Appendix B: Final Avian Protection Plan for Beech Ridge Energy LLC's Beech Ridge Wind Project

FINAL
Avian Protection Plan for Beech Ridge Energy LLC's Beech Ridge Wind Project

Greenbrier and Nicholas Counties, West Virginia

May 2012

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1.0 INTRODUCTION

The following Avian Protection Plan (APP) has been developed for Beech Ridge Energy LLC's (BRE's) Beech Ridge Wind Project located in Greenbrier and Nicholas Counties, West Virginia (Figure 1). The project will be developed in two phases, a 67-turbine phase (already constructed) and an up to 33-turbine phase, to be constructed after issuance of an Incidental Take Permit (ITP). The project's 100 turbines will generate up to 186 megawatts (MW). Associated infrastructure will include access roads, transmission and communication equipment, storage areas, and control facilities. The project is located on a 63,000-acre tract owned by MeadWestvaco approximately 5 miles (8 km) northwest of the town of Trout, approximately 7 miles (11 km) north-northwest of Williamsburg, and approximately 9 miles (14.5 km) northeast of Rupert, West Virginia. The project area encompasses 6,860 acres of the property. A 14-mile transmission line has been constructed from the project site northwest to Allegheny Power's Grassy Field Substation located north of the community of Grassy Field in Nicholas County (Figure 2).

Currently, BRE is working collaboratively with the U.S. Fish and Wildlife Service (USFWS) to develop an application for an ITP pursuant to Section 10 of the Endangered Species Act (ESA) that would cover the proposed Beech Ridge Wind Energy Project. Integral to the application, BRE is developing a habitat conservation plan (HCP) (BRE 2011) in accordance with applicable guidance and regulations (USFWS and National Marine Fisheries Service 1996, USFWS and National Oceanic and Atmospheric Administration 2000). The proposed covered activities in the HCP include operation, maintenance, and decommissioning of the existing 67 turbines and associated infrastructure, as well as construction, operation, maintenance, and decommissioning of up to 33 additional turbines and associated infrastructure.

1.1 Purpose of the APP

Wind energy is one of the fastest growing sources of renewable energy in the United States, is the most economically competitive form of renewable energy, and is generally viewed as an environmentally friendly alternative to nuclear and fossil fuel power plants (American Wind Energy Association [AWEA] 2008, National Research Council [NRC] 2007). However, wind energy projects have the potential to impact bird populations through habitat loss and fragmentation, displacement, and mortality due to collision with turbine blades (National Wind Coordinating Collaborative 2010). The HCP that is currently being prepared describes BRE's conservation strategy for Indiana and Virginia big-eared bats, which is also applicable to all bats in general. BRE has developed this APP as a good-faith effort to document BRE's plans to avoid and minimize potential impacts to birds.

This APP documents the measures that BRE has taken to avoid and minimize impacts to birds during site selection, project design, and construction, and outlines proposed post-construction monitoring efforts and adaptive management strategies. Specific goals of the APP are to:

- Avoid and minimize potential impacts to birds during construction, operation, maintenance, and decommissioning of the project
- Incorporate, by reference, the post-construction bat mortality monitoring procedures defined in the HCP to also estimate mortality of avian species

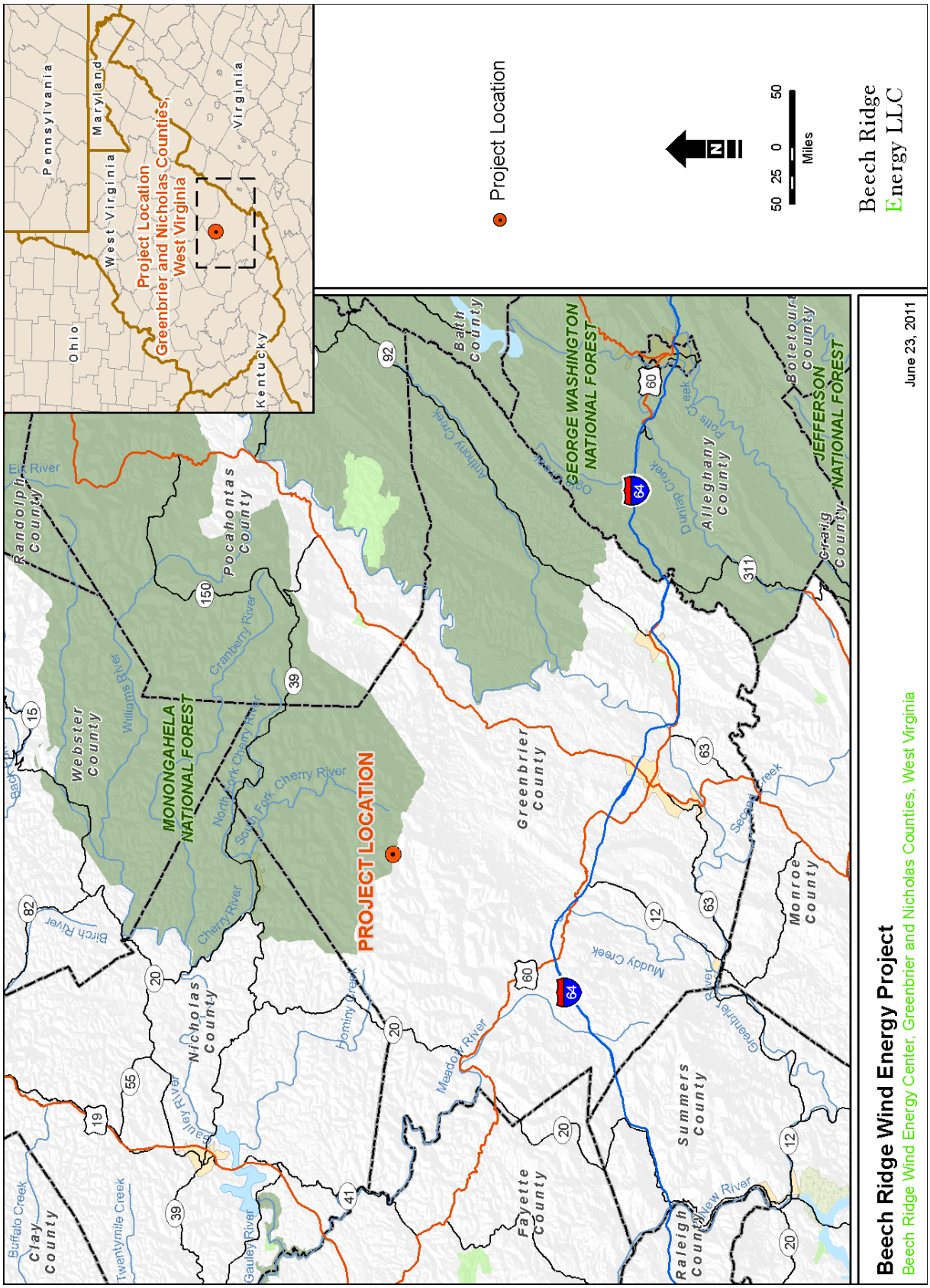

Figure 1 Beech Ridge Wind Project Location, Greenbrier and Nicholas Counties, West Virginia

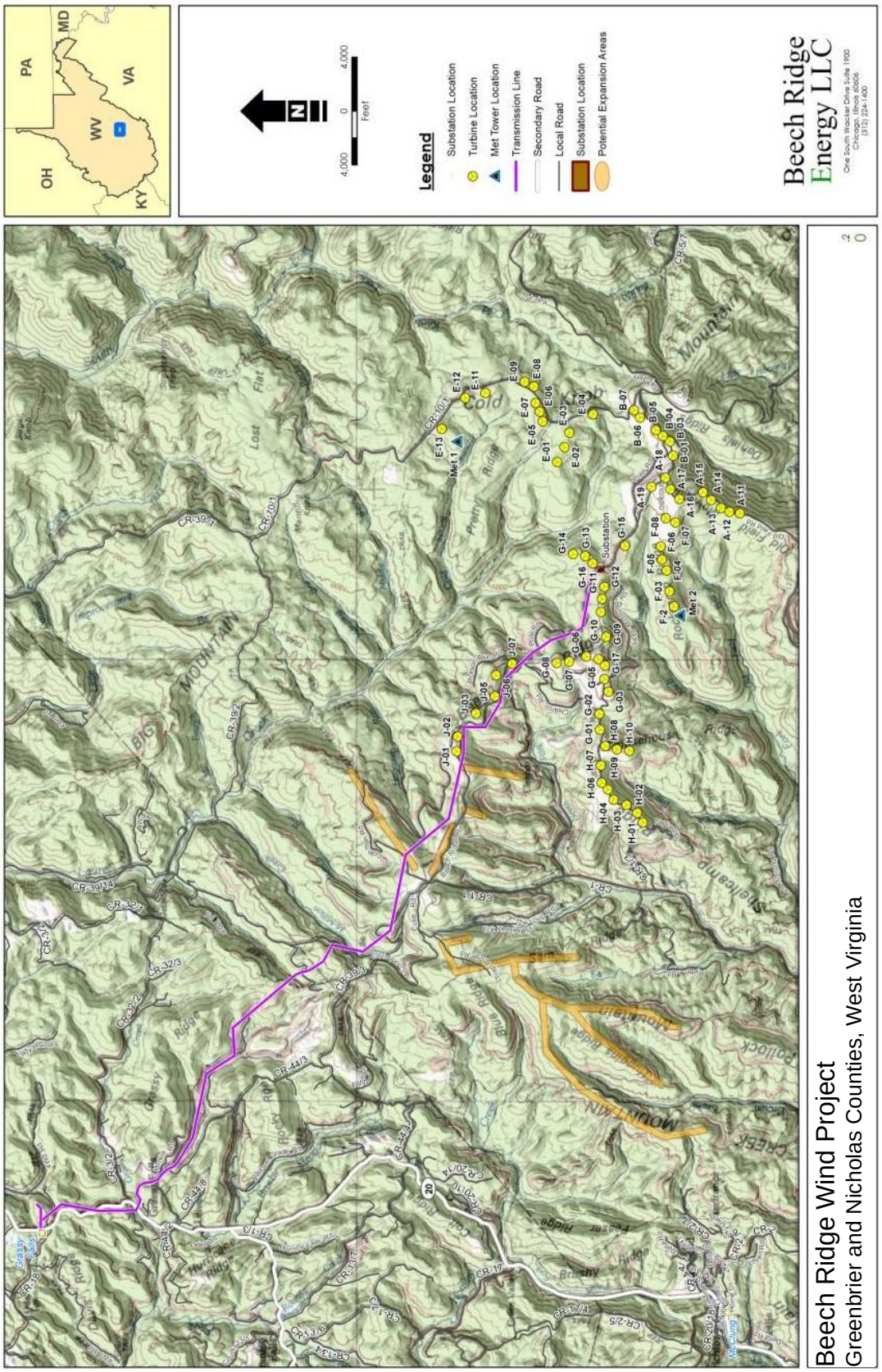

Figure 2 Locations of Existing Turbines and Transmission Line and Proposed Expansion

- Compare post-construction avian mortality at the project site to rates from existing facilities in from similar landscapes with similar species composition.
- Evaluate avian mortality data to determine correlations between mortality and weather conditions and seasonality
- Compare bird fatality rates at the different operational regimes to be tested (see Appendix C in the HCP)
- Use monitoring to validate predictions about relative degree of fatality risk to species of concern (eagles and all other migratory birds) and define actions to reduce effects should they turn out to be significant (see Section 5.0).

1.2 APP Term

This APP will be in effect through development, construction, operation, maintenance, and decommissioning of the project. This term will cover the 20-year minimum functional life of turbines following completion of construction, as well as potential extended operations and/or decommissioning of the project. BRE will update this APP, as needed, through adaptive management (see Section 5.0). Should operation of the project continue beyond its expected life, the APP will automatically renew and remain in effect until the project is decommissioned.

1.3 Regulatory Framework

This section describes the regulations that specifically protect avian species and are relevant to this APP.

1.3.1 Endangered Species Act

The ESA of 1973 provides a program for the preservation of endangered and threatened species and the protection of the habitats upon which those species depend for their survival. Section 9 of the ESA prohibits the "take" of any endangered or threatened species of fish or wildlife listed under the ESA. Under the ESA, the term "take" means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect species listed as endangered or threatened, or to attempt to engage in any such conduct. Under Section 10 of the ESA, the USFWS may authorize, under certain terms and conditions, taking otherwise prohibited by Section 9(a)(1)(B) if such taking is incidental to, and not the purpose of, an otherwise lawful activity. This Section 10 take authorization is known as an ITP. To qualify for an ITP, a non-federal landowner or land manager must develop, fund, and implement a USFWS-approved HCP. As part of a January 2010 settlement agreement concerning the effects of the project on the ESA-listed Indiana bat (*Myotis sodalis*),[1] BRE has prepared an HCP and applied for an ITP to address potential effects of the project on endangered bat species. This APP presents avoidance and minimization measures incorporated to minimize impacts to birds to meet the “otherwise lawful” criterion needed for the USFWS to issue an ITP.

[1] *See Animal Welfare Institute et al. v. Beech Ridge Energy LLC*, Case No.: RWT 09cv1519 (D. MA January 20, 2010)(Stipulation). The Stipulation discusses in detail the agreed construction and operational regime currently implemented as a part of the baseline environmental conditions.

1.3.2 Migratory Bird Treaty Act

The Migratory Bird Treaty Act (MBTA) prohibits the taking, killing, possession, and transportation (among other actions) of migratory birds, their eggs, parts, and nests, except when specifically permitted by regulations. While the MBTA has no provision for allowing unauthorized take, the USFWS realizes that some birds may be killed during wind operations even if all known reasonable and effective measures to protect birds are used. The USFWS's Office of Law Enforcement carries out its mission to protect migratory birds through investigations and enforcement, as well as by fostering relationships with individuals, companies, and industries that have taken effective steps to avoid take of migratory birds and by encouraging others to implement measures to avoid take of migratory birds. It is not possible to absolve individuals, companies, or agencies from liability even if they implement bird mortality avoidance or other similar protective measures. However, the Office of Law Enforcement focuses its resources on investigating and prosecuting individuals and companies that take migratory birds without identifying and implementing all reasonable, prudent, and effective measures to avoid that take (USFWS 2011a). Companies are encouraged to work closely with USFWS biologists to identify available protective measures when developing project plans and/or APPs, and to implement those measures prior to/during construction or other similar activities.

The development and implementation of an APP are voluntary actions. Guidelines on APPs issued by the USFWS (i.e., USFWS 2010) are not intended, nor shall they be construed, to limit or preclude the USFWS from exercising its authority under any law, statute, or regulation, or from taking enforcement action against any individual, company, or agency. These guidelines are not intended to relieve any individual, company, or agency of its obligations to comply with any applicable Federal, state, tribal, or local laws, statutes, or regulation.

To avoid and minimize impacts to MBTA-listed species, BRE will implement this APP in consultation with the USFWS. This plan incorporates applicable measures based on the USFWS' "Land-based Wind Energy Guidelines (LWEG)(USFWS 2012). The LWEG contain materials to assist in evaluating possible wind power sites, wind turbine design and location, pre- and post-construction research to identify and/or assess potential impacts to wildlife, and potential minimization and mitigation measures. Measures taken to avoid and minimize impacts to migratory birds are presented in this APP.

1.3.3 Bald and Golden Eagle Protection Act

The Bald and Golden Eagle Protection Act (BGEPA) (16 U.S.C. 668-668d) prohibits the take of bald and golden eagles unless pursuant to regulations. The BGEPA defines "take" of an eagle to include a broad range of actions, including to pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest, or disturb. The term "disturb" in regulations found at 50 CFR 22.3 means "to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, (1) injury to an eagle, (2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or (3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior."

The USFWS published a final rule (Eagle Permit Rule) on September 11, 2009, under the BGEPA (50 CFR 22.26) authorizing limited issuance of permits to take bald and golden eagles. A permit would authorize the take of bald and golden eagles where the take is (1) compatible with the preservation of the bald eagle and the golden eagle; (2) is necessary to protect an interest in a particular locality; (3) is associated with but not the purpose of the activity; and, for individual incidences of take, the take cannot be practicably avoided, and for programmatic take, the take is unavoidable even though advanced conservation practices are being implemented. In April 2012, the USFWS published proposed changes to its eagle permit regulations related to length of permits and permit processing fees (77 Federal Register 22267). In addition to seeking comments on these regulatory changes, the USFWS also is currently seeking public comments on future improvements to the permit program.

In 2011, the USFWS published the Draft Eagle Conservation Plan Guidance, which explains the USFWS' approach to issuing programmatic eagle take permits under this authority and provides guidance to permit applicants (project proponents). While still in draft form, and subject to future revisions, the USFWS is implementing these draft guidelines. The final rule notes that wind power is an industry sector for which programmatic permits for recurring long-term take are appropriate.

Measures taken to avoid and minimize impacts to eagles are presented in this APP.

1.4 Project History

Evaluation of the project site for a potential wind energy project began in the early 1990s. In 1994, a fall raptor migration study was conducted on the project site (HawkWatch International 1995). Additional avian surveys (Curry and Kerlinger, L.L.C. 2004, Canterbury 2006) and other environmental investigations were conducted between 2004 and 2006 (see Section 3.2). In August 2006, the West Virginia Public Service Commission (WVPSC) granted BRE a siting certificate to construct the project. The project as initially approved included up to 124 1.5-MW turbines totaling 186 MW of total nameplate generating capacity. As part of a January 2010 settlement agreement concerning the effects of the project on the Indiana bat, the project has been scaled back and is now limited to 100 turbines totaling up to 186 MW of generating capacity. The initial phase of project construction began in April 2009 and included the construction of 67 turbines, a 14-mile transmission line, electric substation, operations and maintenance (O&M) building, access roads, and collection and communications lines. This initial phase was completed in August 2010, and that portion of the project is currently in operation.

As part of the January 2010 settlement agreement referenced above, BRE has applied for an ITP for endangered bats for the project pursuant to Section 10(a)(1)(B) of the ESA. Under the terms of this settlement agreement, BRE has agreed to limit the operation of the 67 wind turbines that are already constructed and to forego construction and operation of 33 new turbines until the USFWS issues an ITP.

1.5 Consultation History

BRE initiated consultation with the USFWS regarding migratory birds and eagles in 2007 and received a letter from Thomas Chapman, Field Supervisor, on March 7, 2006, identifying specific issues regarding birds and bats at the Beech Ridge site. BRE initiated bird surveys at the site in 2004. Since January 2011,

BRE has been working closely with the USFWS and the West Virginia Department of Natural Resources (WVDNR) on the project's HCP, and the APP has been discussed on numerous occasions, including meetings on October 6 and 7, 2010; January 25, 2011; March 17, 2011; and April 7, 2011. BRE, Blanton and Associates, Inc., and the USFWS held a conference call on February 7, 2011, to discuss the APP outline, scope, and content. A draft APP was provided to the USFWS on June 27, 2011, and the USFWS provided comments on September 26 and November 9, 2011, which were discussed during a call between BRE and the USFWS on November 17, 2011. A revised APP was submitted to the USFWS in January 2012. Informal discussions occurred during February and March 2012, followed by submittal of written comments on the APP from the USFWS on April 25, 2012. This final APP includes revisions to address USFWS comments.

As a part of its siting certificate, BRE is required to consult with a Technical Advisory Committee (TAC), whose membership is open to the WVPSC, USFWS, WVDNR, the Bat and Wind Energy Cooperative (BWEC), a statewide environmental organization, a statewide bird group, and a private or academic institution with experience in avian issues. The siting certificate requires BRE to consult with the TAC regarding, among other things, three years of post-construction bat mortality and adaptive management studies after operations commence to assess 1) the project's impact, if any, upon bat life, 2) the potential for adaptive management techniques to mitigate such impacts, and 3) the expected costs over a range of mitigation effectiveness levels. BRE has consulted with and will continue to coordinate with the TAC in compliance with its siting certificate. To maintain an independent regulatory enforcement role, the USFWS has chosen not to participate in the project TAC.

1.6 General Study Area

The project is located primarily along Beech Ridge in the southern portion of the Allegheny Mountains ecological section in Greenbrier and Nicholas Counties, West Virginia. The project site is bounded on the west by Clear Creek Mountain, on the south by Old Field Mountain, on the east by Cold Knob, and on the north along County Road 10/1, just past Big Bull Hill. The 63,000-acre property on which the project is located is currently managed for commercial timber operations, coal mining (surface and deep mining), and oil and gas exploration and production. Historical land use included timber harvesting, oil and natural gas exploration, and coal mining (surface and deep mining). The project area is largely forested, with interspersed clearings for roads, timber harvest activities, and historic and active fossil fuel activities. Dominant vegetation includes oaks (*Quercus* spp.), sugar maple (*Acer saccharum*), black cherry (*Prunus serotina*), white ash (*Fraxinus americana*), and mountain maple (*Acer spicatum*) (BHE Environmental, Inc. [BHE] 2006). Vegetation types in the project area are typically disturbed, and the project site contains a substantial amount of edge and successional habitats due to current and past land use. Of the 48,000 acres within 0.5 mile (1 km) of the site, approximately 79 percent is characterized as timber greater than 26 years old, 19 percent is characterized as timber less than 26 years old, and 2 percent is non-forested (e.g., roads, surface mines) (BHE 2006).

A 14-mile transmission line that connects the project to the existing electric power grid was constructed between April 2009 and April 2010. It extends from the project site northwest to Allegheny Power's Grassy Falls Substation north of the community of Grassy Falls in Nicholas County. The transmission

line permanent right-of-way (ROW) occupies approximately 86 acres and is located on property owned by seven landowners, including portions of the MeadWestvaco tract. Where possible, the transmission line was routed through previously impacted areas such as reclaimed surface mines, existing power line ROWs, and property actively utilized for forest products. Portions of the transmission line traverse forested habitats that are similar to those located on the project site.

2.0 PROJECT DESCRIPTION

The primary project components include wind turbines, access roads, transmission and communication equipment, storage areas, and control facilities. These components are discussed below. A more detailed project description is provided in the HCP and Environmental Impact Statement (EIS) that have been prepared for the project.

2.1 Wind Turbines

The project would ultimately include 100 wind turbines constructed in two phases. During the initial phase, 67 1.5-MW GE turbines were constructed in 2009 and 2010 and are currently in commercial operation (Figure 2). The existing 67 turbines are three-bladed, upwind, horizontal-axis wind turbines, with the turbine rotor and nacelle mounted on top of a tubular tower. The turbines are freestanding monopole tubular steel structures with a hub height of 262 feet (ft) (80 meters [m]). They have a 252-ft (77-m) rotor diameter with a rotor swept area of approximately 50,095 square ft (4,654 square m) (Figure 3). The turbines begin operation in wind speeds of approximately 8 miles per hour (mph) (3.5 meters per second [m/s]) and reach rated capacity at a wind speed of approximately 28 mph (12.5 m/s). The rotor speed ranges from 11.0 to 22.2 revolutions per minute (rpm). From commencement of operations through April 1, 2012, the existing 67 turbines were operated 24 hours per day from November 16 through March 31 and from one-quarter hour after sunrise to one-half hour before sunset (daylight hours) from April 1 through November 15 (non-winter months). From April 1, 2012 through November 15, 2012, these 67 turbines will be operated 24 hours per day; however, from one-half hour before sunset to one-quarter hour after sunrise (nighttime hours) only when wind speeds exceed 15.2 mph (6.9 m/s). During winter months, they will operate 24 hours a day.

The second phase of construction would occur after issuance of an ITP and would include the construction of up to an additional 33 turbines (size and models to be determined) (Figure 2). The 33 additional wind turbines would be monopole towers with a maximum hub height of 328 ft (100 m) (Figure 3). The towers would be either a steel design or a steel lattice structure covered in architectural fabric to create a monopole tower. They would use a maximum 328-ft (100-m) rotor diameter with a maximum rotor swept area of approximately 84,454 square ft (7,875 square m). The rotor speed would range from 5.0 to 14.0 rpm. The additional 33 turbines would operate in accordance with the protocols outlined in the HCP. To minimize impacts to birds, the existing and proposed turbines incorporate state-of-the-art turbine technology, including unguyed, tubular towers and slow-rotating, upwind rotors. In addition, the project has been scaled back from 124 turbines to 100 turbines, which reduced potential impacts to avian species, such as habitat loss/fragmentation and collision-related mortality.

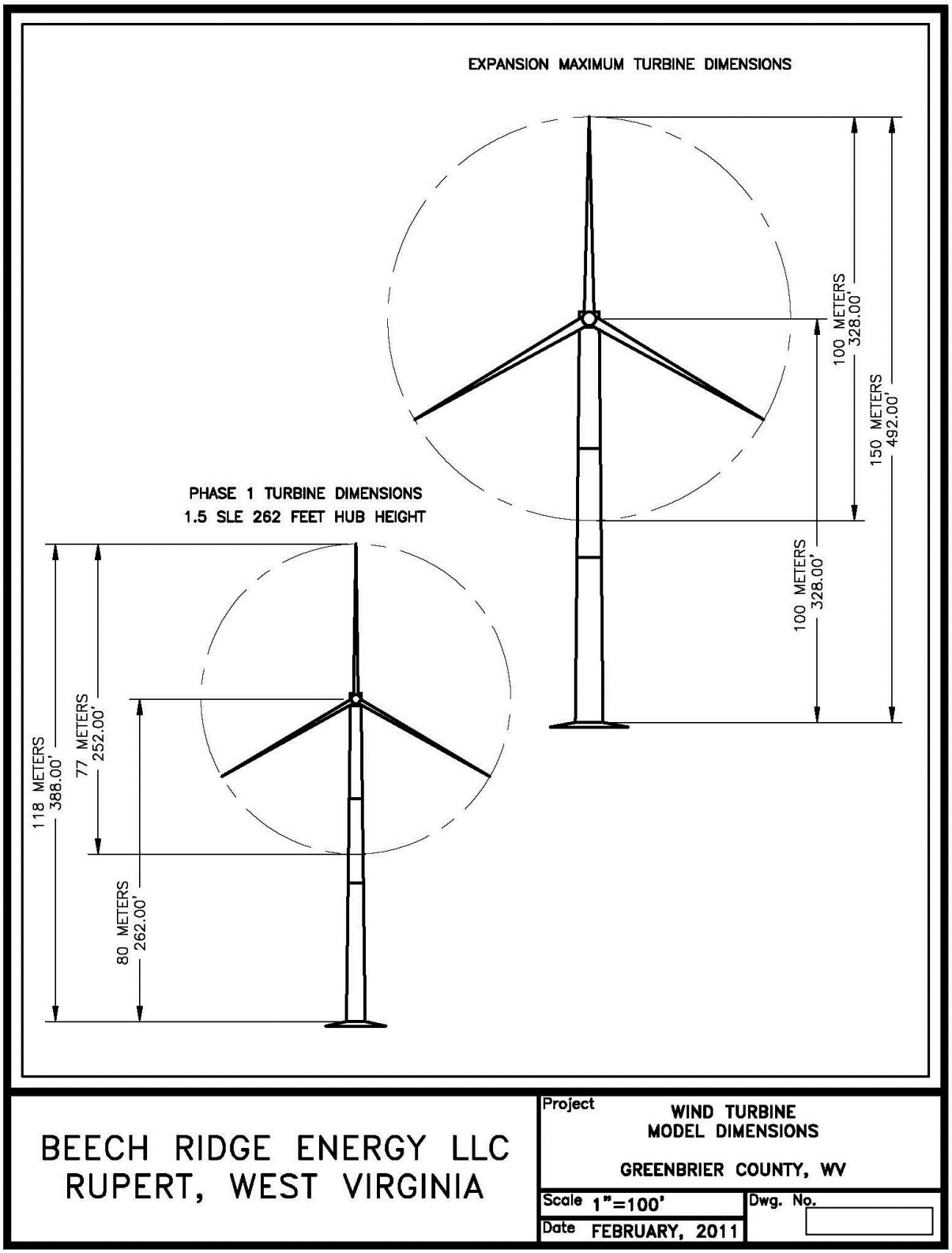

Figure 3 Wind Turbine Model Dimensions

2.2 Access Roads

The project site is accessed using existing public county roadways and privately-owned timber roads, as well as existing upgraded or newly constructed all-weather access roads. The main access route for the project, including equipment deliveries, is via County Road 1 North from Rupert to Clearco.

Approximately 16 miles (26 km) of roads utilized for the 67 turbines were either existing upgraded roads (8 mi [13 km]) or newly constructed roads (8 mi [13 km]). For the 33-turbine phase, BRE estimates that it will need to upgrade up to 6 mi (10 km) of existing roads and potentially construct approximately 4 mi (6 km) of new roads. During construction, primary component haul roads were typically 20 ft (6 m) wide, and turbine/crane access roads were typically 60 ft (18 m) wide, providing the 35 ft (11 m) needed for movement of the large crane and additional clearance area for crane operation. During the operational phase, access roads are approximately 16 ft (5 m) wide. Disturbance width typically increased in steeper areas due to cuts and fills necessary to construct and stabilize roads on slopes.

To minimize impacts to habitats, BRE utilized existing roads and logging trails where possible and minimized the width of upgraded and new roads. BRE will continue to minimize impacts from access roads during the design and construction of the 33 additional turbines.

2.3 Communications and Collection System

Generated electricity will move through an underground collection system to the project substation. Both power and communication cables were or will be buried in trenches a minimum of 4 ft (1 m) deep. An estimated 32 miles (51 km) of underground collection system were installed for the 67-turbine project, and up to approximately 9 miles (15 km) of underground collection system are anticipated for the additional 33 turbines. By burying the collection system, this project component prevents collision-related avian impacts. Habitat loss/fragmentation has been and would continue to be minimized by clearing and disturbing the minimum amount possible to install the lines and by allowing disturbed areas to re-vegetate following construction.

2.4 Substation and O&M Facility

The project substation is owned by BRE and was constructed and is operated to industry standards. The substation is similar to substations used on transmission systems in the region. The substation main transformer was installed within a 1-acre parcel of land centrally located within the project site. The project O&M facility, which contains all necessary plumbing and electrical connections needed for typical operation of offices and a maintenance shop, is located separately from the project substation. Utilities such as electric service, water service, sewer service, telephone service, as well as access to a septic system, are required at the site.

To minimize attracting night-migrating birds, security lighting at the O&M facility is kept to the minimum required, the lights have motion sensors so they operate only when needed, and the lights are down-shielded to minimize light emission into the sky.

2.5 Transmission Line

A 14-mile overhead transmission line associated with the project was constructed in 2009/2010. The transmission line extends from the project substation in a northwestern direction into Nicholas County, where it ties into the existing Allegheny Power Grassy Falls Substation adjacent to West Virginia State Route 20 (Figure 2). The Grassy Falls Substation is referred to as the Point of Interconnect and is the location where energy generated by the project connects to Allegheny Power's existing transmission system. The construction ROW was 100 ft (30 m) wide, while the permanent ROW is 50 ft (15 m) wide. One hundred fifty-six (156) transmission line poles were installed, with an average span between poles of approximately 500 ft (152 m). The transmission line poles consist of primarily single steel pole structures, secured as necessary with guy wires. Two of the pole structures are H-frame structures, and one is a three-pole structure. Pole height ranges from 61 to 88 ft (19 to 27 m).

To minimize impacts to natural habitats, the transmission line was routed through previously impacted areas such as reclaimed surface mines, existing power line ROWs, and property actively utilized for forest products where possible. The transmission line incorporates practices suggested by the Avian Power Line Interaction Committee (APLIC 2006) to minimize collision and electrocution-related avian mortalities.

2.6 Post-Construction Grading, Erosion Control, and Site Clean-up

Once construction of the 33-turbine phase is complete, all disturbed areas will be graded to the approximate original contour, and trash or debris will be properly disposed of off-site. Areas disturbed during construction will be stabilized and reclaimed using appropriate erosion control measures, including site-specific contouring, reseeding, or other measures agreed to by the landowner and designed and implemented in compliance with the project's Storm Water Pollution Prevention Plans (SWPPPs). Areas that are disturbed around each turbine during construction will revert to the original land use after construction except for a 130-ft (40-m) diameter area around each turbine that BRE will maintain for post-construction bird and bat fatality monitoring purposes. Upon the completion of construction, the existing land use will be able to continue with very little impact from the project.

2.7 Operations, Maintenance, Decommissioning, and Restoration

BRE will perform project O&M for the life of the project, which is anticipated to be a minimum of 20 years. BRE and the turbine supplier will control, monitor, operate, and maintain the project by means of the Supervisory Control and Data Acquisitions (SCADA) system, and regularly scheduled on-site inspections will be conducted.

All maintenance activities would occur within areas previously disturbed by construction, so no new ground disturbance will occur during the O&M phase of the project. Turbine maintenance is typically performed up-tower, and O&M personnel perform maintenance within the tower or nacelle and access the towers using pick-up trucks, so no heavy equipment in needed. In the unlikely event that a large crane would be needed for maintenance, vegetation would be cleared within the area previously disturbed during construction to provide for safe and efficient operation of the crane, but no tree removal or soil disturbance would be necessary.

Vegetation mowing will occur along project roads and around turbines for vegetation control purposes. Vegetation within 130 ft (40 m) around turbines to be monitored will be regularly mowed to improve searcher ability to find bird carcasses. The transmission line route and other project areas will be inspected for hazard trees that may pose safety threats or potential damage to project facilities. Hazard trees will be trimmed or cut as needed. Except in an emergency where there is a risk to public safety, inspections and tree cutting needed for these purposes will occur between November 15 and March 31 to prevent direct impacts to migratory bird nests, eggs, or young.

At the end of the project's life (20 years), BRE expects to explore alternatives for decommissioning the project. These include providing energy under a new long-term contract with a power purchaser or dismantling and removing the components from the site. If a new contract were initiated, BRE would reapply for new or amended required permits to retrofit the turbines and power system with upgrades based on new technology. If it were determined that the wind turbines would not be replaced or repowered after 20 years, the following sequence for removal of components would be implemented:

- Turbines, transmission line, and substation would be dismantled and removed
- Pad-mounted transformers would be removed
- All turbine and substation foundations would be removed to a depth of 4 ft (1 m)
- Disturbed areas and access roads would be graded as near as practicable to the original contour, if the landowner requests that BRE decommission these areas

BRE's WVPSC siting certificate includes an obligation to maintain a Decommissioning Fund, which has been established with the Greenbrier County Commission, sufficient to cover the cost of the removal of all improvements to 4 ft (1 m) below grade. The Decommissioning Fund for the first 67 turbines is already in place and would be updated as the 33-turbine phase approaches commercial operation.

2.8 Avian Conservation Measures

Throughout project development, BRE has considered conservation measures to aid in the protection of avian species, including eagles, other raptors, and other migratory birds. These conservation measures have been incorporated in site selection, infrastructure layout and design, construction/clean-up, operation, and decommissioning/restoration of the project site. BRE has consulted and coordinated with the USFWS and the WVDNR regarding proposed conservation measures. This section provides a summary of the conservation measures considered during each stage of development, followed by a comprehensive list of measures that may avoid/minimize impacts to avian species. Throughout the following sections, the term "will be" is used to describe activities that have or will be performed during operation, maintenance, and decommissioning of both the 67- and 33-turbine phases of the project, although many of these activities have already been implemented for the existing operating 67-turbine phase.

2.8.1 Site Selection and Project Design

During the site selection stage of the project, pre-construction avian surveys were conducted and determined that the project site did not include unique habitats or bird communities such that the project

would create a high avian mortality risk. Many of the habitats in the project area have been disturbed by current and historic mining, oil and natural gas exploration, and timber harvest industries. Siting of project infrastructure within the project area considered the minimization of habitat loss and fragmentation. For example, the project minimizes the construction of new roads by using existing timber/mining haul roads and historic timber skid trails roads where practical, and located new roads to avoid sensitive resources and steep topography to the extent possible. In addition, the number of turbines has been reduced from 124 to 100, which reduces the project footprint, minimizes impacts to habitats, and reduces potential collision-related mortality.

The project design incorporates recommendations found in the USFWS document *Interim Guidelines to Avoid and Minimize Wildlife Impacts from Wind Turbines* (USFWS 2003) and the WTGAC recommendations (WTGAC 2010). The project incorporates state-of-the-art turbine technology, including unguyed, tubular towers and slow-rotating, upwind rotors. The project implemented APLIC (2006) recommendations into the transmission line design to minimize collision and electrocution risks to avian species.

2.8.2 Construction

During project construction, travel has been and will continue to be restricted to designated roads, and project personnel will be advised regarding speed limits (25 mph) to minimize wildlife mortality due to vehicle collisions. Where feasible, construction equipment will not be allowed in riparian areas, on steep slopes, or in other sensitive habitats. If avoidance is not feasible, activities within riparian areas or other sensitive habitats will be conducted in accordance with SWPPP requirements. Best management practices (BMPs) will be implemented to protect topsoil and adjacent resources and to minimize soil erosion. No construction activities will be conducted when soil is too wet to adequately support construction equipment (i.e., if such equipment creates ruts in excess of 4 inches [10 centimeters (cm)] deep).

To avoid potential harm to avian species nests and eggs, BRE will limit its tree clearing to that which is necessary for project construction and to the period between November 15 and March 31 (outside the nesting season), except that up to 15 acres may be cleared between April 1 and May 15 or between October 15 and November 14. The additional 30 to 45 days are needed to provide BRE flexibility to complete clearing should weather or deep snow or ice prevent clearing or create safety issues for construction workers. Trees that would be cleared during the breeding season will be surveyed for nests by a trained biologist prior to construction. If an active nest is found, an appropriate buffer would be established around the nest until the young have fledged.

After construction, roads, portions of roads, crane paths, and staging areas not required for operation and maintenance will be restored to the original contour and made impassable to vehicular traffic. Areas to be reclaimed will be contoured, graded, and seeded as needed to promote successful revegetation, thereby reestablishing habitats that could be used by avian species. Seed mixtures will be developed based on BMPs for the region, requirements or recommendations by West Virginia Department of Environmental Protection (WVDEP) or specific requests by the landowner or easement requirements.

2.8.3 Operations and Maintenance

Upon issuance of the ITP, BRE will operate the project in accordance with approved turbine operational protocols that include raising the cut-in speed of all turbines at night. The purpose of this curtailment is to reduce mortality of bat species, including endangered bats.

BRE would perform regular maintenance on project components. All maintenance activities for the project would occur within areas previously disturbed by construction and thus already converted to grass/shrubland. No heavy equipment would be needed for general maintenance activities. In the unlikely event that a large crane would be needed for maintenance, vegetation would be cleared within the area previously disturbed during construction to provide for safe and efficient operation of the crane, but no tree removal or soil disturbance would be necessary. Ground disturbing activities may include the occasional need to access underground cable or communications lines. The project site and transmission line will be inspected for hazard trees that may pose safety threats or potential damage to project facilities. Hazard trees will be trimmed or cut as needed. Inspections and tree cutting needed for these purposes will occur between November 15 and March 31 to minimize impacts to nesting birds, except in an emergency where there is a risk to public safety. The project site will also be monitored, during routine O&M activities, for perches or trees adjacent to cleared areas that are frequently used by eagles. If observed, these branches or trees will be removed.

2.8.4 Decommissioning and Restoration

In the event that the project is decommissioned at the end of the project life, the project infrastructure would be removed, and the site would be graded and restored to as near its original condition as possible. Habitats that were removed as a result of the project would be allowed to re-establish through natural succession, thereby restoring habitat over time for avian species.

2.8.5 List of Conservation Measures that Avoid/Minimize Impacts to Avian Species

The host of measures that have been incorporated into the project design and construction and that may avoid and/or minimize impacts to avian species and their habitats are listed below.

General

- The project will comply with all federal, state, and local environmental laws, orders, and regulations.
- Prior to construction, all supervisory construction personnel will be instructed on the protection of wildlife resources including (1) federal and state laws regarding plants and wildlife, including collection and removal, and (2) the importance of these resources and the purpose and necessity of protecting them. This information will be disseminated through the contractor hierarchy to ensure that all appropriate staff members are aware of the correct procedures and responsibility to report wildlife incidences.
- BRE will monitor bird and bat fatalities at the site in accordance with the Research, Monitoring, and Adaptive Management Plan (RMAMP, see Appendix C of the HCP) to verify the effectiveness of the avoidance, minimization, and mitigation strategies incorporated in the project operation and management.

Siting and Surveys

- The project has been sited in a previously disturbed landscape and avoids critical habitats for sensitive species.
- An avian risk assessment and pre-construction surveys were conducted and identified that the project site does not contain unique habitats or avian communities such that the project would create an undue mortality risk or impact. Raptor use surveys initiated in 2011 as required by the WVPSC siting certificate will be conducted through the winter/spring of 2011/2012 to further document eagle use of the project area.
- Project facilities were located to avoid (1) documented locations of any species of wildlife, fish, or plant protected under the ESA, (2) known local bird migration pathways and daily movement flyways, and (3) areas where birds are highly concentrated.
- Fragmentation of wildlife habitat has been and will continue to be minimized through the use, where practical, of lands already disturbed, including using existing roadways.
- To minimize the potential for the destruction of nests, eggs, and young, clearing of trees would be conducted outside the nesting season, with the exception of 15 acres of trees that may be cleared during the nesting season. If clearing is required during the nesting season, habitats will be surveyed for nests by a trained biologist prior to clearing.

Surface Water, Soils, and Vegetation

- Appropriate storm water management practices that do not create attractions for birds will be implemented. SWPPPs have been prepared to ensure that erosion is minimized during storm events and will be kept on-site at all construction sites, as well as in the construction contractors' offices. BRE and its contractors will implement the SWPPP. To minimize damage to the land surface and property, contractors will limit the movement of crews and equipment to the project site, including access routes, to that which is necessary for safe and efficient construction. When weather and ground conditions permit, construction-caused deep ruts will be leveled, filled and graded, or otherwise eliminated. Ruts, scars, and compacted soils will be loosened and leveled using a ripper or disc or other landowner-approved method. Damage to ditches, roads, and other features of the land will be repaired. Water bars or small terraces will be constructed along access road ditches on hillsides to minimize water erosion and to facilitate natural revegetation.
- Additional wind turbines and most ancillary facilities will be built on uplands and will avoid surface water features and designated floodplains.
- The project will comply with all federal regulations concerning the crossing of waters of the U.S. as listed in Title 33 CFR Part 323.
- Refueling and staging will occur at least 300 ft (91 m) from the edge of a channel bank at all stream channels. Sediment control measures will be utilized to minimize impacts to aquatic and riparian habitats.
- Roads, portions of roads, crane paths, and staging areas not required for operation and maintenance will be restored to the original contour and made impassable to vehicular traffic. Areas to be reclaimed will be contoured, graded, and seeded as needed to promote successful revegetation, provide for proper drainage, and prevent erosion. Seed mixtures will be developed based on best

management practices for the region, requirements or recommendations by WVDEP or specific requests by the landowner or easement requirements.

- The transmission line was designed to span riparian areas and minimize impacts to riparian vegetation.
- Equipment and vehicles will not cross riparian areas on the ROW during operation or decommissioning activities. Existing bridges or fords will be used to access the ROW on either side of riparian areas.
- During project construction, riparian areas will be avoided, where feasible. If avoidance is not feasible, activities within riparian areas will be conducted in conformance with SWPPP requirements.
- During construction and operation of the project, industry-standard BMPs will be implemented to protect topsoil and adjacent resources and to minimize soil erosion. Practices may include containing excavated material, protecting exposed soil and stabilizing restored material, and re-vegetating areas as necessary.
- Existing roads and previously disturbed lands will be used where feasible to reduce vegetation impacts within the project area. Surface disturbance will be limited to that which is necessary for safe and efficient construction.
- All surface-disturbed areas will be restored to the approximate original contour and reclaimed in accordance with easement agreements.
- Removal or disturbance of vegetation will be minimized through site management (e.g., by utilizing previously disturbed areas, designating limited equipment/materials storage yards and staging areas, scalping) and reclaiming all disturbed areas not required for operations.
- No construction or routine maintenance activities will be conducted when soil is too wet to adequately support construction equipment (i.e., if such equipment creates ruts in excess of 4 inches [10 cm] deep).
- Soil erosion control measures will be monitored, especially after storms, and will be repaired or replaced if needed.
- Construction activities in areas of moderate to steep slopes (≥15 to 20 percent) will be avoided, where possible.

Site Management

- To avoid attracting eagles and other raptors, the availability of carrion will be reduced by removing carcasses and gut piles discovered on-site during regular maintenance and monitoring activities. O&M vehicles will be equipped with shovels so that carrion, if discovered, can be immediately buried. Alternatively, O&M personnel may pick up the carrion and dispose of it at an appropriate off-site facility, or may call the West Virginia Department of Transportation to collect deer carcasses.
- BRE will work with MeadWestvaco to provide information to hunting clubs that use the site regarding the importance of removing carcasses and removing or burying gut piles before leaving the site.
- Hunting, fishing, dogs, or possession of firearms by BRE's employees and designated contractor(s) in the project area will be prohibited during construction, operation, and maintenance.
- Project personnel will be advised regarding speed limits on roads (25 mph) to minimize wildlife mortality due to vehicle collisions.

- Potential increases in poaching will be minimized through employee and contractor education regarding wildlife laws. If violations are discovered, the offense will be reported to the WVDNR, and the offending employee or contractor will be disciplined and may be dismissed by BRE and/or prosecuted by the WVDNR.
- Travel will be restricted to designated roads; no off-road travel will be allowed except in emergencies.
- The project site will be monitored during routine O&M activities for perches or trees adjacent to cleared areas that are frequently used by eagles. If observed, these branches or trees will be removed.

Collision Risk

- Unguyed, tubular towers and slow-rotating, upwind rotors will be used.
- Practices suggested by the APLIC (2006) were used to ensure that the transmission line was designed and constructed in a manner to minimize bird collision and electrocution risk.
- Collection and communication lines will be buried.
- Any future meteorological towers erected at the site will be un-guyed.
- Turbine lighting will be minimized to that which is required by the Federal Aviation Administration (FAA) plus a low voltage, shielded light on a motion sensor at the entrance door to each turbine.
- The FAA typically requires every structure taller than 200 ft (61 m) above ground level to be lighted, but in the case of wind power developments, FAA allows a strategic lighting plan that provides complete conspicuity to aviators but does not require lighting every turbine. BRE will develop a lighting plan for the project to be submitted for FAA approval. An estimated 30 to 70 percent of the project's turbines will be designated for lighting with medium intensity dual red synchronously flashing lights for night-time use and daytime use, if needed.
- Upon issuance of the ITP, BRE will operate the project in accordance with approved turbine operational protocols that include raising the cut-in speed of all turbines at night. The purpose of this curtailment is to reduce mortality of bat species, including endangered bats.

Fencing

- Upon completion of construction, gates will be installed on private roads to restrict public access to turbine locations. The substation and O&M building will be fenced as required for public safety, but no other fencing is proposed at this time. The public will continue to have access to portions of the project area via public roads and private roads that are regularly open to the public.

Hazardous and Solid Wastes

- All applicable hazardous material laws and regulations existing or hereafter enacted or promulgated regarding regulated chemicals will be complied with, and a Spill Prevention, Control, and Countermeasure Plan will be implemented. The only hazardous chemicals anticipated to be on-site are the chemicals contained in diesel fuel, gasoline, coolant (ethylene glycol), and lubricants in machinery. These hazardous chemicals will not be stored in or near any stream, nor will any vehicle refueling or routine maintenance occur in or near streams. When work is conducted in and adjacent to streams, fuels and coolants will be contained in the fuel tanks and radiators of vehicles or other equipment.

- Construction activities will be performed using standard construction BMPs so as to minimize the potential for accidental spills of solid material, contaminants, debris, and other pollutants. Excavated material or other construction materials will not be stockpiled or deposited near or on stream banks.
- No burning or burying of waste materials will occur at the project site. The contractor will be responsible for the removal of all waste materials from the construction area. All contaminated soil and construction debris will be disposed of in approved landfills in accordance with appropriate environmental regulations.

Fire Protection

- A fire protection system will be implemented, using industrial best practices, and in accordance with all applicable fire safety codes. BRE will coordinate with fire, safety, and emergency personnel during all stages of the project to promote efficient and timely emergency preparedness and response.
- A representative will be designated to be in charge of fire control during construction. The fire representative will ensure that each construction crew has appropriate types and amounts of fire fighting tools and equipment, such as extinguishers, shovels, and axes available at all times.
- At all times during construction and operation, satisfactory spark arresters will be maintained on internal combustion engines.

Weeds

- Certified weed-free straw mulches, certified weed-free hay bale barriers, silt fences, and water bars will be used to control soil erosion.
- Mechanical measures will be used to control noxious weeds in all surface-disturbed areas.
- Equipment will be washed at a commercial facility prior to construction and on-site during construction if noxious weeds are encountered in the project area.

Noise

- Effective exhaust mufflers will be installed and properly maintained on all construction equipment.
- BRE will require construction contractors to comply with federal limits on truck noise. Construction activities will take place mostly during daylights hours. Construction contractors will be required to ensure their employee and delivery vehicles are driven responsibly. BRE and its contractors will adhere to a project-wide speed limit of 25 mph or lower depending on the requirements of the specific equipment utilizing the roads. Nighttime construction work will be minimized, and when it does occur, it generally will be limited to relatively quiet activities.

3.0 EXISTING ENVIRONMENT

3.1 Overview

The project area lies within the Central Appalachian Broadleaf Forest Ecological Subregion (Bailey 1997, McNab and Avers 1994). Within this subregion, the project is located in the southern portion of the Allegheny Mountains ecological section. The Allegheny Mountains section comprises part of the Appalachian Plateau physiographic province and is characterized by a dissected plateau of high ridges, low mountains, and narrow valleys. Bedrock is covered by residuum on the ridges and mountain tops, colluvium on the slopes, and alluvial materials in the valleys. Devonian shale and siltstone, Mississippian

carbonates and sandstones, and Pennsylvanian shale, sandstone, and coal form the bedrock. Sandstone and sturdy carbonates support upland areas, and weaker carbonates and shale underlie valleys (McNab and Avers 1994).

Vegetation of the Allegheny Mountains section is categorized in four forest groups influenced by elevation and aspect: red spruce (*Picea rubens*), northern hardwoods, mixed mesophytic, and oak (*Quercus* sp). Red spruce forest is characteristic above 3,500 ft (1,060 m) and includes common associates such as American beech (*Fagus grandifolia*) and yellow birch (*Betula alleghaniensis*). The northern hardwood forests include sugar maple occurring with beech and black cherry. Mixed mesophytic forest occurs in the transition zones to drier forest types, and dominant species include red oak (*Quercus rubra*), basswood (*Tilia americana*), white ash, and tulip poplar (*Liriodendron tulipifera*). Oak forests are typically found on drier slopes and are characterized by red and white oak (*Quercus alba*) (McNab and Avers 1994). Approximately three-quarters of Greenbrier County, West Virginia, are forested (BHE 2006).

Precipitation in the Allegheny Mountains typically ranges from 45 to 60 inches (114 to 152 cm) per year with approximately 20 to 30 percent being snowfall. Monthly average temperatures range from 39 to 54°F (4 to 12°C). The growing season ranges from 140 to 160 days (USDA-FS 1994). Within the project area, the dominant soil types belong to the Dekalb-Gilpin stony complex (Gorman et al. 1972).

3.2 Pre-construction Avian Surveys

Pre-construction avian surveys were conducted on the project site in 1994, 2004, 2005, and 2011. The first of these surveys was a raptor migration study that was conducted in the fall of 1994 (HawkWatch International 1995). During the study, 14 raptor and vulture species were identified in the project area. No large concentrations of migrating raptors were observed. A total of 974 raptors and vultures was observed during 476.5 hours on selected days in September through November, yielding an overall passage rate of 204 raptors/vultures per 100 hours (two raptors/vultures per hour). The most common species observed were red-tailed hawks (*Buteo jamaicensis*), turkey vultures (*Cathartes aura*), and sharp-shinned hawks (*Accipiter striatus*). These species comprised 33 percent, 16 percent, and 16 percent, respectively, of the total observations.

In 2004, a desktop analysis was conducted to evaluate the risk of avian impacts at the project site (Curry and Kerlinger, L.L.C. 2004). The analysis determined that, based on available maps, literature review, and knowledge of the region, the project site does not appear to be situated on a major or well-used migration pathway for any of the major types of birds, including hawks, waterfowl, shorebirds, and other birds. The habitats within the project boundary are not suggestive of important stopover sites or sites used by large concentrations of shorebirds, waterfowl, songbirds, or other types of avian migrants, although there is certainly some migration of many types of birds over the site. As a result, the report concluded that wind power development in the project area would have minimal impacts on bird populations.

During the spring and fall of 2005, an avian study was conducted that included fixed-point count surveys, raptor surveys, a nocturnal bird survey, and mist-netting. The number of birds, mean use, percent composition, and frequency of use from the 2005-2006 study were calculated from the bird survey data to

characterize the avian community and assess potential impacts (Table 1). Important findings from the studies are provided in the following bullets.

Table 1 Avian Survey Data Collected During 2005-2006 Fixed-point Surveys

Group	Spring				Fall			
	No. of Birds Observed	Mean Use	% Composition	% Frequency	No. of Birds Observed	Mean Use	% Composition	% Frequency
Waterfowl	15	0.009	0.18	0.31	10	0.004	0.09	0.09
Upland Gamebirds	74	0.039	0.81	2.65	201	0.048	1.11	1.80
Raptors	66	0.043	0.90	2.87	561	0.170	3.93	12.75
Vultures	300	0.164	3.42	6.03	829	0.248	5.74	7.78
Doves	49	0.045	0.94	1.61	40	0.018	0.42	0.56
Cuckoos	27	0.032	0.67	1.40	12	0.003	0.07	0.35
Nightjars	2	0,001	0.02	0.10	94	0.028	0.65	0.44
Swifts/Hummingbirds	14	0.012	0.25	0.52	35	0.010	0.23	0.56
Woodpeckers	188	0.156	3.26	8.83	352	0.104	2.41	7.22
Flycatchers	186	0.135	2.82	8.88	354	0.102	2.36	9.19
Vireos	537	0.374	7.81	22.13	314	0.092	2.13	8.10
Corvids	559	0.424	8.85	21.25	1,904	0.556	12.86	33.52
Swallows	29	0.018	0.38	0.73	25	0.005	0.12	0.12
Titmice/Chickadees	295	0.216	4.51	12.05	300	0.086	1.99	4.86
Nuthatches/Creepers	105	0.089	1.86	4.83	148	0.044	1.02	3.03
Wrens	64	0.060	1.25	2.80	62	0.016	0.37	1.33
Kinglets/Gnatcatchers	35	0.035	0.73	1.45	160	0.041	0.95	2.62
Thrushes	602	0.531	11.08	23.79	1,300	0.388	8.98	1.26
Mimids	134	0.146	3.05	6.49	216	0.059	1.36	5.30
Starlings	12	0.006	0.13	0.26	3,009	0.886	20.50	0.41
Waxwings	199	0.147	3.07	5.82	709	0.209	4.83	4.04
Warblers	1,025	1.091	22.77	40.99	1,523	0.450	10.41	22.65
Tanagers	97	0.094	1.96	4.68	22	0.006	0.14	0.44
Grassland/Sparrows	929	0.723	15.09	12.56	1,817	0.543	37.87	29.07
Blackbirds	89	0.087	1.82	3.27	1,068	0.319	7.38	0.41
Finches	149	0.113	2.36	6.23	321	0.094	2.17	1.94
Total	**5,781**				**15,386**			

Mean use = Number of observations per plot per 10-minute survey
% Composition = Mean use divided by total use for all species
% Frequency = Percent of surveys in which the species was recorded
Source: Canterbury 2006

- A total of 124 avian species was recorded in the project area. The total number of species and individuals observed was higher in the fall (121 species observed) than in the spring (100 species observed).
- Passerines were the most numerous group observed and comprised 87.3 percent and 79.6 percent of the total birds observed in the spring and fall, respectively.
- The most numerous species (number of observations) observed included red-eyed vireo (*Vireo olivaceus*), American crow (*Corvus brachyrhynchos*), turkey vulture, American robin (*Turdus migratorius*), yellow-rumped warbler (*Dendroica coronata*), blue jay (*Cyanocitta cristata*), European starling (*Sturnus vulgaris*), common grackle (*Quiscalus quiscula*), and cedar waxwing (*Bombycilla cedrorum*).

- A total of 366 raptors and vultures was observed during spring fixed-point surveys, 82 percent (300 observations) of which were vultures. Approximately 36 percent of the raptors and 66 percent of the vultures were observed to be in the rotor-swept zone during spring surveys.
- A total of 1,390 raptors and vultures was observed during fall fixed-point surveys, 60 percent (829 observations) of which were vultures. Approximately 73 percent of the raptors and 83 percent of the vultures were observed to be in the rotor-swept zone during fall surveys.

The 2005-2006 avian study concluded that the project area does not appear to contain unique situations or habitat features that would result in higher-than-expected concentration of birds and therefore potential avian mortality. The study found no major flyways or key concentration areas of spring or fall migrants. Overall, the results of spring and fall studies suggest low probability of significant adverse impacts, as defined by the LWEG (USFWS 2012), to species of concern , which, for the purposes of this APP include eagles or other migratory birds.[2]

Between March 15 and May 31, 2011, additional avian surveys were conducted at the Beech Ridge project site and the adjacent proposed expansion area, including fixed point surveys for ospreys, eagles, and raptor migration.

The surveys of the existing Beech Ridge site were intended to fulfill the WVPSC siting certificate post-construction monitoring requirement to investigate use of the site by ospreys. As the Beech Ridge project site does not have any summer habitat for ospreys (e.g., large rivers or reservoirs), spring raptor migration surveys were conducted within the existing project site to survey for migrant ospreys, eagles, and other raptors moving through the area (Young et al. 2011a). These raptor migration surveys were conducted at five survey stations. Between March 16 and May 13, 2011, 135 surveys were completed. All surveys were conducted between the hours of 0900 and 1600 on days conducive to raptor migration. Overall mean use for all raptors, including vultures, was 3.60 birds per observer hour, and overall species richness was 1.34 raptor species per survey. Overall mean raptor use, excluding vultures, was 0.62 birds per observer hour. During the surveys, only one osprey was observed, for a mean use of less than <0.01 osprey per observer hour. Six golden eagles and one bald eagle were observed for a use estimate of 0.04 eagles per observer hour.

Surveys at the proposed expansion area for the project included fixed-point avian use surveys and raptor migration surveys (Young et al. 2011b). Eighty species were observed over the course of the avian use surveys between April 8 and May 31, 2011. There were 2,552 observations in 2,086 separate groups (defined as one or more individuals) during the avian use surveys. Mean species richness was 3.62 bird species per 10-minute survey per plot. Ninety percent of observations were of passerines. Eastern towhee (*Pipilo erythrophthalmus*) and ovenbird (*Seuirus aurocapillus*) were the most commonly observed passerines with 292 observations recorded (11.4% of overall bird observations) and 184 observations (7.2% of overall bird observations), respectively. Other common species observed with more than 100

[2] This definition of species of concern is consistent with the more encompassing definition presented in the LWEG and with BRE's RMAMP. Under the RMAMP, fatalities of all birds will be recorded and analyzed (see Appendix C in the HCP), and if fatalities are greater than predicted, adaptive management measures will be implemented (see Section 5.0 below).

observations included red-eyed vireo, dark-eyed junco (*Junco hyemalis*), chestnut-sided warbler (*Dendroica pensylvanica*), and black-throated green warbler (*Dendroica virens*). The most abundant non-passerine bird species observed were turkey vulture with 47 observations and pileated woodpecker (*Dryocopus pileatus*) with 24 observations.

Raptor migration surveys were conducted in the proposed expansion area from March 17 through May 31, 2011, at three survey stations, three times per week, for a total of 98 surveys completed. All surveys were conducted on days conducive to raptor migration and occurred between 0900 and 1600. Eleven raptor species were observed during the surveys, for an overall mean species richness of 1.72 species per survey. Overall mean raptor use, including vultures, was 4.88 raptors per observer hour. Excluding vultures, mean use of diurnal raptors was 1.25 raptors per observer hour. The most common species observed during the expansion area raptor migration surveys were turkey vulture with 483 observations, red-shouldered hawk (*Buteo lineatus*) with 71 observations, and broad-winged hawk (*Buteo platypterus*) with 47 observations. No bald eagles and seven golden eagles were observed during the 2011 surveys of the expansion area. None of the golden eagles were observed flying in the rotor-swept area.

3.3 Federal- and State-listed Species

No ESA-listed or candidate threatened or endangered avian species are of potential occurrence in Greenbrier County or Nicholas County (http://www.fws.gov/endangered/). Fifty-seven avian species are considered rare or threatened by the State of West Virginia (WVDNR 2007, Appendix A). Thirty-three of the state-listed species were observed in the project area during pre-construction surveys. For most of these species, less than 15 individuals were observed in the project area during spring and fall surveys. Exceptions include black vulture (*Coragyps atratus* – 45 observations), blackburnian warbler (*Dendroica fusca* – 60 observations), and Swainson's thrush (*Catharus ustulatus* – 151 observations). Seventy-four bird species are listed in the state's Wildlife Conservation Action Plan (Brown et al. 2005)(Appendix A) as in greatest need of conservation, and of these, the same low numbers of 33 species have been observed on site during pre-construction surveys..

3.4 Bald and Golden Eagles

Both the bald and golden eagle are known to migrate through the project area, and golden eagles potentially winter in the project area, but no suitable nesting habitat for either species has been identified in or occurs in the project area (Curry and Kerlinger, LLC 2004). Discussions regarding habitat and observations of bald and golden eagles in the vicinity of the project are provided below.

Bald Eagle

The bald eagle is relatively common in the eastern U.S. It nests in or adjacent to large bodies of water, such as major rivers or lakes, where it feeds largely on fish and waterfowl. These birds are known to travel over wide areas and visit lakes, rivers, and large waterways throughout the eastern U.S. (Curry and Kerlinger, LLC 2004, Potesta & Associates, Inc. 2005). The project area consists of mountainous uplands with no major rivers or lakes. Summersville Lake, the closest potential nesting, wintering, or stopover habitat for the bald eagle is approximately 17 miles northwest of the project area. The closest relatively large rivers include Greenbrier River, located approximately 20 miles south of the site, and Gauley,

Laurel and Cherry Rivers, located within approximately 12 miles to the north of the site (Curry and Kerlinger, LLC 2004). The following bullets summarize bald eagle sightings during studies in the project area.

- In 1994, one bald eagle was observed migrating through the Beech Ridge project area during the fall (HawkWatch International 1994).
- In 2005, three bald eagles were documented in the project area during the fall season (Canterbury 2006).
- In the spring of 2011, one bald eagle was observed in the project area.

As a comparison, at the Hanging Rock Raptor Observatory located on Peter's Mountain approximately 30 miles southeast of the project site (Monroe County, WV), three bald eagles were observed during the fall 1994 migration period, 33 bald eagles were observed during the fall 2005 migration period, and 71 bald eagles were observed during the fall 2009 migration period (Hanging Rock Raptor Observatory 2011). The Hanging Rock Raptor Observatory is located on the Allegheny front in forested areas. Data from the site show that bald eagles migrate through the region and may use other portions of the region more than the Beech Ridge area. However, the data may suggest that migration through an area may vary from year to year.

The project area does not provide suitable nesting habitat for the bald eagle. Although they are known to migrate through the region, bald eagles are not known to concentrate in the project area and the expected number of bald eagles migrating through the project area is low (Curry and Kerlinger 2004, Canterbury 2006).

To date, there are four documented bald eagle fatalities and one injury (the eagle survived but will not be released back into the wild) at modern wind farms (Van Fleet 2010; U.S. Department of Agriculture, Rural Utilities Service and U.S. Department of Energy, Western Area Power Administration 2010; pers. comm. with Sarah Nystrom, USFWS, October 2011; Iowa Department of Natural Resources 2011; pers. comm. with Laura Hill, USFWS, April 2012). There have been no documented bald eagle fatalities at Appalachian Mountain wind farms (e.g., Fiedler et al. 2007, Kerns and Kerlinger 2004, Nicholson et al. 2005, Young et al. 2011c).

Based on the lack of nesting and foraging habitat in the project area, low use documented within the project area, and the very low fatality rates observed at wind farms, it is unlikely that take of bald eagles would occur at the Beech Ridge Project.

Golden Eagle

The golden eagle currently has no documented breeding pairs in the eastern U.S., with the last known nesting pair occurring in western Maine in 1998. Fewer than 30 individual breeding territories have been documented in the eastern U.S., primarily in New York, New Hampshire, and Maine (U.S. Department of Agriculture-Forest Service [USDA-FS] 2011). The number of golden eagles in the eastern U.S. increases in the winter as hundreds of eagles from Canada migrate into the U.S. and winter from New York south to Virginia and West Virginia primarily in the Appalachian Mountain region. Golden eagles typically nest in

cliffs or large trees generally overlooking grasslands or open country. The project area is forested and not suitable for nesting golden eagles; however, golden eagles are known to winter throughout the mountains in West Virginia. The following bullets summarize golden eagle sightings during studies in the project area.

- In 1994, seven golden eagles were observed migrating through the Beech Ridge project area during the fall (HawkWatch International 1994).
- In 2005, one golden eagle was documented in the project area during the fall (Canterbury 2006).
- During a telemetry study conducted in the region, one golden eagle was recorded, in December 2006, as crossing the Beech Ridge project area (pers. comm. with Todd Katzner, West Virginia University, November 2011).
- In the spring of 2011, seven golden eagles were observed in the project area.

As a comparison, at the Hanging Rock Raptor Observatory located on Peter's Mountain, two golden eagles were observed during the fall 1994 migration period, six golden eagles were observed during the fall 2005 migration period, and 28 golden eagles were observed during the fall 2009 migration period (Hanging Rock Raptor Observatory 2011). The Hanging Rock Raptor Observatory is located in a similar forested area on the Allegheny front. These data show that golden eagles migrate through the region and may use other portions of the region more than the Beech Ridge area. However, the data may suggest that migration through an area may vary from year to year.

The project area does not provide suitable nesting habitat for the golden eagle, golden eagle use of the project area is low during the late spring through early fall. Golden eagles, though present, are not known to concentrate in the project area during migration. Though use of the project area by wintering golden eagles is currently unknown, golden eagles have been documented using areas surrounding the project area (pers. comm., with Todd Katzner, West Virginia University, November 2011). Raptor use surveys will be conducted, weather permitting, during the fall/winter of 2011/2012 to provide additional information. There have been no documented golden eagle fatalities at Appalachian Mountain wind farms (e.g., Fiedler et al. 2007, Kerns and Kerlinger 2004, Nicholson et al. 2005, Young et al. 2011c), suggesting that risk to golden eagles in the eastern U.S. may be low.

4.0 UNAVOIDABLE IMPACTS

Impacts to avian species from wind energy projects may include direct impacts, which include direct mortality resulting from collisions during construction and operation, as well as indirect impacts such as habitat loss/fragmentation and disturbance/displacement of individuals from converted habitats and areas near project infrastructure.

4.1 Direct Impacts – Avian Collision and Mortality

4.1.1 Construction-related Mortality

The project could result in the direct mortality of birds and other wildlife during construction. Incidental mortality from construction activities could include the destruction of nests, eggs, or young, as well as

collisions with vehicles and construction equipment. To minimize the potential for the destruction of nests, eggs, and young, clearing of trees would be conducted outside the nesting season, with the exception of 15 acres of trees that may be cleared during the nesting season. If clearing is required during the nesting season, habitats will be surveyed for nests by a trained biologist prior to clearing. If an active nest is found, an appropriate buffer would be established around the nest until the young have fledged.

To minimize mortality associated with vehicle collisions or other construction-related activities, project personnel will be advised regarding speed limits on roads (25 mph). In addition, all supervisory construction personnel will be instructed on the protection of wildlife resources including (1) federal and state laws regarding plants and wildlife, including collection and removal, and (2) the importance of these resources and the purpose and necessity of protecting them. This information would be disseminated through the contractor hierarchy to ensure that all appropriate staff members are aware of the correct procedures and responsibility to report wildlife incidences.

With the implementation of the above measures, avian mortality resulting from construction activities is expected to be minimal.

4.1.2 Operation-related Mortality

Collision with various man-made structures can be a significant source of bird mortality (**Table 2**; Trapp 1998, Kerlinger 2000, Shire et al. 2000, Erickson et al. 2001). Nationwide, wind turbines are responsible for 0.01 to 0.02 percent of all avian fatalities due to human structures (Erickson et al. 2001, 2002, 2005).

Table 2 Estimated Annual Avian Mortality from Anthropogenic Causes in the U.S.

Mortality Source	Estimated Annual Mortality
Collisions with buildings	97-976 million
Collisions with power lines	130-174 million
Depredation by domestic cats	100 million
Automobiles	80 million
Pesticides	67 million
Communication towers	4-50 million
Oil pits	1.5-2 million
Wind turbines	20,000-37,000

Source: Erickson et al. 2005

In 2003, an estimated 20,000 to 37,000 birds were killed by approximately 17,500 wind turbines in the United States (Erickson et al. 2005). Fatalities ranged from zero to about nine birds/turbine/year (b/t/y), with an overall average of 2.1 b/t/y (Erickson et al. 2005). Studies have shown avian mortality rates to be consistent across wind energy facilities, both nationally and by region. The number of avian fatalities at wind energy facilities is generally low when compared to the total number of birds observed at these sites (Erickson et al. 2002). Although avian collision mortality can occur during both the breeding and migration seasons, patterns in avian mortality at tall towers, buildings, wind turbines, and other man-made structures suggest that the majority of fatalities occur during the spring and fall migration periods (NRC 2007). Limited data from existing wind facilities suggest that migrant species represent roughly half of documented fatalities, while resident species represent the other half (NRC 2007).

Studies from the eastern U.S. indicate that avian mortality rates have generally been higher and more variable in the eastern U.S., with collision mortality rates ranging from 0 to approximately 10 b/t/y (Erickson et al. 2008). Review of mortality rates from 23 studies at wind energy facilities in the eastern U.S. indicate that mortality rates tend to be higher at facilities sited in forested habitat, ranging from 1.35 to 5.85 b/t/y (2.7 to 11.7 birds per MW per year [b/MW/y]; conversely, raptor mortality rates in forested habitat have been lower than in other habitats, ranging from 0 to 0.01 b/t/y (0 to 0.02 b/MW/y) (Erickson et al. 2008). For a regional comparison with the Beech Ridge site, other wind projects located in the Allegheny Mountains ecological section include the Mount Storm and Mountaineer wind projects in West Virginia and the Casselman, Locust Ridge II, and other wind projects in Pennsylvania (Table 3). Fatality rates at these projects ranged from 0 to15.69 and averaged of 5.62 birds/turbine/year. .

Table 3 Estimates of Annual Avian Mortality from High Elevation Forested Ridgelines or Escarpments in the Central Appalachians[1]

Site and state	No. turbines	Habitat	Dates surveyed	Estimated mortality rate	CI for mortality rate	Annual project mortality range based on CI	Reference
Studies where modified Shoenfeld estimator was used :							
Mountaineer, West Virginia	44	forested ridgeline	Apr 4 – Nov 11, 2003	4.04	2.41-8.33	106-367	Kerns and Kerlinger, (2004)
Mount Storm, West Virginia	132	forested ridgeline	Mar 23 – Oct 8, 2009	8.74	5.12-12.77	676-1,686	Young et al. (2009b, 2010a)
Mount Storm, West Virginia	132	forested ridgeline	Apr 16 - Oct 15, 2010	6.74	3.92-10.03	517-1,324	Young et al. (2010b, 2011c)
Mount Storm, West Virginia	132	forested ridgeline	Apr 12 – Oct 15, 2011	8.49	6.59-12.36	870-1,632	Young et al. (2011d, 2012)
Casselman, Pennsylvania	23	forested ridgeline	Apr 19 - Nov 15, 2008	2.27	0.88-3.92	20-90	Arnett et al. (2009a), Librandi-Mumma and Capouillez 2011
Casselman, Pennsylvania	23	forested ridgeline	Apr 1 - Nov 15, 2009	4.32	2.67-6.44	61-148	Arnett et al. (2010), Librandi-Mumma and Capouillez (2011)
Locust Ridge II, Pennsylvania	51	forested ridgeline	Apr 1 – Nov 15, 2009	1.62	0.83-2.93	42-149	Arnett et al. (2011), Librandi-Mumma and Capouillez (2011)
Locust Ridge II, Pennsylvania	51	forested ridgeline	Apr 1 – Nov 15, 2010	1.51	0.64-2.61	33-133	Arnett et al. (2011)
Site 6-3, Pennsylvania	nr	forested ridgeline or escarpment	May 1 – Nov 17, 2007	1.8	nr	-	Librandi-Mumma and Capouillez (2011)
Site 6-3, Pennsylvania	nr	forested ridgeline or escarpment	Apr 1 – Nov 15, 2008	2.4	nr	-	Librandi-Mumma and Capouillez (2011)

Table 3 Estimates of Annual Avian Mortality from High Elevation Forested Ridgelines or Escarpments in the Central Appalachians[1]

Site and state	No. turbines	Habitat	Dates surveyed	Estimated mortality rate	CI for mortality rate	Annual project mortality range based on CI	Reference
Site 2-14, Pennsylvania	nr	forested ridgeline or escarpment	Apr 1 – Nov 15, 2008	6.5	3.80-10.10	--	Librandi-Mumma and Capouillez (2011)
Site 2-14, Pennsylvania	nr	forested ridgeline or escarpment	Apr 1 – Nov 15, 2009	5.0	3.30-6.90	--	Librandi-Mumma and Capouillez (2011)
Site 2-10, Pennsylvania	nr	forested ridgeline or escarpment	Apr 1 – Nov 15, 2008	1.3	0.00-3.20	--	Librandi-Mumma and Capouillez (2011)
Site 2-4. Pennsylvania	nr	forested ridgeline or escarpment	Apr 1 – Nov 15, 2009	9.8	2.70-12.40		Librandi-Mumma and Capouillez (2011)
Average for projects using the modified Shoenfeld estimator (14 studies)				4.61	0-12.77		
Sites where Huso estimator was used:							
Casselman, PA	23	Forested ridgeline	Apr 19 – Nov 15, 2008	4.69	1.25 – 14.31	29 -329	Arnett et al., 2009
Casselman, PA	23	Forested ridgeline		8.68	4.76 – 15.69	109 - 361	Arnett et al 2010
Locust Ridge II, PA	52	Forested ridgeline	Apr 1 – Nov 15, 2009	4.05	1.73 – 13.62	88-695	Arnett et al 2011
Locust Ridge II, PA	52	Forested ridgeline		2.20	0.82 – 4.52	42-320	Arnett et al 2011
Average for project using the Huso estimator (4 studies)				4.9	0.82 – 15.69		
Overall bird fatalities in birds/turbine/yr using the higher estimator for the study when more than one estimator was provided (14 studies)				5.32	0 – 15.69		

[1] All studies met the criteria of (1) having a study period covering spring, summer and fall field seasons when most bird mortality is expected to occur; (2) fatality estimates based on contemporaneous equations corrected for searcher efficiency and scavenger removal biases; (3) turbines searched daily; and (4) at least 10 turbines searched. Operational cut-in speeds also were similar (3 to 4 m/s).

Bird groups have experienced varied impacts from wind turbines, which is likely due to differences in abundance and use of habitat. Based on 24 post-construction mortality studies conducted at 19 different locations in the eastern and Midwestern U.S., passerines (both resident and migrant) represented 72.4 percent of documented fatalities in the region and therefore are likely to constitute the greatest number of fatalities at the Beech Ridge facility. At the Beech Ridge facility, passerines comprised 86.4 percent of the total birds observed during pre-construction bird surveys within the project area (Canterbury 2006). Night-migrating passerines may be at a higher risk, as most passerine fatalities recorded in the region were believed to occur during nocturnal migration due to the seasonality and timing of fatality events. Pre-construction bird surveys at Beech Ridge documented almost 11,000 nocturnal migrants from May 13 to 31 and September 9 to October 5, 2005 (Canterbury 2006),

indicating that high volumes of nocturnally migrating passerines are expected to pass through the project area during the spring and fall migration periods. Recent radar surveys conducted at proposed wind energy facilities in the Allegheny Mountains region have documented nightly mean flight altitudes of migrating passerines to range from 702 ft to 2,523 ft [214 m to 769 m] above ground, which is well above the height (492 ft or 150 m) of the existing and proposed Beech Ridge turbines. In addition, one of the studies showed that fall migrants tend to cross ridgelines rather than follow them (Mabee et al. 2006).

As with most wind farms, some night-migrating passerine fatalities are likely to occur at the proposed Beech Ridge turbines. Birds taking off at dusk or landing at dawn, and birds traveling at lower flight altitudes due to low cloud or fog conditions are likely at the greatest risk of collision (Kerlinger 1995). However, fatalities of night-migrating passerines at Beech Ridge are still expected to affect a very small percentage of the overall number of nocturnally migrating passerines flying through the area (Erickson et al. 2002). Nationally, these mortalities have not been known to result in a significant population level impact to any one species, mainly because the species with relatively high collision mortality are regionally abundant.

Based on the observed presence of raptors within the proposed rotor-swept zone at the Beech Ridge site during pre-construction surveys (Canterbury 2006), raptor fatalities may occur at the Beech Ridge project. However, risk to raptors from the project is likely to be low for a number of reasons. First, no major migration flyways were identified in the project area; raptor passage rates ranged from 0.10 birds/hr to 14.0 birds/hr on the ridges (Canterbury 2006). Second, outside of California (where rates are greatly influenced by the high-fatality Altamont site), nationwide raptor mortality rates average 0.006 b/t/y (Erickson et al. 2002). Mortality at wind energy facilities located along forested ridgelines has been documented as slightly lower than in other habitats, ranging from 0 to 0.01 b/t/y. Finally, modern wind farms have avoided/minimized impacts to raptors by using tubular towers, which eliminate perching by raptors, and large blades, which reduce motion blur and thus are more visible. In addition, studies have documented high raptor collision avoidance behaviors at modern wind facilities (Whitfield and Madders 2006, Chamberlain et al. 2006).

No predictive model exists to quantify expected avian collision mortality rates at wind energy facilities. Therefore, risk assessments must qualitatively consider a combination of pre-construction indices and indicators of risk, including habitat assessment, breeding bird and raptor migration surveys, and observed avian flight behaviors. Pre-construction surveys for the Beech Ridge facility revealed no indicators of elevated risk (e.g., unusually high abundance, ecological attractants [i.e., habitat at the site is common in the region], migratory routes or stopover habitat, abundance of rare species). Therefore, collision risk at the project site is likely to be consistent with other wind energy facilities located on forested ridgelines in the eastern U.S. If mortality is consistent with the regional average fatality rate of 5.85 birds/turbine/year in forested areas, this project is likely to take a maximum number of 585 birds per year.

Meteorological Towers

Other possible risks to birds may result from collisions with the meteorological (met) towers that have been and will be constructed in the project area. Data on met tower impacts to birds indicate that, overall, the average number of bird fatalities per year is similar for met towers as for turbines; however, at one site

in Wyoming, average avian mortality was three times greater at guyed met towers than at the turbines (Young et al. 2003). Studies conducted at unguyed met towers have reported no avian mortalities at those towers.

More data on bird fatalities is available for communications towers. Avian mortality at communication towers varies greatly depending on tower height, lighting, color, structure, and the presence of guy wires (The Ornithological Council 2007). Although variable across habitats, the majority of collision fatalities at communications towers consist of passerines, particularly night migrants. Reported mortality rates at guyed communication towers 380 to 480 ft (115 to 146 m) tall range from one bird per tower per 20 days to 12.3 birds per tower per 20 days, depending on the type of lighting on the tower – white strobe lighting typically results in the lowest mortality rate (The Ornithological Council 2007). In addition to baseline mortality rates, single night mass mortality events periodically occur at lighted communications towers on cloudy nights.

Although avian fatalities could occur at the project's met towers, the likelihood of mass mortality events at the towers is considered low given the typical flight heights of nocturnal migrants in comparison to the towers.

4.2 Indirect Impacts

4.1.3 Habitat Loss/Fragmentation

Construction of wind energy facilities may impact birds through habitat loss or fragmentation. The removal of habitat and conversion of interior habitat to edge habitat during construction of turbines and associated facilities may permanently displace certain bird species from the project footprints. Construction of the 67-turbine phase resulted in the removal of approximately 50 acres of habitats (Table 4). The primary habitat lost was deciduous forest dominated by a mix of oaks, maples, black locust, and black cherry. In addition to lost habitat, the project converted approximately 336 acres of forested habitat to early successional communities, which would eventually revert to mature forest. Temporary land disturbances resulting from the construction of the existing 67 turbines and associated infrastructure have been reclaimed and revegetated so that natural succession could occur.

Table 4 Estimated Acres of Disturbance/Habitat Conversion for the 67- and 33-turbine Phases of the Project

Category	67-turbine Phase		33-turbine Phase		Total – 100 Turbines	
	Converted Habitat (ac)	Permanent Disturbance (ac)	Converted Habitat (ac)	Permanent Disturbance (ac)	Converted Habitat (ac)	Permanent Disturbance (ac)
Turbine assembly area/pad[1]	100	9	49	5	149	14
Existing roads to be upgraded[2]	39	–	29	–	68	–
New access roads to be constructed[3]	43	16	21	8	64	24
Staging area and batch plant[4]	0	0	0	0	0	0
Electrical and communication cable trenches[5]	8	8	3	3	11	11
Overhead Transmission Line[6]	140	11	19	2	159	13
Substation, O&M Facility, and permanent meteorological towers[7]	6	6	3	3	9	9
Totals	**336**	**50**	**124**	**21**	**460**	**71**

[1] Based on 150-ft (46-m) radius during construction minus a 40-ft by 120-ft (12-m by 37-m) crane pad area plus the 20-ft (6-m) radius maintained for operational purposes.

[2] Based on increasing existing road ROW by an additional 40 ft (12 m) for construction purposes and restoring these areas once construction is complete.

[3] Based on creating a new 60-ft (18-m) ROW during construction. After construction the ROW would be reduced to 16 ft (5 m) for operations.

[4] Staging area and batch plant constructed for 67 turbines phase covered approximately 12 acres. BRE constructed this area in an existing agricultural field and fully restored it upon completion of construction. BRE anticipates using this site for the same purpose for the 33-turbine phase. Area does not result in habitat conversion or permanent disturbance.

[5] Calculation based on 4-ft (1-m) wide disturbance area primarily located along project road ROWs. Two-foot disturbance areas used for permanent impact.

[6] Existing transmission line is approximately 14 miles long, which required approximately 11.5 mi of habitat disturbance due to BRE's successful efforts to locate 2.5 miles of the line within reclaimed strip mine areas. Permanent impact associated with existing transmission line is based on an 8-ft (2-m) access road for the length of the line. A supplementary 1.6-mile long transmission line could be required for the 33-turbine phase. Each line would have a construction ROW width of 100 ft (30 m) and permanent ROW of 50 ft (15 m).

[7] Calculations based on having 1 acre for the substation, 2 acres for O&M facility and 1.5 acres for each permanent met tower (assumes two permanent met towers for each phase).

The 33 turbines to be constructed would be built in deciduous forest that provides habitat for a number of avian species. Based on the current infrastructure layout, approximately 21 acres of forest would be removed by facility construction. In addition, the 33-turbine phase would convert approximately 124 acres of forested habitat to early successional communities that would eventually revert to mature forest.

Compared to facilities constructed in agricultural landscapes, wind facilities in contiguously forested landscapes create disruptions in habitat associated with turbine pad clearings, new roads, and transmission lines. While the Beech Ridge project would result in the loss of forested habitat, the forests in the project site have historically been affected by timber harvesting and surface mining and continue to experience periodic disturbances associated with logging, recreation, and prospecting. As a result, there are many clearings within the forested areas, and the forested areas are in different stages of succession. In addition, the forests are not unique to the region, and there are large areas of forest in the surrounding area. Indirect

impacts to habitats that would not be removed or converted by the project would be minimized during construction by preventing construction equipment from entering those areas.

4.1.4 Disturbance/Displacement

In addition to removing habitat, the Beech Ridge wind turbines may displace wildlife from an area due to creation of edge habitat, the introduction of vertical structures, and disturbances directly associated with turbine operation (e.g., noise and shadow flicker) (USFWS 2011b, Committee on Environmental Impacts of Wind-Energy Projects 2007). Impacts would be concentrated near turbine locations and along access roads, although available data indicate that avoidance of wind turbines by birds generally extends 245 to 2,625 ft (75 to 800 m) from a turbine, depending on the environment and the bird species affected (Strickland 2004). Interior forest species may be most affected (USFWS 2011b, Committee on Environmental Impacts of Wind-Energy Projects 2007). Forest birds and birds that use edges near forests observed in the project area that could be affected include black-billed cuckoo (*Coccyzus erythropthalmus*), whip-poor-will (*Caprimulgus vociferus*), red-headed woodpecker (*Melanerpes erythrocephalus*), yellow-bellied flycatcher (*Empidonax flaviventrus*), alder flycatcher (*Empidonax alnorum)*, brown creeper (*Certhia americana*), Swainson's thrush, golden-winged warbler (*Vermifora chrysoptera*), yellow-rumped warbler, and blackburnian warbler (Canterbury 2006).

Deciduous forest cover is the predominant land cover within 2.5 miles (4.0 km), 5 miles (8 km), and 20 miles (32 km) from the project area (Table 5). Forest interior nesting birds typically require minimum patch sizes of 500 ac or larger to maintain viable local breeding populations (Robbins et al. 1989). Although the project is predominantly forested and includes a mosaic of patches of forest and openings of different sizes and ages, it's not clear if the minimum requirements of the forest interior bird are satisfied or not (either pre-project or post project). However, all of the land upon which the Beech Ridge project is constructed and all land within the 2.5-mile (4.0-km) habitat analysis area is owned by one major landowner and several smaller landowners; is managed for timber production, coal mining and/or oil and gas exploration and production; and is eligible for timber harvest. Ongoing and future timber harvest activities will include periodic cutting within and around the Project area, so of the 6,860-acre easement held by Beech Ridge, any or all of the timber may be harvested by the landowners at any time. Because land use, which includes timber harvest, is not controlled by BRE, no post-construction studies regarding species of habitat fragmentation concern are proposed.

Table 5 Summary of Land Cover within 2.5 miles (4 km), 5 miles (8 km), and 20 miles (32 km) of the 100-turbine Project Area

Land Cover Type	Within 2.5 miles (4 km) of Project Area					
	Area 1[1]		Area 2		Area 3	
	Acres	Percent of 2.5 mile (4.0 km)	Acres	Percent of 2.5-mile (4.0-km) study area	Acres	Percent of 2.5-mile (4-km) study area
Open water	2	0.02	4	0.03	5	0.04
Developed	247	1.96	357	2.85	215	1.71
Barren land	211	1.68	286	2.28	206	1.64
Deciduous forest	11,761	93.60	11,795	93.86	11,706	93.16

Table 5 Summary of Land Cover within 2.5 miles (4 km), 5 miles (8 km), and 20 miles (32 km) of the 100-turbine Project Area

Evergreen forest	128	1.02	19	0.15	165	1.31
Mixed forest	181	1.44	85	0.67	201	1.6
Shrub scrub	0	0	0	0	0	0
Grassland/herbaceous	0	0	0	0	0	0
Pasture/hay	11	0.09	1	0.01	18	0.14
Cultivated crops	19	0.15	3	0.03	10	0.08
Wetlands	5	0.04	16	0.12	39	0.31
Totals	**12,566**	**100**	**12,566**	**100**	**1,164,668**	**100.00**

Land Cover Type	**Within 5 miles (8 km) of Project Area**		**Within 20 miles (32 km) of Project Area**	
	Acres	**Percent of 5-mile (8-km) study area**	**Acres**	**Percent of 20-mile (32-km) study area**
Open water	115	0.07	8,073	0.69
Developed	3,744	2.40	55,954	4.80
Barren land	2,057	1.32	8,502	0.73
Deciduous forest	142,434	91.32	905,834	77.78
Evergreen forest	1,469	0.94	40,200	3.45
Mixed forest	1,814	1.16	41,636	3.57
Shrub scrub	0	0	3	<0.01
Grassland/herbaceous	0	0	802	0.07
Pasture/hay	3596	2.31	86,189	7.40
Cultivated crops	495	0.32	13,683	1.17
Wetlands	256	0.17	3,791	0.32
Totals	**155,980**	**100.00**	**1,164,668**	**100.00**

[1] Since the project is more than 2.5 miles (4.0 km) wide/long, it was divided into three 2.5-mile (4.0-km) radius circles so that existing and proposed turbine locations were included in the 2.5-mile (4.0-km) analysis. The analysis was conducted using 2009 aerial photography and thus includes most disturbance from the 67-turbine project.

A review of the literature by Dooling (2002) on how well birds can hear in noisy (windy) conditions suggests that birds cannot hear the noise from wind turbine blades as well as humans can. In practical terms, a human with normal hearing can probably hear a wind turbine blade twice as far away as can the average bird. Although Dooling's study was intended to explore potential avoidance measures for birds (i.e., collision mortality), he found that birds habituate to acoustic disturbances and that blade noise becomes inaudible to some bird species at 82 ft (25 m) from the turbine, suggesting that impacts from noise may be minimal at these distances. It is anticipated that displaced species will return to the area after construction disturbance has been completed and birds have acclimated to turbine noise (USFWS 2011b).

4.3 Cumulative Impacts

Cumulative impacts associated with project operations are discussed in the USFWS EIS associated with the ITP.

5.0 POST-CONSTRUCTION MONITORING AND ADAPTIVE MANAGEMENT

BRE will implement a post-construction monitoring, adaptive management, and reporting program to estimate and evaluate avian mortality resulting from the project. The program would follow the protocol presented in the project's RMAMP (see Appendix C of the HCP) which is designed to detect bird and bat fatalities and to make defensible fatality estimates adjusted for field biases.

In addition, the WVPSC siting certificate issued for the project required a post-construction eagle and osprey study to be conducted. BRE and the TAC have determined that a contribution to an ongoing eagle study by Todd Katzner would be appropriate to meet this requirement for eagles. BRE is also conducting spring/fall 2011 and winter/spring 2012 surveys at the construction site, which address ospreys, eagles, and other raptors (see Section 3.2).

5.1 Monitoring

In addition to the goals described in the RMAMP (Appendix C in the HCP), BRE will analyze bird mortality monitoring data to:

- Determine bird and bat fatality rates for the project
- Determine fatality rates for species of concern
- Compare estimated fatality rates to predicted fatality rates
- Evaluate bird and bat fatalities within the project site in relation to site characteristics
- Compare fatality rates to fatality rates from existing projects in similar landscapes with similar species composition and use
- Determine the composition of fatalities in relation to migrating and resident birds and bats at the site, and
- Assess whether fatality data suggest the need for measures to reduce impacts.

In addition, BRE's O&M personnel will conduct weekly searches, year-round, for the presence of eagle carcasses and large-scale mortality events (defined in Section 4.2 below). During the HCP mortality monitoring period (April through November), O&M personnel will drive to all non-search turbines to check for readily-observable carcasses. Outside of the HCP monitoring period (i.e., December through March) O&M personnel will inspect areas around project turbines for readily-observable carcasses. O&M personnel will walk around the turbine base and visually scan the area for carcasses. Any carcasses found will not be used to develop estimates of mortality rates. O&M personnel searches will not be performed when weather conditions make turbines inaccessible in a standard road vehicle.

5.2 Adaptive Management

BRE's adaptive management plan, presented in the RMAMP (Appendix C to the HCP), includes evaluation of 1) baseline migratory bird mortality rates and 2) effects of various turbine operational protocols on migratory bird fatality rates. It will be applied to migratory birds as well as bats. Mortality monitoring will include three years of intensive bird carcass searches, bias adjustments, and calculated fatality estimates, by species, season, etc. followed by annual monitoring to evaluate mortality trends for

the life-of-project. The RMAMP also includes multiple years of testing effects of various turbine operational protocols on estimated fatality rates. Since daily monitoring will be conducted, BRE will also evaluate relationships between bird fatality rates and weather. Actions described below include an investigation of the probable causes of fatality events that could trigger the need for adaptive management, including weather events, turbine conditions, and other considerations. Combined, the RMAMP and APP provide a robust framework for assessing if the adaptive management triggers defined below have been reached. This APP also includes a commitment to evaluate possible off-site mitigation if it is determined that modified turbine operations are not effective at reducing impacts to birds (see below).

Adaptive management triggers for the project include the following:

1. If documented fatalities are lower or not different than predicted and are not significant, no mitigation will be conducted.[3]

2. If fatalities are greater than predicted and are likely to be significant, BRE will meet and confer with the USFWS and the applicable actions presented below will be carried out. If a particular cause can be identified, BRE will develop specific mitigation measures in consultation with USFWS to address the occurrence.

If a bald or golden eagle fatality occurs at the project, the following actions will be taken:

1. BRE will, working with a trained and permitted wildlife biologist, promptly identify and secure the carcass at the place of its discovery. BRE will obtain a global positioning system location and take at least three pictures of the carcass, including identifying characteristics, and placement of the carcass in relation to any project infrastructure. BRE will notify USFWS prior to the removal and storage of the carcass unless USFWS personnel cannot be reached and the carcass will be compromised. The carcass will be properly stored after its discovery until it can be transferred to state or federal authorities.

2. BRE will notify the USFWS within one business day after the discovery of the eagle fatality.

3. BRE will meet and confer with the USFWS to investigate, using available data, the circumstances under which the fatality occurred.

4. BRE will work with the USFWS to evaluate available data concerning the event and, as appropriate, identify and implement avoidance or mitigation measures to reduce the risk of future mortalities.

5. BRE will conduct follow-up post-construction monitoring in the season in which the fatality occurred during the subsequent year of operations to assess whether avoidance or mitigation measures are effective at reducing impacts on eagles.

[3] While the LWEG indicate that no further monitoring is needed under this scenario, BRE has committed to life-of-project monitoring in Appendix C in the HCP and will continue to monitor and report on bird mortalities.

If new information becomes available that suggests that take of bald and/or golden eagles by the project is likely, BRE will investigate and implement measures to minimize this risk.

Avoidance and minimization actions that may be taken under adaptive management include the following:

- Removing/modifying the source(s) of bird attraction
- Implementing turbine operational protocols designed to reduce bird fatalities at turbines that data show are likely to take bald and/or golden eagles, or have shown higher than average fatality rates, including:
  - raising cut-in speeds (define cut-in speed, time of day, days of the year, turbines affected)
  - curtailment (define time of day, days of the year, weather triggers [e.g., storm front], biological triggers [e.g., fall migration for large flocks of a particular species], and turbines affected)
- Implementing technological solutions. If bird mortalities exceed the above-defined adaptive management triggers and new techniques or technology become available that are cost-effective and feasible to implement, BRE will evaluate whether to replace or augment the measures detailed in the APP with these new approaches.
- Negotiating with transmission line owners to retrofit power poles to adhere to APLIC guidelines (APLIC 1994, 2006).

This APP is based on the assumption that impacts to migratory birds can be effectively avoided and reduced through cost-effective operational adjustments. However, if during monitoring, operational restrictions are not effective at avoiding and minimizing impacts, and impacts exceed the levels defined above, BRE will consider the potential for off-site mitigation to offset documented impacts, including possible off-site habitat preservation and/or restoration. The off-site mitigation project to be completed to mitigate impacts to Indiana bats (see Section 5.0 in the HCP) will also benefit migratory birds and thus off-set all or a portion of any adverse effect from the project. Alternatively, if off-site mitigation is infeasible or ineffective and specific research needs addressing migratory bird mortality are identified, BRE could facilitate such research to take place as a form of mitigation.

5.3 Reporting

Reporting will be completed as described in the RMAMP (Appendix C in the HCP).

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Appendix A West Virginia Birds of Greatest Conservation Need (Brown et. al 2005) and Rare, Threatened and Endangered Animals (WVDNR 2007)

Scientific Name	Common Name	State Rank	Global Rank
Accipiter cooperii	**Cooper's hawk**	**S3B, S4N**	**G5**
Accipiter gentilis	**Northern goshawk**	**S1B,S1N**	**G5**
Accipiter striatus	**Sharp-shinned hawk**	**S3B,S4N**	**G5**
Actitis macularius	Spotted sandpiper	S3B	G5
Aegolius acadicus	**Northern saw-whet owl**	**S1N,S2B**	**G5**
Aimophila aestivalis	Bachman's sparrow	SHB	G3
Ammodramus henslowii	Henslow's sparrow	S3B	G4
Ammodramus savannarum	Grasshopper sparrow	S3B	G5
Anas crecca	Green-winged teal	SHB,S2N	G5
Anas rubripes	American black duck	S2B,S4N	G5
Ardea Herodias	Great blue heron	S3B,S4N	G5
Asio flammeus	Short-eared owl	S1B,S1N	G5
Asio otus	Long-eared owl	S1B,S1N	G5
Bartramia longicauda	Upland sandpiper	SHB,S1N	G5
Botaurus lentiginosus	American bittern	S1B,S1N	G4
Caprimulgus carolinensis	Chuck-will's-widow	S1B	G5
Caprimulgus vociferous	**Whip-poor-will**	**S3B**	**G5**
Carduelis pinus	Pine siskin	S2B,S4N	G5
Catharus ustulatus	**Swainson's thrush**	**S3B**	**G5**
Chondestes grammacus	Lark sparrow	S1B	G5
Circus cyaneus	**Northern harrier**	**S1B,S3N**	**G5**
Cistothorus palustris	Marsh wren	S1B,S2N	G5
Cistothorus platensis	Sedge wren	S1B	G5
Certhia Americana	**Brown Creeper**	**S3B, S4N**	**G5**
Chordeiles minor	**Common nighthawk**	**S3B**	**G5**
Coccyzus erythropthalmus	**Black-billed Cuckoo**	**S3B**	**G5**
Colinus virginianus	Northern bobwhite	S3B, S3N	G5
Contopus virens	**Eastern wood-pewee**	**S5B**	**G5**
Contopus cooperi	Olive-sided flycatcher	S1B	G4
Coragyps atratus	**Black vulture**	**S3B,S4N**	**G5**
Dendrocia cerulean	**Cerulean warbler**	**S4B**	**G4**
Dendrocia coronate	**Yellow-rumped warbler**	**S3B, S3N**	**G5**
Dendrocia discolor	**Prairie warbler**	**S4B**	**G5**
Dendroica fusca	**Blackburnian warbler**	**S3B**	**G5**
Dolichonyx oryzivorus	Bobolink	S3B	G5
Empidonax virescens	**Acadian Flycatcher**	**S5B**	**G5**
Empidonax alnorum	**Alder flycatcher**	**S3B**	**G5**
Empidonax flaviventris	**Yellow-bellied flycatcher**	**S1B**	**G5**
Eremophila alpestris	Horned lark	S2B,S3N	G5
Falco peregrinus	Peregrine falcon	S1B,S2N	G4
Fulica Americana	American coot	S1B,S3N	G5
Gallinago delicate	Wilson's snipe	S3B,S3N	G5
Gallinula chloropus	Common moorhen	S1B	G5
Haliaeetus leucocephalus	**Bald eagle**	**S2B,S3N**	**G5**
Helmitheros vermivorus	**Worm-eating warbler**	**S5B**	**G5**
Hylocichla mustelina	**Wood thrush**	**S5B**	**G5**
Ixobrychus exilis	Least bittern	S1B	G5
Lanius ludovicianus migrans	Migrant loggerhead shrike	S1B,S2N	G4T3Q
Limnothlypis swainsonii	**Swainson's warbler**	**S3B**	**G4**
Lophodytes cucullatus	Hooded merganser	S1B,S4N	G5
*Loxia curvirostra**	Red crossbill	SNA,S2N	G5
Melanerpes erythrocephalus	**Red-headed woodpecker**	**S2B,S3N**	**G5**
*Mergus merganser**	Common merganser	S1B,S3N	G5
Nycticorax nycticorax	Black-crowned night-heron	SHB	G5
Oporornis formosus	**Kentucky warbler**	**S4B**	**G5**
Pandion haliaetus	**Osprey**	**S2B**	**G5**

Appendix A West Virginia Birds of Greatest Conservation Need (Brown et. al 2005) and Rare, Threatened and Endangered Animals (WVDNR 2007)

Scientific Name	Common Name	State Rank	Global Rank
Petrochelidon pyrrhonota	Cliff swallow	S3B	G5
Podilymbus podiceps	Pied-billed grebe	S2B,S4N	G5
Pooecetes gramineus	**Vesper sparrow**	**S2N,S3B**	**G5**
Porzana Carolina	Sora	S1B, S1N	G5
Protonotaria citrea	Prothonotary warbler	S2B	G5
Rallus elegans	King rail	S1B	G4
Rallus limicola	Virginia rail	S1B,S1N	G5
Riparia riparia	Bank swallow	S2B	G5
Scolopax minor	American woodcock	S4N, S4B	G5
Seiurus motacilla	Louisiana waterthrush	S5B	G5
Seiurus noveboracensis	**Northern waterthrush**	**S2B**	**G5**
Sphyrapicus varius	**Yellow-bellied sapsucker**	**S1B,S3N**	**G5**
Spiza Americana	Dickcissel	S2B	G5
Spizella pallid	Clay-colored sparrow	S1B	G5
Spizella pusilla	**Field Sparrow**	**S4B,S4N**	**G5**
Thryomanes bewickii altus	Appalachian Bewick's wren	S1B,S1N	G5T2Q
Tyto alba	Barn owl	S2B,S2N	G5
Vermivora chrysoptera	**Golden-winged warbler**	**S2B**	**G4**
Vermivora pinus	**Blue-winged warbler**	**S4B**	**G5**
Vermivora ruficapilla	**Nashville warbler**	**S1B**	**G5**
Zonotrichia albicollis	White-throated sparrow	S1B,S4N	G5

Source: WVDNR 2007
Species in bold font were observed on the Project site during the Spring and Fall of 2005 avian surveys.
* = This species is not listed in the West Virginia Wildlife Conservation Action Plan, however it is listed at http://www.wvdnr.gov/Wildlife/documents/Animals2007.pdf, as of May 16, 2012.

Global Rank
G1 = Five or fewer documented occurrences, or very few remaining individuals globally. Extremely rare and critically imperiled.
G2 = Six to 20 documented occurrences, or few remaining individuals globally. Very rare and imperiled.
G3 = Twenty-one to 100 documented occurrences. Either very rare and local throughout its range or found locally in a restricted range.
G4 = Common and apparently secure globally, though it may be rare in parts of its range, especially at the periphery.
G5 = Very common and demonstrably secure, though it may be rare in parts of its range, especially at the periphery.
GH = Historical. May be rediscovered.
GX = Believed extirpated. Little likelihood of rediscovery.
T# = Rank of subspecies or variety.
State Rank
S1 = Five or fewer documented occurrences, or very few remaining individuals in the state. Extremely rare and critically imperiled.
S2 = Six to 20 documented occurrences, or few remaining individuals in the state. Very rare and imperiled.
S3 = Twenty-one to 100 documented occurrences.
S4 = Common and apparently secure with more than 100 occurrences.
S5 = Very common and demonstrably secure.
SH = Historical. Species that have not been relocated within the last 20 years. May be rediscovered.
SX = Believed extirpated. Little likelihood of rediscovery.
Species with State Ranks of S1, S2 or S3 are tracked by the WDP.
Characters related to Global and State Ranks
B = Breeding populations
N = Non-breeding populations
Q = Questionable taxonomy