverse impacts of alternative 5 may be slightly less severe than alternatives 2, 3, and 4 because of the smaller area affected by construction. Considering the intensity of the adverse impacts in the context of human health and safety, alternative 5 would not likely result in significant impacts to human health and safety because the risks would be minimized through proper management, advanced planning, and park staff expertise dealing with these types of disruptions.

SUSTAINABILITY AND LONG-TERM MANAGEMENT

In accordance with NEPA, and as further explained in NPS Director's Order 12: *Conservation Planning, Environmental Impact Analysis, and Decision Making* (NPS 2011g), consideration of long-term impacts and the effects of foreclosing future options should be central to any NEPA document. According to Director's Order 12, and as defined by the World Commission on Environment and Development, "sustainable development is that which meets the needs of the present without compromising the ability of future generations to meet their needs." For each alternative considered in a NEPA document, considerations of sustainability must demonstrate the relationship between local short-term uses of the environment and the maintenance and enhancement of long-term productivity. This is described below for each alternative.

The NPS must consider whether the effects of the alternatives involve tradeoffs between the long-term productivity and sustainability of park resources and the immediate short-term use of those resources. It must also consider whether the effects of the alternatives are sustainable over the long term without causing adverse environmental effects for future generations (NEPA section 102[c][iv]).

Short-term and long-term alterations to and permanent loss of natural vegetation communities have occurred, are occurring, and will occur as a result of natural and unnatural changes inside the study area, including successional changes in vegetation, controlled and uncontrolled fires, invasive species colonization and management, disease and treatment or management of diseased vegetation or organisms, construction or demolition of park facilities, and park operations, including but not limited to law enforcement, interpretation, and conservation programs.

The existing ROW has been in place for more than 80 years and predates the parks. It is an established component of the parks, albeit an unnaturally maintained one that is not consistent with ordinary NPS management. The natural resources in the existing ROW are productive and sustainable; however, the form of that productivity and sustainability is inherently managed and maintained artificially and is not equivalent to the productivity of the mature forest that once existed in the ROW. Alternative 1, the no-action alternative, and the action alternatives (2, 2b, 3, 4, and 5) presented and analyzed in this EIS would create impacts that could further alter the short-term and long-term productivity of the natural resources inside the study area as discussed below.

THE RELATIONSHIP BETWEEN SHORT-TERM USE AND LONG-TERM PRODUCTIVITY OF THE ENVIRONMENT

Short-term uses of resources in the study area include the disturbance of soils, vegetation communities, and wildlife during construction and regular vegetation maintenance activities. The ecological productivity of the study area would be temporarily reduced but would continue over the long term, although in potentially different ways as a result of long-term alterations. Disturbed soils would be restored and revegetated; wildlife species that have fled disturbance and activity would return to former habitats or take up residence in new areas; vegetation would be reestablished; and feeding and foraging by wildlife would resume. Wildlife species that move between habitats would alter movement and foraging behavior temporarily as a result of limited mobility, or would avoid the area. Although vegetation maintenance would only be performed annually and would be localized along the ROW, vegetation maintenance would continue for the period of analysis and would therefore cause adverse impacts on natural resources. The periodic maintenance would not be frequent enough that wildlife in the vicinity would become habituated to the disturbance.

As noted, a transmission line is not consistent with ordinary NPS management to protect natural, scenic, and recreational resources; the incompatible use of NPS land would have an adverse impact on the natural, scenic, cultural, and recreational resources in the study area as well as on visitor experience.

Alternative 1: No Action

Activities under alternative 1, the no-action alternative, would continue to alter and use park resources for the transmission of electricity. Because the ROW would remain in place and continue to provide electricity under alternative 1, the continued presence of the ROW would require regular maintenance and an early successional plant community would result over the long term. Regular maintenance of vegetation in the ROW is a departure from the maintenance that has occurred in the past. Annual maintenance over the long term would maintain a more visually obvious ROW that would also increase the disconnectedness of adjacent habitats that was created more than 80 years ago. Other effects resulting from the presence of the ROW would include short-term, periodic, and localized disturbance; the disruption of daily and seasonal behaviors; and the direct mortality of individuals of some species. Although the long-term viability of park natural resources would continue, the ecological productivity of the habitats and wildlife in the ROW would be altered. Visual resources and visitor use and experience would continue to be affected over the long term by the presence of the ROW and transmission line components in the viewshed and landscape inside the study area. Although the transmission line would not be as visible as a larger, higher, new line, the regular maintenance of the ROW would ensure its visibility in the landscape and would be experienced by visitors to the parks from a variety of locations.

The NPS has been working with state and local agencies as well as nongovernmental conservation organizations in Pennsylvania and New Jersey to identify lands that connect state and federal lands and to prioritize areas that would establish connectivity on a regional scale. Wildlife species in the parks are directly affected by the natural abundance, biodiversity, and ecological integrity of their habitat. The presence of the ROW in the study area and regular maintenance under alternative 1 would not support the NPS role in establishing regional landscape connectivity.

Common to All Action Alternatives

The activities associated with the construction and maintenance of the ROW for any action alternative would result in a number of impacts that would alter long-term uses of park resources despite mitigation measures and BMPs that would offset the level of the impacts. The drilling of geologic resources; the possible alteration of hydrology from impacts on geology; the clearing of forest communities; permanent

alterations of visual aesthetics and changes to visitor experience from the presence of a newer, larger transmission line and permanent access roads; and the annual vegetation maintenance of a wider ROW as early successional stage vegetation are all long-term impacts that would affect resources and the uses of those resources by wildlife, visitors, and park personnel as well as influencing park operations in the long term. Some benefit would be provided by the decommissioning and restoration of the B-K Line in conjunction with the development of another ROW for the transmission line under alternatives 3 through 5; however, the long-term restoration process would not be expected to succeed into mature forest within the period of analysis of this EIS (15 years).

Alternative 2

Alternative 2 would maintain and expand the same use of park resources for the transmission of electricity as alternative 1. The expansion of the ROW and the construction of new towers would cause adverse impacts on natural resources during construction in addition to the adverse impacts associated with the loss of habitat and annual maintenance activities. The presence of the ROW in the study area and regular maintenance would not support the NPS role in establishing regional landscape connectivity.

Ecological productivity would continue under alternative 2; however, the widening of the ROW would alter the ecological productivity of the affected areas in the ROW as a result of the clearing and maintenance-related changes in vegetation communities and the wildlife using the new, maintained, early successional habitat. Disturbance, avoidance/abandonment, and mortality of wildlife would occur during specific periods of activity. Along the ROW in the study area, 52% of the ROW contains rare and unique communities that could be affected by construction and maintenance activities even though they would be avoided to the extent practicable.

Cultural resources would be affected by construction and the long-term presence of the transmission line, affecting archeological resources, cultural landscapes, and historic structures. Visitor use and experience and visual resources would be affected by the construction activities and the presence of a larger, higher transmission line in the long term. The towers would be twice the height of current towers and the ROW would be expanded and regularly maintained, making the towers, the line, and the ROW much more visible and intruding on visitor experience in the parks.

Alternative 2b

Alternative 2b would maintain the same use of park resources for the transmission of electricity as alternative 1, the no-action alternative. Because the applicants would not expand the ROW, the need for the removal of danger trees would be greater, resulting in long-term changes in the forested area along the ROW; however, the ecological productivity of the adjacent habitats along the existing ROW would be maintained because the habitat would not be cleared or altered. The construction of new towers would cause adverse impacts on natural resources during construction in addition to the adverse impacts associated with the loss of habitat and annual maintenance activities. Rare and unique communities are present as stated for the previous alternative (52%), and the productivity of these areas would be expected to be altered where they could not be avoided. The productivity of the ecological components in the ROW would continue but would be altered by a shift in vegetation community and wildlife use over the long term as a result of regular and thorough maintenance.

Cultural resources would be affected by the construction and the long-term presence of the transmission line, affecting archeological resources, cultural landscapes, and historic structures. Visitor use and experience and visual resources would be affected by the construction and the long-term presence of the transmission line. The towers would be double the height of current towers, making the towers and line much more visible and intruding on visitor experience in the parks.

The presence of the ROW in the study area and the regular maintenance over the long term under alternative 2b would not support the NPS role in establishing regional landscape connectivity.

Alternative 3

Alternative 3 would expand the use of park resources for the transmission of electricity, widening an existing ROW inside the study area. The expansion of the ROW and construction of new towers would cause adverse impacts on natural resources, including rare and unique communities, during construction in addition to the adverse impacts associated with the loss of habitat and annual maintenance activities. For the alternative 3 ROW, 47% of the area is designated as rare and unique communities that could also be affected by construction and maintenance impacts.

Cultural resources would be affected by the construction and the long-term presence of the transmission line, affecting archeological resources, cultural landscapes, and historic structures. Visitor use and experience and visual resources would be affected by the construction and the long-term presence of the transmission line.

As noted, a transmission line is not compatible with NPS protection of natural, scenic, and recreational resources; the incompatible use of NPS land would have a long-term adverse effect on the natural, scenic, cultural, and recreational resources inside the study area as well as on visitor experience. The presence of the ROW in the study area and the regular maintenance under alternative 3 would not support the NPS role in establishing regional landscape connectivity. Removal of the B-K Line under alternative 3 would offset the impact from the proposed transmission line by removing one non-compatible feature from an area of the parks that is relatively undeveloped. The towers would be double the height of current towers and the conductors would be doubled, making the towers and lines much more visible and intruding on visitor experience in the parks.

Alternative 4

Alternative 4 would not use park resources for the transmission of electricity to the extent expected for alternatives 1, 2, 2b, and 3. Despite the smaller footprint of the transmission line in alternative 4, the productivity of park resources would be altered from existing levels. The construction of new towers would cause adverse impacts on natural resources during construction and long-term impacts associated with the loss of habitat and annual maintenance activities. Rare and unique communities compose about 42% of the area and the productivity of these areas would be expected to be altered similarly where they could not be avoided. Productivity in forested areas would be reduced and altered (increasing the maintained early successional habitat). Visitor use and experience and visual resources would be affected by the construction and long-term presence of the larger, taller transmission line. Removal of the B-K Line under alternative 4 would offset the impact from the proposed transmission line by removing one non-compatible feature from an area of the parks that is relatively undeveloped. Alternative 4 would also move the infrastructure to the edge of DEWA where the park is already impacted by encroaching development.

Alternative 5

Alternative 5 would result in the least amount of park resources (0.9 miles) used for the transmission of electricity; however, the proposed route contains the highest percentage of rare and unique communities. The expansion of the ROW and the construction of new towers would cause short-term impacts on natural resources, including rare and unique communities, during construction and long-term impacts associated with the loss of habitat and annual maintenance activities. Visitor use and experience and visual resources would be affected by the construction and the long-term presence of the transmission line. However,

removal of the B-K Line under alternative 5 would offset the impact from the proposed transmission line by removing one non-compatible feature from an area of the parks that is relatively undeveloped. Alternative 5 would also move the infrastructure to the edge of DEWA where the park is already impacted by encroaching development.

IRREVERSIBLE OR IRRETRIEVABLE COMMITMENT OF RESOURCES

The NPS must consider whether the effects of the alternatives are irreversible or irretrievable commitments of resources. Irreversible impacts are those effects that cannot be changed over the long term or are permanent. Irretrievable commitments are those resources that, once gone, cannot be replaced. Irreversible commitments would result from the construction of new and permanent access roads and the operation of an upgraded transmission line that would require labor and would consume fossil fuels, would use raw materials such as steel, and would require roadway construction materials such as concrete and aggregate. The NPS must also consider whether the impacts on park resources would mean that once gone, the resource could not be replaced; in other words, the resource could not be restored, replaced, or otherwise retrieved (NEPA section 102[c][v]). The loss of geologic resources, special-status species (individuals), wetlands (through changes to hydrology, soils, vegetation), or wildlife habitat at the park would be considered an irretrievable resource commitment. Mitigation would be required for the loss of some resources, but would not fully offset impacts. Drilling and/or excavation could have an irretrievable impact on topography and paleontological resources associated with geologic formations if resources are lost or destroyed. Changes to rare and unique communities could be considered an irreversible resource commitment if drilling or other activities permanently alters the resource such that it can no longer support special-status species or function as a rare and unique community. In addition to natural resources, impacts to historic resources such as archeological sites, historic structures, and cultural landscapes could be considered an irretrievable resource commitment if drilling or excavation permanently alters or destroys resource, or the resource is completely lost. Impacts to these resources would be mitigated through various cultural landscape management requirements, but the impact would be irretrievable unless the known resources are completely recovered prior to construction activities. The use of land for permanent access roads and the ROW for the transmission line would be an irreversible commitment of resources during the period that the land is used for transportation infrastructure or energy requirements. However, the land could be converted to another use at a future date, just as the proposed project would remove and restore some roads and the existing ROW (depending upon the alternative) in the study area.

Alternative 1: No Action

Alternative 1 would continue ongoing impacts on natural resources, especially vegetation; landscape connectivity, wetlands, wildlife habitat, and wildlife as well as rare and unique communities. Some of these impacts could be reversed if the transmission line were to be removed and the natural resources restored. Under alternative 1, tree removal in forested wetlands would result in the conversion of wetland habitat type from a forested wetland to an emergent or scrub shrub wetland. Because northern forested wetlands may take 50 years to reach maturity (Kusler 2006, iii) and because trees in the ROW under alternative 1 would continue to be maintained/removed, wetland areas within the ROW would not recover during the period of analysis to become fully functioning forested wetlands. Mitigation would be required for the loss of wetlands, but would not fully offset impacts. Changes to rare and unique communities (that may also include wetlands) could be considered long-term and/or an irreversible resource commitment if maintenance activities permanently alters the resource such that it can no longer support special-status species or function as a rare and unique community. Although vegetation removal and maintenance efforts would continue, no new development, construction, excavation, or drilling would occur under alternative 1.

Alternatives 2 and 2b

Alternatives 2 and 2b would result in the irreversible and irretrievable commitment of geologic resources. The construction of the towers involves drilling bedrock and approximately seven of the towers would be sited in geologic resources that are rare or unique. These impacts would be permanent and irreversible and could not be mitigated. Drilling and excavation could also have an irreversible and irretrievable impact on topography and paleontological resources associated with geologic formations if resources are lost or destroyed. Unless mitigation involves documenting and recovering these resources prior to construction activities, an irreversible and irretrievable commitment of these resources would occur under alternatives 2 and 2b.

Additionally, the drilling of bedrock has the potential to cause impacts on groundwater and surface water resources, ultimately affecting hydrology in rare and unique communities as well as *Exceptional Value Wetlands* such as Arnott Fen. However this drilling is unlikely to affect groundwater (see discussion in "Geologic Resources") and is not discussed further. These impacts could be permanent and could not be mitigated if hydrology changes such that wetland functions are no longer self-sustaining. Changes to rare and unique communities (that may also include wetlands) could also be considered long-term and/or an irreversible resource commitment if maintenance activities permanently alters the resource such that it can no longer support special-status species or function as a rare and unique community. Special-status plant species could be lost directly during vegetation removal/maintenance activities and/or indirectly due to the spread of invasive plant species from removal/maintenance activities. Special-status wildlife species could be lost through direct mortality with construction equipment or indirectly through loss of habitat or human disturbances. If there is a "take" of special-status species under alternatives 2 and 2b (likely individuals and not entire populations), this would be considered an irreversible commitment of resources.

Under alternatives 2 and 2b, tree removal in forested wetlands would result in the conversion of wetland habitat type from a forested wetland to an emergent or scrub shrub wetland. Because northern forested wetlands may take 50 years to reach maturity (Kusler 2006, iii) and because trees in the ROW under alternatives 2 and 2b would be removed and then maintained, wetland areas within the ROW would not recover during the period of analysis to become fully functioning forested wetlands. Mitigation would be required for the loss of wetlands, but would not fully offset impacts. Other long-term impacts such as those to vegetation; landscape connectivity, wildlife habitat, and wildlife; and visual resources would occur and would be irreversible during the period of analysis. These impacts, however, could only be mitigated or reversed after the period of analysis if the line were to be removed and the area of the ROW were restored in the future.

Under alternatives 2 and 2b, impacts to historic resources such as archeological sites, historic structures, and cultural landscapes could be considered an irreversible resource commitment if drilling or excavation permanently alters or destroys resource, or the resource is completely lost. Visual impacts would also occur due to the presence of the transmission line. Some impacts to these resources could be mitigated through various cultural landscape management requirements, but the impact would be irreversible unless the known resources are completely recovered prior to construction activities.

Alternatives 3 through 5

Similar to alternatives 2 and 2b, alternatives 3 through 5 would result in the irreversible and irretrievable commitment of geologic resources from the drilling and excavation activities required for the construction of the towers. The impacts would be permanent and irreversible and could not be mitigated. Along the alternative 3 alignment, approximately 11 to 15 of the towers would be sited in geologic resources that are rare or unique; construction and clearing would also impact paleontology and topography. Unless

mitigation involves documenting and recovering these paleontological resources prior to construction activities, an irreversible and irretrievable commitment of these resources would occur under alternatives 3, 4, and 5.

There are no rare or unique geologic resources along the corridors for alternatives 4 and 5, but adverse impacts to paleontology and topography resources could result in an irreversible and irretrievable commitment of these resources. Wetlands in rare or unique communities or *Exceptional Value Wetlands* would not be affected under alternatives 3, 4, or 5. Special-status plant or wildlife species could be lost directly and/or indirectly as described above for alternatives 2 and 2b. If there is a "take" of special-status species under alternatives 2 and 2b (likely individuals and not entire populations), this would be considered an irreversible commitment of resources.

Under alternatives 3,4, and 5, tree removal in forested wetlands would result in the conversion of wetland habitat type from a forested wetland to an emergent or scrub shrub wetland and these wetland areas within the would not recover during the period of analysis to become fully functioning forested wetlands. Mitigation would be required for the loss of wetlands, but would not fully offset impacts. Other long-term impacts such as those to vegetation; landscape connectivity, wildlife habitat, and wildlife; and visual resources would occur and would be irreversible during the period of analysis. These impacts, however, could only be mitigated or reversed after the period of analysis if the line were to be removed and the area of the ROW were restored in the future.

Under alternative 3, impacts to historic resources such as known archeological sites, historic structures, and cultural landscapes could be considered an irreversible resource commitment if drilling or excavation permanently alters or destroys resource, or the resource is completely lost. Alternatives 4 and 5 do not contain known archeological resources, but historic structures, and cultural landscapes would be affected and could be considered an irreversible resource commitment. Visual impacts would also occur due to the presence of the transmission line under alternatives 3, 4, and 5. Some impacts to these resources could be mitigated through various cultural landscape management requirements, but the impact would be irreversible unless the known resources are completely recovered prior to construction activities.

UNAVOIDABLE IMPACTS

Unavoidable impacts constitute a substantial change to existing environmental conditions that cannot be completely offset by the implementation of mitigation measures. Unavoidable impacts on geology and visual resources could arise from the action alternatives 2, 2b, 3, 4, and 5 as described in chapter 2.

The excavation and drilling activities required for the construction of the new towers would permanently affect geologic resources. Because drilling is unlikely to affect groundwater (see discussion in "Geologic Resources") it would not affect hydrology of the wetland areas or rare and unique communities in the vicinity and is not discussed further. The spread of invasive plant species from construction, excavation, and removal/maintenance activities would be an unavoidable impact to special-status plant and wildlife species as well as to native vegetation and wildlife species through competition of resources and habitat. It is expected that invasive plant species would spread along the ROW, along access roads and off the ROW, as well as into adjacent plant communities.

It is assumed that unavoidable impacts would also occur to unknown archeological and paleontological resources that have not yet been documented. There would also be unavoidable impacts to vegetation, park operations, and infrastructure (roadways).

Visual resources would be significantly affected by the presence of larger, taller transmission lines under all action alternatives, which would constitute an unavoidable impact and would adversely affect aesthetics and the experiences of visitors to the parks.

Cultural landscapes would be altered permanently and would constitute an unavoidable impact.

Landscape scale connectivity would be impacted permanently for both existing and potential protection in perpetuity and would constitute an unavoidable impact.

No other unavoidable impacts on resources were identified.