4 AFFECTED ENVIRONMENT

This chapter describes the existing conditions of the Project area and its surroundings. CEQ and DOI regulations implementing NEPA indicate that the scope of analysis depends on the extent of reasonably foreseeable Project-related impacts. This Project is somewhat unique in that a lawsuit halted construction at 67 turbines.[23] The court's decision forced the Project to be completed in two phases (see Chapter 1), and requires BRE to acquire an ITP to change operations and complete Phase II (33 additional turbines). Effects to the environment resulting from the proposed federal permitting action would cover incidental take of Indiana and Virginia big-eared bats resulting from Phase I changes in operations and construction and operation of Phase II, as well as decommissioning of both phases. As such, to properly define the affected environment, each section in this chapter will delineate the Project area prior to Phase I construction, as well as the environment as it exists today with Phase I in place and operating under the court's restriction.

Phase I and Phase II of the Project are located in Greenbrier and Nicholas Counties, West Virginia, and include the 6,860-acre lease and the additional road ROWs [3,688 acres have been leased from a commercial timber company; 3,172 acres will be added to the lease for Phase II prior to the publication of the FEIS]. The Project also includes a transmission line that extends into Nicholas County and is currently servicing Phase I of the Project. Phase II will require creating a small transmission line laterally to connect the western most turbines associated with Phase II construction. The ITP and HCP would apply to the 6,860 acres of land leased by BRE for construction and operation of the Project (covered lands) (Figure 1-1). These lands include the locations for Phase I turbines (existing and operational) and Phase II turbines (proposed for construction) under the WVPSC siting regulations. The total area leased by BRE is privately owned and managed primarily for coal and timber production.

As described Section 1.1.1, the existing stipulation modification will alter the existing condition for some resources. Based on this modification, the limited operations for the existing 67 turbines are:

1. Beginning on April 1, 2012, implement turbine operations as follows:
    a. Operate turbines with cut-in-speeds of 6.9 m/s during the period from April 1 through November 15 from 0.5 hour prior to sunset until 0.25 hour after sunrise; and
    b. Feather turbine blades so there is only minimal rotation (<2 rpm) at wind speeds below turbine cut-in speeds.
2. Implement appropriate monitoring to detect the unlikely take of ESA-listed species; and
3. In the event take is detected, discontinue nighttime operations described above during the period of April 1 to November 15, 2012.

This change may alter existing night-time conditions for noise, birds, and bats. These changes are addressed below in their corresponding sections.

4.1 Geology and Soils

4.1.1 Scope of Analysis

This section describes the existing soil and geologic resources in the Project area, including topography, bedrock features, and seismicity. The soils and geology analysis in this DEIS is based on information publicly available in online databases and/or documents produced by the U.S. Department of Agriculture Natural Resources Conservation Service (USDA-NRCS) and U.S. Geological Survey (USGS).

[23] The Service discourages wind power developers from segmenting projects (i.e. constructing a project or a portion of a project, and then applying for an ITP to cover operations after the project is already constructed). We prefer that applicants seek ITPs prior to construction rather than waiting until turbines are operational. In this case, the Service provided technical assistance to BRE during project planning to help BRE judge the risk of take, explained to BRE it was responsible for ensuring its actions did not result in unauthorized take, discussed take authorization mechanisms, and offered BRE assistance in this regard prior to project construction (Service letters to BRE dated March 7, 2006, August 10, 2006, and July 31, 2007).

4.1.2 Existing Conditions

4.1.2.1 *Topography and Geology*

The covered lands exhibit abrupt topography of steep Appalachian Mountain Ridgelines. The Project area elevations range from 2,940 ft to 4,357 ft above mean sea level (amsl). The covered lands are located in the Allegheny Mountains section of the Appalachian Plateau physiographic province (Figure 4-1). These mountains are described as a dissected, westward-tilting plateau of high, sharp ridges, low mountains, and narrow valleys (McNab and Avers 1994). In the Project area, side slopes range from 0 to 38% and average approximately 11%. Mountain tops in the Project area include Beech Ridge, Big Ridge, Cold Knob, Ellis Knob, Old Field, Nunly Mountain, Rock Camp Ridge, and Shellcamp Ridge; their average elevation is approximately 4,014 ft amsl.

Most of the rocks in West Virginia are sedimentary and were deposited during the Paleozoic Era (600 to 230 million years ago). The Project area generally is composed of Pennsylvanian and Mississippian deposits approximately 280 to 330 million years old (West Virginia Geological and Economic Survey 1969). The Mississippian deposits include the Greenbrier Group, which is composed primarily of limestone yet includes shale and sandstone. Pennsylvanian deposits include thousands of feet of non-marine sandstone, shale, and coal.

During the Permian Period (225 to 270 million years ago), the Appalachian range of West Virginia was uplifted, the heavy deposition of sediments ceased, and erosion became the dominant geologic activity. This resulted in the formation of the ridges and valleys that now characterize the Project area. Although Permian tectonic activity occurred in the area to create structural folds and faults, seismic activity in the Project area occurs infrequently (USGS 2008).

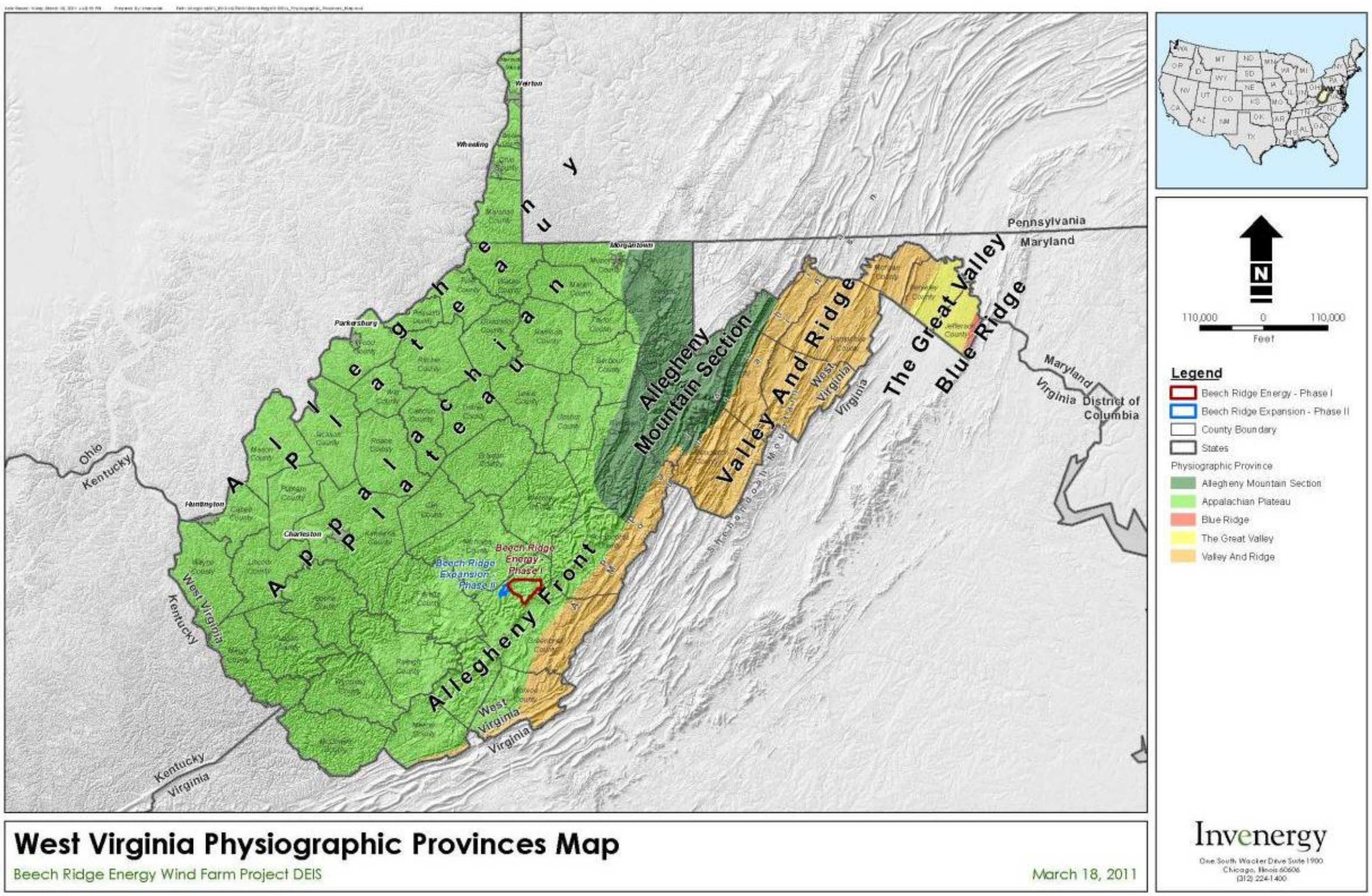
Within the Central Virginia Seismic Zone near the town of Mineral, reverse faulting on a north or northeast-striking plane produced a 5.8 magnitude earthquake on August 23, 2011. This event was felt strongly in much of central Virginia and southern Maryland and caused minor damage in parts of Delaware, southeastern Pennsylvania, and southern New Jersey (USGS 2011). Mineral, Virginia is approximately 150 mi east of the Project area. The Central Virginia Seismic Zone has produced small and moderate earthquakes since at least the 18th century (USGS 2011). The largest historical shock from this seismic zone occurred in 1875, prior to the invention of effective seismographs; however, anecdotal evidence suggests that it produced a 4.8 magnitude earthquake at that time (USGS 2011).

The Project area generally borders the eastern boundary of the West Virginia coal fields. The coal resources in the area are found in deposits in the New River and Pocahontas Formations of the Pottsville Group. There are several underground and surface coal mines in the Project area.

Geology underlying the Project area is sandstone and shale of the Kanawha Formation. The Kanawha River alluvial aquifer, a semi-confined aquifer, underlies the Project area. Sandstone and sturdy carbonates support slopes and ridges, and weaker carbonates and shale underlie valleys (McNab and Avers 1994).

The Project area is located in an eroded plateau where the ridgetops and upper side slopes are comprised of the Kanawha, New River, and Pocahontas Formations of the Pottsville Group of the Pennsylvanian age, which usually consists of sandstone and conglomerate (Flegel 2007). The middle and lower side slopes consist of the Bluestone, Princeton, and Hinton Formations of the Mauch Chunk Group of Mississippian age, which usually consists of yellow and brown shale and siltstone.

Figure 4-1. West Virginia Physiographic Provinces.



All Phase I turbines were built along ridgelines at sites ranging from approximately 3,870 ft amsl to 4,385 ft amsl. Newly constructed roads for Phase I ranged in elevation from approximately 3,825 ft amsl to 4,348 ft amsl. The currently proposed Phase II turbine locations are at slightly lower elevations ranging from approximately 3,570 ft amsl to 4,065 ft amsl. Phase II on-the-ground siting of exact turbine and access road locations have yet to be identified. However, the approximate sites are indicated in Figure 1-4.

Caves and Mines

In 2006, BRE queried available literature on caves within the general Project area (Davies 1965 as cited in BHE 2006, Storrick 1992 as cited in BHE 2006). BRE also coordinated with the WVDNR; the Natural Resources Analysis Center at West Virginia University; and Mr. Bill Balfour, a caving authority in the Project area. BRE developed a Geographic Information System (GIS) database identifying approximately 140 known caves within 5 mi of the then proposed turbine locations. This number was reported as an approximation because compiling data from numerous sources may have included undetected duplications. BRE focused their attention on caves within 5 mi because previous studies at the time indicated Indiana bat activity during swarming (prior to hibernation) and staging (after hibernation) was concentrated within 5 mi of hibernacula. All caves within 5 mi of the Project site occur in a southwest to northeast trending band, south and east of the then proposed turbine locations (BRE 2006). A query of mining permits by BRE revealed that several hundred mines in varying stages of use (e.g., active to inactive) exist within 20 mi of Phase I and Phase II Project areas.

4.1.2.2 *Soils*

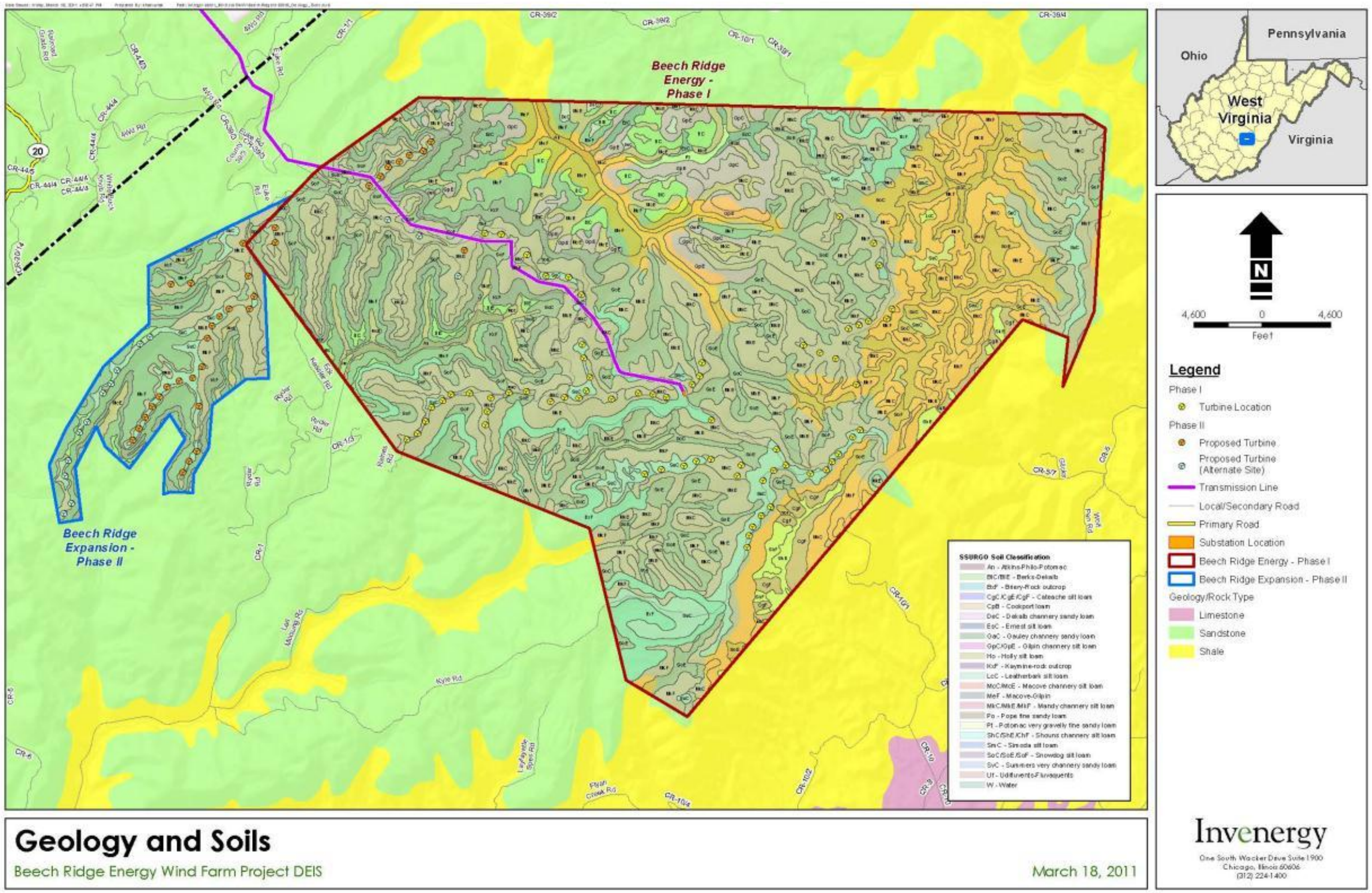
According to Flegel (2007), the headwaters of the Meadow and Cherry Rivers and their tributaries are located in an eroded plateau where the ridgetops and upper side-slopes comprise the Kanawha, New River, and Pocahontas Formations of the Pottsville Group of Pennsylvanian age. The middle and lower side-slopes comprise the Bluestone, Princeton, and Hinton Formations of the Mauch Chunk Group of Mississippian age (Figure 4-2).

The Pottsville Group on ridgetops usually consists of sandstone and conglomerate (Flegel 2007). At the higher elevations, these positions are occupied by the Gauley, Summers, Leatherbark, and Simoda soils. The Pottsville Group and the Bluestone and Princeton Formations of the Mauch Chunk Group on the upper and middle side-slopes consist of yellow and brown shale and siltstone; Mandy soils are on these sites. Snowdog and Trussel soils are on the foot-slopes.

Briery soils cover the strip-mined areas in the Pottsville Group at the higher elevations (Flegel 2007) such as on Cold Knob and Grassy Knob. At the lower elevations in the Pottsville Group and Bluestone and Princeton Formations of the Mauch Chunk Group, the Gilpin and Lily soils are on the ridgetops, the Gilpin soils are on the side slopes, and the Macove soils are on the foot-slopes. The Kaymine soils are in strip-mined areas at lower elevations. The lower side slopes that are in the Hinton Formation of the Mauch Chunk Group are composed mainly of siltstone and shale. The reddish Cateache soils and the yellowish Culleoka soils are on the side-slopes, and the reddish Shouns soils and yellowish Macove soils are on the foot-slopes.

Predominant soil types in the Project area belong to Mandy channery silt loam, Macove-Gilpin complex, Cateache silt loam, and Kaymine rock outcrop (Flegel 2007, USDA-NRCS 2008). These well-drained, loamy soils are formed in siltstone, shale, and sandstone. Additionally, these soils are not subject to flooding or high water tables (Flegel 2007, USDA-NRCS 2008).

Figure 4-2. Beech Ridge Wind Energy Project geology and soils, Greenbrier and Nicholas Counties, West Virginia.



4.2 Noise

Potential noise from the Project was evaluated in terms of its likely audibility or perceptibility at noise sensitive receptor locations relative to the background sound level. Noise sensitive receptor locations can be described as specific locations of any property or outdoor activity that is considered to contain noise-sensitive land use (e.g., residential developments, schools, hospitals, recreational areas).

4.2.1 Scope of Analysis

The WVSPSC Siting Rules include specifications for assessing noise (§150-30-3.1.m.4.A-C). The assessment must include estimates for preconstruction (ambient), construction, and operations noise. The base line noise study must be no less than 7 days, including Saturday and Sunday. The Siting Rules do not identify noise limits or recommend setbacks. BRE contracted with Acentech, Incorporated to conduct acoustical studies for Phases I and II of the Project. These reports are provided in Appendix 4, and the results of these studies are summarized in this section.

4.2.1.1 *Measuring Noise*

Sound pressure level is measured in decibels (dB). The quietest sound level that can be heard by a healthy human ear is around 0 dB. A moderate sound level is 55 to 60 dB, about the level of normal conversation. What one considers to be loud becomes somewhat objective; generally, sounds around 80 dB and higher often are interpreted to be loud.

Sound frequency or tonality is measured in Hz, and most sounds include a composite of frequencies. The normal range of healthy human hearing extends from 20 Hz to 20,000 Hz. Hearing sensitivity varies, and humans generally hear best in the frequency range of human speech, around 500 Hz to 4,000 Hz.

Sound level instruments are equipped with a weighting filter. Filters make it possible to isolate measurements of those sounds perceived by the human ear. Environmental noise is most often measured using the A-weighted filter, which will remove frequencies below 500 Hz, and is expressed as dBA. The C-weighted scale is used to measure noise at very high sound levels and includes more of the low-frequency range of sounds than the A-weighted scale. The C-weighted filtered measurements are expressed as dBC.

The equivalent sound level (Leq) quantifies the entire ambient noise as a single value for a specified period, also sometimes known as average sound level. The Leq includes both the high-level single event sounds and the relatively steady background sounds. The day-night sound level (Ldn) is the A-weighted average equivalent sound for a 24-hour period with 10 dBA added to the Leq from 10 p.m. to 7 a.m. Adding 10 dBA to the night-time sound levels accounts for the expectation that night-time is a quiet period. The USEPA (1978) selected both the Leq and Ldn as the most meaningful descriptors for measuring and evaluating environmental noise. The USEPA (1978) indicated an Ldn level of 55 dBA as sufficient for the protection of human health and welfare.

4.2.2 Existing Conditions

The Project area is located approximately 10 mi northeast of Rupert, West Virginia in a mountainous area south of the Monongahela National Forest. The proposed and existing turbine strings run along mountain ridges and peaks north of State Route 60 and Interstate 64 and west of State Route 219. Lightly traveled paved and unpaved roads cross this heavily forested landscape, which is infrequently dotted with small settlements, single residences, and hunting cabins. Lands are primarily used for commercial timber production.

Turbines are present and planned for the Project area in the commercial timber lands. A noise study identified noise sensitive receptor locations such as residences and churches. Other potential noise sensitive receptor areas include larger communities with schools, hospitals, and libraries, recreational areas, and parks; these sites are located more than 1 mi from the Project area.

BRE contracted with Acentech, Incorporated to conduct an acoustical study to assess the potential noise impacts from Phase II construction and operation. Acentech conducted the study in February 2011. The report is provided in Appendix C (Report C-2) and summarized below. Although this study was conducted to help assess the potential impact of construction and operation of Phase II, it collected information on the existing conditions post-Phase I construction and operation, and thus helps to determine the overall current noise levels in the Project area.

For assessing the noise environment, the Phase II analysis area included 47 turbines, comprised of 33 proposed turbine locations and 14 alternate turbines locations (Figure 4-3). For the Phase II 47-turbine layout, Acentech conducted a 12-day acoustical study during February 4-15, 2011. The Phase II noise study identified noise sensitive areas within 1 mi and 5 mi of the 47-turbine layout. Acentech monitored ambient (background) noise levels at 4 locations proximal to the 2-mi buffer of the 47-turbine layout (Figure 4-3). Monitoring locations were in close proximity to nearby homes, seasonal residences, and small groups of homes and ranged from 1,600 ft to 10,600 ft from the nearest proposed Phase II turbine location. Acentech (2011) determined these locations to be representative of the general site conditions found at the identified sensitive noise receptors.

Acentech monitored each of the sites for 255 hours; they measured dBA and dBC ambient noise at each of the 4 locations. By comparing dBA with dBC, one can determine the low frequency component of the sound. Ldn sound levels ranged from 47 dBA to 50 dBA (Table 4-1). Ambient noise levels across the 4 locations were relatively uniform; the average Ldn was 48 dBA (SD ±1 dBA; Acentech 2011).

Table 4-1. Ambient sound survey results for receptors potentially affected by the Phase II 47-turbine layout (33 proposed locations and 14 alternate locations) (Acentech 2011). Ambient noise levels shown indicate current conditions in the western portion of the Project area (Phase II) and include noise associated with the unrestricted operation[24] of 67 Phase I turbines in the eastern portion of the Project area.

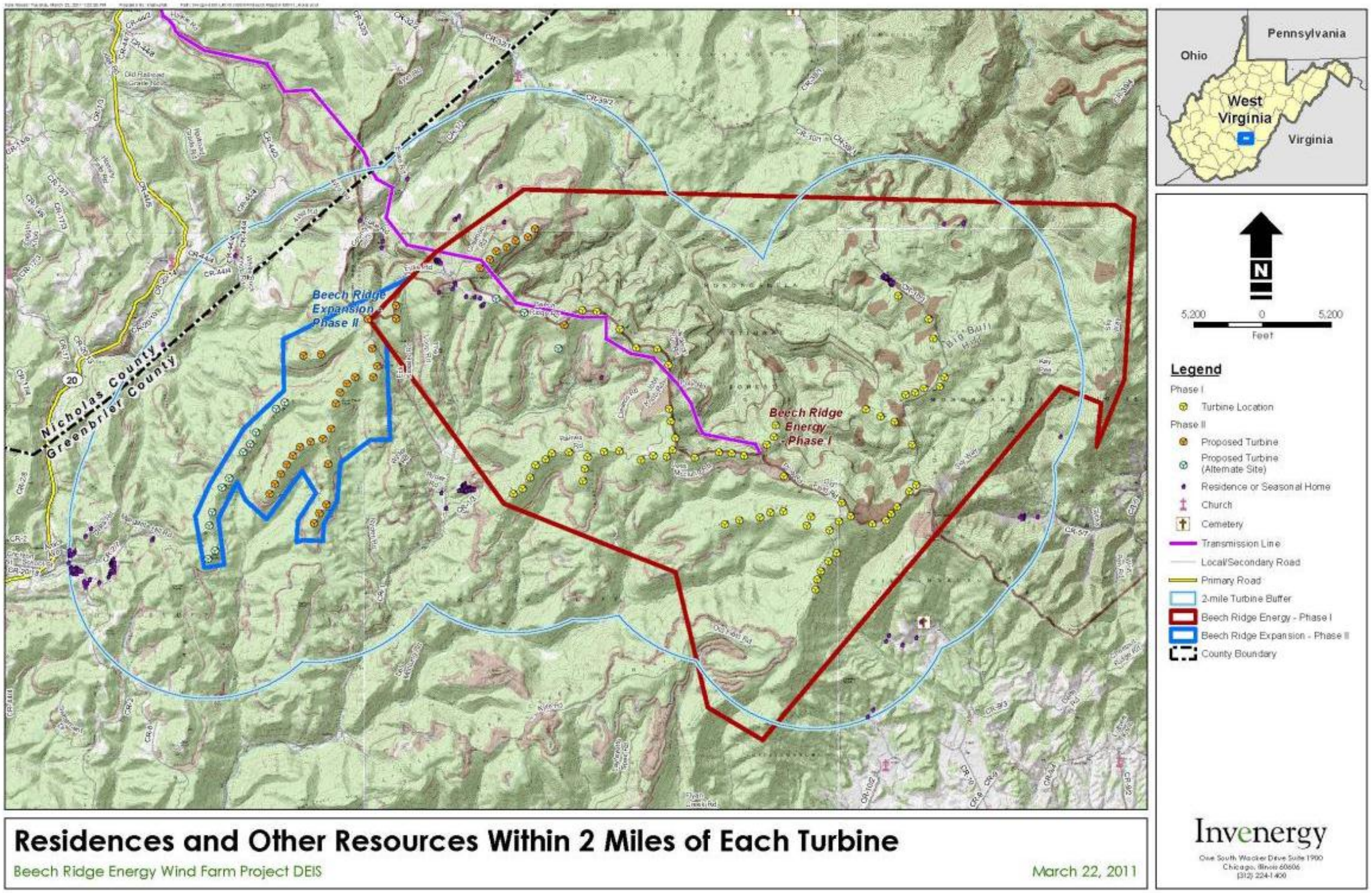
Survey location	Receptor	Description	Approximate distance to nearest turbine	Ambient Ldn (dBA)	Ambient Ldn (dBC)
1	Town of Duo	Hamlet with several residences, church	10,500 ft (2.0 mi)[1] 3,600 ft (0.7 mi)[2]	48	65
2	Beech Ridge Road	Few rural residences	1,600 ft (0.3 mi)	50	73
3	NW of Phase II	Near hamlet with several residences	5,800 ft (1.1 mi)	47	55
4	Town of Quinwood	Hamlet with several residences	5,000 ft (0.9 mi)	48	56

[1] Distance to nearest proposed Phase II turbine.
[2] Distance to nearest existing Phase I turbine.

Sound levels included both steady background and short-term intrusive sounds. Observed sound sources included wind in trees, local and distant traffic, dogs barking, bird songs, aircraft, distant mining industry, and a flowing creek.

[24] Under the court order and settlement agreement, these 67 turbines are allowed to operate unrestricted during winter months when bats are in hibernation. The noise levels were recorded February 2011.

Figure 4-3. Beech Ridge Wind Energy Project 2-mile noise buffer in Greenbrier and Nicholas Counties, West Virginia.



During a site visit, the Acentech field crew heard sounds of the existing wind facility while at the Town of Duo location (Acentech 2011). Eventually, local wind speed increased, and the associated sound of wind in the trees masked the turbine noise. In this particular instance, the wind was from the southwest, and the Duo location was typically crosswind/downwind of the existing Phase I Project. The average sound levels at the Town of Duo location ranged from 41 dBA to 43 dBA during the time when the wind facility sound was observed (Acentech 2011). Although the nearest turbines could be heard, the Acentech field team judged that turbine sound did not significantly influence the average sound levels (Acentech 2011). As the data in Table 4-1 indicate, the long-term Ldn sound level at the Town of Duo location was similar to the Ldn levels measured at the 3 other monitoring locations that are much farther from the existing wind facility.

4.2.3 Effect of Stipulation Modification

During the period from April 1 through November 15, 2012, the 67-turbine Project will operate during night-time hours when wind speeds are 6.9 m/s or higher. This is a change from the previous 2 years (2010 and 2011) when turbines did not operate at night during this period. The limited operations during this seasonal period will result in night-time turbine noise. However, based on the results of the Acentech surveys (2006, 2011), turbine operation noise at night is not expected to have major adverse effects on the surrounding environment. Turbine noise is estimated to be comparable to the ambient noise levels at several locations within the Project area (Acentech 2006, 2011; see Section 5.2.2.1).

4.3 Climate and Air Quality

4.3.1 Scope of Analysis

This section describes the current climate and ambient air quality associated with the covered lands and the surrounding region. The climate and air quality analysis in this DEIS is based on data and information from publicly available online databases and/or documents produced by the following:

1. U.S. Global Change Research Program: coordinates and integrates federal research on changes in the global environment and their implications for society;
2. National Oceanic and Atmospheric Administration's (NOAA) National Climate Data Center;
3. Northeast Regional Climate Center and West Virginia State Climate Office (climate summaries);
4. USEPA: the primary federal agency responsible for protecting and regulating air quality in the U.S.; and
5. WVDEP Division of Air Quality: the state agency responsible for ensuring West Virginia’s compliance with NAAQS mandated by the CAA.

The Northeast Regional Climate Center and West Virginia State Climate Office and Meteorology monitor and report on climate in West Virginia. The National Weather Service Office in Beckley, West Virginia is the closest first-order weather station (approximately 50 mi from the Project area). First-order weather stations observe and report on an array of meteorological elements, including atmospheric pressure, temperature, wind speed and direction, humidity, precipitation type and amount, cloud cover, and visibility.

The National Regional Climate Data includes West Virginia, along with 12 other states, as part of the northeast region. For this region, the National Weather Service has tracked records for the past 116 years. Monthly climate summaries are available back through 1994 for the region and back through 2010 for West Virginia.

The WVDEP’s Division of Air Quality publishes annual air quality data for the State of West Virginia. The most recent summary of air quality data available for the state is the 2009 Air Quality Annual Report (WVDEP 2010). Included in this report are summaries of the NAAQS, 2009 air quality data, air toxics monitoring projects, and education and outreach efforts.

The WVDEP's Division of Air Quality monitors air pollutants throughout West Virginia using ambient air quality sampling sites, 1 of which is located in Greenbrier County. The 6 West Virginia counties and 2 Virginia counties that abut Greenbrier County do not have ambient air quality sampling sites. The air quality sampling sites assess air quality levels based on population exposure and industry emissions, determine compliance with the NAAQS, and determine background levels. Each site is designed to monitor those air pollutants and parameters identified as problematic.

4.3.2 Existing Conditions

4.3.2.1 *Regional Climate*

The warmest and wettest years for the northeast region occurred after 1996. In 2010, the average annual temperature was 49.2°Fahrenheit (F), making 2010 the 5^{th} warmest year since record-keeping began in 1895 (NRCC 2011). Annual precipitation in the northeast was 52 inches (NRCC 2011).

From 1981 through 2010, the Elkins area (130 mi northeast of the Project) experienced an average annual temperature of 50.0°F. Average annual maximum temperature was 62.0°F, and average annual minimum temperature was 38.0°F. The maximum and minimum temperatures on record for the area are 99.0° F and -28.0°F, respectively. Annual average precipitation from 1971-2000 was 45.09 inches; average snowfall was 83.8 inches per winter season (NOAA-NWS 2011).

The U.S. Global Change Research Program reports that the annual average temperature in the northeast region has increased by 2°F since 1970 (Karl et al. 2009). Over the next several decades, temperatures in the Northeast are projected to rise an additional 2.5°F to 4°F in winter and 1.5°F to 3.5°F in summer.

In the past 50 years, the Northeast has experienced increased incidents of heavy rain events, winter precipitation falling less as snow and more as rain, and reduced snowpack (Karl et al. 2009). It is projected that climate change in the Northeast would result in a general trend of warmer, shorter winters and hotter, longer summers (Karl et al. 2009). Future climate models project there will be an increased frequency of rare events such as extreme heat waves and severe winter storms (Karl et al. 2009).

4.3.2.2 *Local Climate*

Winters are cold and snowy in the Project area. Summers are fairly warm in the mountains and very warm and occasionally very hot in the valleys. The average temperature in winter is 33.1°F, and the average daily minimum temperature is 23.0°F. In summer, the average temperature is 69.7°F and the average daily maximum temperature is 81.7°F.

Rainfall is evenly distributed throughout the year, but it is significantly heavier on the west-facing slopes. Normal annual precipitation is roughly 40 inches (Flegel 2007). Of this, 18.4 inches (45%) typically falls from May through September. The Allegheny Mountains form a "rain shadow" that shelters the eastern portion of Greenbrier County from the prevailing storm systems. The average seasonal snowfall is about 28.5 inches. On average, 19 days of the year have at least 1 inch of snow on the ground. Prevailing winds are from the southeast, and the average wind speed is highest during March at 9.6 mph (4.3 m/s).

4.3.2.3 *Air Quality*

Ozone (O_3) is the only criteria pollutant monitored at the Greenbrier County sampling site located at Sam Black Church, which is roughly 6.5 mi from the Phase II Project area. The site monitors ozone (O_3) during the ozone season, which is April through October. When averaged over 3 years, the WVDEP standards for ozone were not exceeded at the air quality monitoring station in Greenbrier County (WVDEP 2009). However, the NAAQS standards for ozone were exceeded at this site according to the revised standard of 0.075 parts per million (ppm), which the WVDEP adopted into rule in 2010 (45 CSR 8 § 4.4).

Ground-level ozone is formed by chemical reactions among nitrogen oxides (NO_X) and volatile organic compounds (VOCs) in the presence of sunlight. Motor vehicle exhaust, industrial emissions, gasoline vapors, chemical solvents, and natural sources emit NOx and VOCs that help form ozone.

For most days of recent years (2007-2009), Greenbrier County experienced good air quality (WVDEP 2009). Generally, less than 15% of the days per year were of moderate air quality or unhealthy for sensitive groups; ozone was the main pollutant (WVDEP 2009).

Based on the available air quality information (WVDEP 2008, 2009), the air quality in the Project area is not in attainment for ozone based on the revised NAAQS standards and the new WVDEP rule. Phase I Project operation does not generate air emissions. Project maintenance requires a small amount of vehicular traffic resulting in some carbon dioxide (CO_2) emissions and particulates.

4.4 Water Resources

Water resources include groundwater and surface water. Groundwater is subsurface water that serves as a resource for commercial and residential consumption, agricultural irrigation, and surface water discharge/recharge. Surface water resources include open water (lakes, ponds), waterways (rivers, streams), wetlands, and floodplains.

4.4.1 Scope of Analysis

The Project has the potential to affect groundwater and surface water resources within and proximal to the Project area. The water resources analysis in this DEIS is based on information from publicly available databases and documents, and materials prepared for the Project application to the WVPSC. Sources include:

- USGS 7.5 minute topographical maps;
- Federal Emergency Management Agency's (FEMA) Flood Insurance Rate Maps (FIRMs); and
- Potesta & Associates, Inc.'s (Potesta) wetland and stream delineations for the facility and transmission line (Potesta 2005a, 2005b, 2010).

4.4.2 Existing Conditions

4.4.2.1 *Groundwater*

The Kanawha River alluvial aquifer, a semi-confined aquifer, underlies the Project area. According to the Greenbrier County Local Health Department, there are no public water wells in the Project area (GCLHD 2009 as cited in HDR 2009). Information describing the location and nature of domestic and private wells in the Project area was not available.

4.4.2.2 *Surface Water*

There are 2 federally designated National rivers in West Virginia. The New River Gorge National River and Bluestone National Scenic River are approximately 24 mi and 42 mi southwest of the Project area, respectively.

The Project area lies within the Gauley River drainage, which merges with the New River to form the Kanawha River, a tributary of the Ohio River. These drainage basins can be divided into smaller sub-watersheds using the WVDEP's stream coding system, which uses an alphanumeric code to label tributaries within the watersheds of larger rivers.

Figure 4-4 and Figure 4-5 illustrate the location of streams in relationship to the existing turbines, proposed and alternate turbines, and associated Project infrastructure. Tributaries of the Gauley River and a headwater stream of the Greenbrier River drain the Phase I and II Project areas (Figure 4-4 and Figure 4-5). Based on USGS topographic maps, surface water resources and their associated tributaries are listed in Table 4-2. A number of unnamed intermittent and ephemeral streams, which may be designated waters of the U.S., are located within the Project area. The unnamed streams flow to the streams listed in Table 4-2. In addition, there are numerous borrow pits and settling ponds from past coal mine activities located on and around the Phase I and II project footprint areas.

Table 4-2. Perennial streams proximal to the Beech Ridge Wind Energy Project.

Stream	WV AN Code	Designated Trout Waters[1]
Gauley River Watershed		
Meadow Creek	WVKG-17-A	No - Warm water fishery
Big Clear Creek	WVKG-19-U	Yes - Documented
Brown Creek	WVKG-19-U-1	Yes - Documented
South Fork Big Clear Creek	WVKG-19-U-2	Yes – Documented
Job's Knob Creek	WVKG-19-U-2-D	Yes - Documented
Unnamed Tributary	WVKG-19-U-2-D-1	No
Old Field Branch	WVKG-19-U-2-C	No - Warm water fishery
Sam Creek	WVKG-19-U-3	Yes - Documented
Elijah Branch	WVKG-19-U-4	Probably - Undocumented
Long Branch	WVKG-19-U-5	Yes - Documented
Maple Branch	WVKG-19-U-7	Probably - Undocumented
Bruffman Branch	WVKG-19-U-6-A	No - Warm water fishery
Hominy Creek	WVKG-24	Yes - Documented
Peaser Branch	WVKG-24-K	Probably - Undocumented
Laurel Creek/Cherry River	WVKG-34-E	Yes - Documented
McMillion Creek	WVKG-34-E-6	Probably - Undocumented
Beech Run	WVKG-34-E-8	Yes - Documented
Hogcamp Run	WVKG-34-E-9	Yes - Documented
Jackson Run	WVKG-34-E-9.7	No
Rupe Hinton Branch	WVKG-34-E-11.5	No
Job Knob Branch	WVKG-34-E-12	No
Linn Branch	WVKG-34-E-12A	Yes - Documented
Cold Spring Branch	WVKG-34-E-13	Yes - Documented
Bull Run	WVKG-34-E-13	No
Johnson Branch	WVKG-34-E-14	No
South Fork Cherry River	WVKG-34-G	Yes – Documented
Blue Knob Branch	WVKG-34-G-10-B	Yes - Prospective
Greenbrier River Watershed		
Roaring Creek	WVKNG-30-0.5A-1-C-1-(S)	Yes - Documented

[1] Source: WVDEP Water Quality Standards Program.

Figure 4-4. Surface water resources in the Beech Ridge Energy Phase I Project Area.

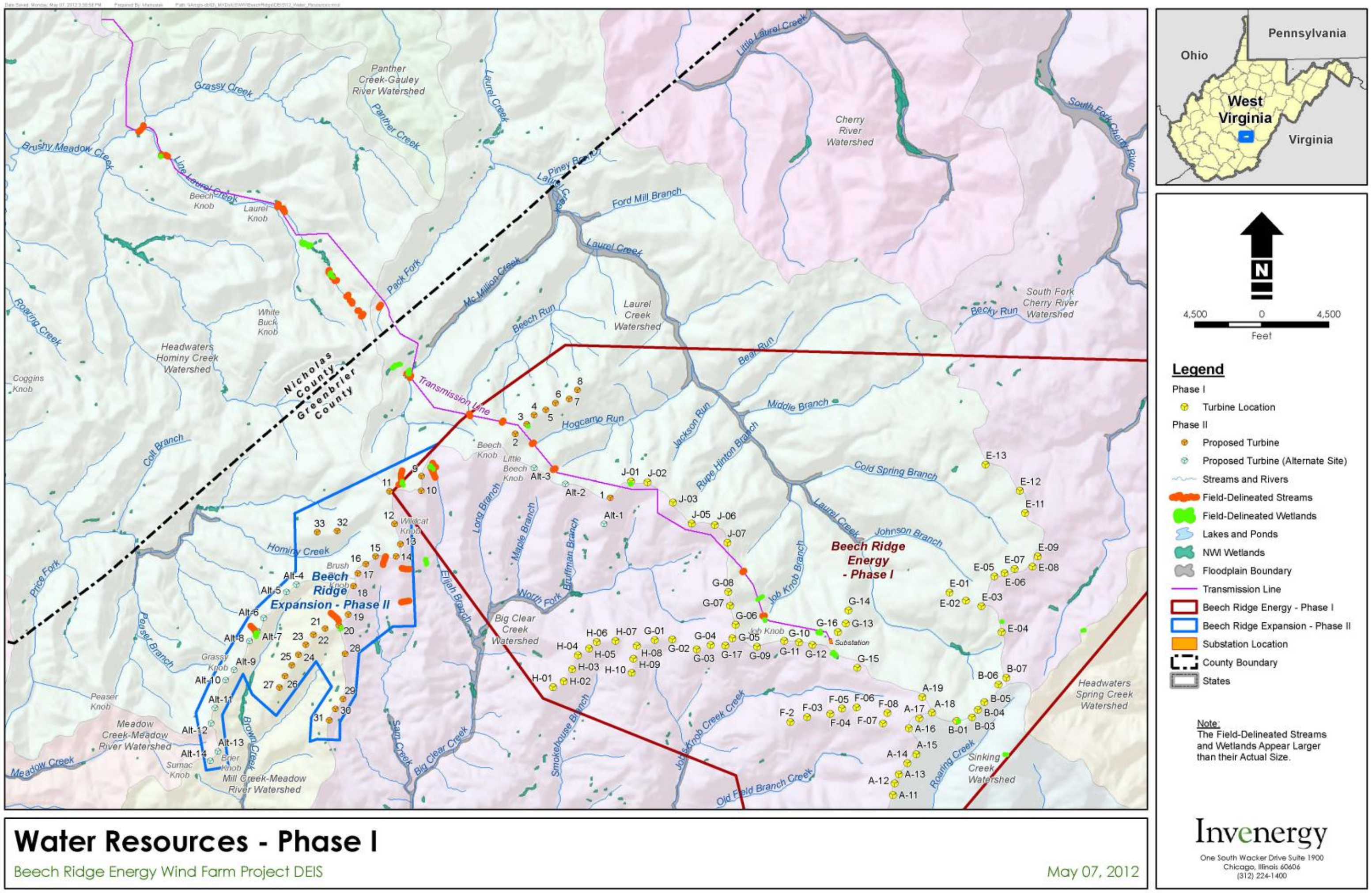
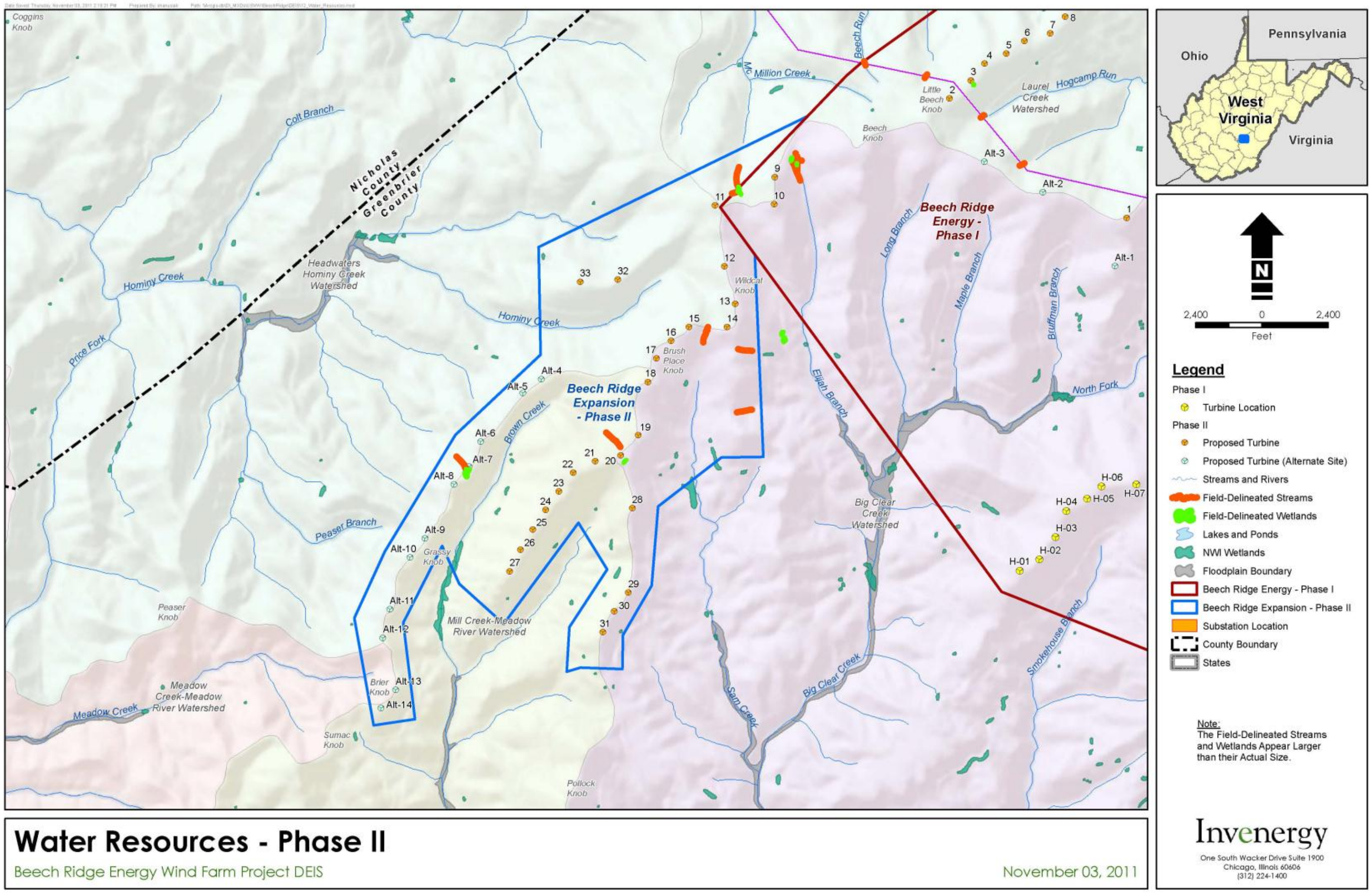


Figure 4-5. Surface water resources in the Beech Ridge Energy Phase II Project Area.



The WVDEP's Water Quality Standards Program has designated uses for surface waters. The water quality standards rule (47 CRS 2) states that all streams at a minimum are designated for propagation and maintenance of fish and other aquatic life (i.e., warm water fishery or cold water trout fishery) and contact recreation. In addition, the standards apply a public water supply use to all streams. For aquatic life use, streams that are not designated trout waters are automatically designated warm water fishery. Trout waters are designated use for propagation and maintenance of fish and other aquatic life in streams or stream segments that sustain year-round trout populations. In the Phase I and Phase II Project areas, 15 streams are designated trout waters, and 4 streams are probably trout waters but have not been documented (Table 4-2, WVDEP Water Quality Standards Program, personal communication).

4.4.2.3 *Floodplains and Drainage Hydrology*

A floodplain is flat land adjacent to a stream or river that experiences occasional or periodic flooding. The 1%-annual chance flood, also referred to as Base Flood or the 100-year floodplain, is the basis for delineation of Special Flood Hazard Areas on FIRMs and floodplain regulations administered by West Virginia communities. The Special Flood Hazard Area is divided into the floodway and flood fringe. The floodway includes the channel and the portion of the adjacent floodplain required to pass the 100-year flood without increasing flood heights. Most floodplain regulations require that proposed floodway developments do not block the free flow of flood water, as this could dangerously increase that water's depth and velocity. The flood fringe is the remaining portion of the Special Flood Hazard Area that usually contains slow-moving or standing water. Regulations for development in the flood fringe typically require protection from floodwaters through flood proofing so water cannot enter the structure.

A review of FEMA FIRMs indicated no 100-year floodplains occur within the disturbance footprint of the existing Phase I project area or within the footprint of the proposed Phase II project areas.

4.4.2.4 *Waters of the U.S. and Wetlands*

Wetlands and other surface waters were identified in accordance with the USACE Wetlands Delineation Manual (Environmental Laboratory 1987, and subsequent regulatory guidance issued by the USACE), and WVDEP (WVDEP 2009).

From August 31, 2005, through September 9, 2005, Potesta delineated wetlands and streams within what was at the time the Beech Ridge Project area. Potesta surveyed wetlands and streams at the sites of the then proposed 133 turbine locations, proposed new access roads, and existing roads. These surveys covered all of the currently operational Phase I footprint, including 5 turbine sites proposed for Phase I at the time that are now proposed for the Phase II expansion (Figure 4-4, Potesta 2005b). The USACE approved the Phase I wetland and stream delineation on March 23, 2006. Potesta identified jurisdictional waters of the U.S. during this survey (Potesta 2005b). One non-jurisdictional wetland was identified in association with the 5 turbine sites that are now the sites of 7 Phase II turbines (Phase II turbines 2 through 8, Figure 4-5).

From September 14, 2010, through October 1, 2010, Potesta delineated wetlands and streams within the Phase II Project area. The survey area was defined within an approximately 200-ft wide corridor along the ridgelines where turbines are proposed. Potesta surveyed wetlands and streams at the sites of proposed turbine locations, proposed new access roads, and existing roads. Potesta identified 3 jurisdictional wetlands, 3 non-jurisdictional wetlands, 1 non-jurisdictional pond, 4 perennial streams, 1 intermittent stream, and 4 ephemeral streams (Table 4-3 and Table 4-4). Included in the Phase II analysis area is 1 non-jurisdictional wetland that was identified during the Phase I delineation (Potesta 2005b), located near what was originally turbine I2 and now referred to as turbine 3 (Figure 4-5).

Table 4-3. Streams identified within Phase II of the Beech Ridge Wind Energy Project.

Stream Reach ID	Classification	USGS Name	Relationship to Project Component(s)	Characteristics
STR-II-2	Ephemeral	Unnamed tributary of Brown Creek	~550 ft north of proposed turbine 20	
STR-II-3	Perennial	Sam Creek headwaters	Between proposed turbines 14 and 15	Spring-fed
STR-II-4	Ephemeral	Unnamed tributary of Elijah Branch	Ordinary high water mark ~1,000 ft from proposed turbine 14	
STR-II-5	Perennial	Elijah Branch headwaters	~1,300 ft northeast of proposed turbine 9; adjacent to Eck Kessler Road; crossed by unnamed mining road	Ordinary high water mark at WL-II-5
STR-II-6	Ephemeral	Unnamed tributary of Elijah Branch	~1,400 ft northeast of proposed turbine 9; adjacent to unnamed mining road	Flows into STR-II-5
STR-II-7	Intermittent	Unnamed tributary of Elijah Branch	~1,100 ft northeast of proposed turbine 9; crossed by Eck Kessler Road	Flows into STR-II-5; ordinary high water mark at WL-II-4
STR-II-8	Perennial	Unnamed tributary of Elijah Branch	~3,000 ft south of proposed turbine 14	Spring-fed
STR-II-9	Perennial	Unnamed headwater tributary of McMillion Creek	~700 ft east of proposed turbine 11	Flows into WL-II-2

Sources: Potesta (2005b, 2010)

Table 4-4. Jurisdictional wetlands identified within Phase II of the Beech Ridge Wind Energy Project.

Wetland ID	Wetland Type[1]	Relationship to Project Component(s)	Area (ac)	Characteristics
WL-II-2	PEM	~1,000 ft east of proposed turbine 11; abuts Trap Ridge Road	0.27	Hydrologically connected to STR-II-9
WL-II-4	PFO	~1,000 ft northeast of proposed turbine 9; within 100 ft of Eck Kessler Road	0.04	Hydrologically connected to STR-II-7
WL-II-5	PFO	~1,000 ft northeast of proposed turbine 9;\; within 150 ft of Eck Kessler Road	0.12	Hydrologically connected to STR-II-5

[1] Based on Cowardin et al. (1979); PFO = Palustrine Forested, PEM = Palustrine Emergent
[2] Delineated during wetland survey conducted in October 2005 for the original proposed Beech Ridge Wind Energy Project.
Sources: POTESTA (2005a, 2005b, 2010).

Streams

The surface water delineation (Potesta 2010) identified 8 streams within the 200-ft wide corridor along the ridgelines where turbines are proposed that meet the definition of jurisdictional Waters of the United States (as per 40 CFR 230.3(s)). Table 4-3 summarizes the characteristics of these streams and their relationships to Project components.

Wetlands

The surface water delineation (Potesta 2010) identified 3 wetlands within the 200-ft wide corridor that meet the definition of Jurisdictional Waters of the United States (as per 40 CFR 230.3(s)). Table 4-4 summarizes the characteristics of these wetlands, each of which are less than 0.3 acre individually.

4.5 Vegetation

4.5.1 Scope of Analysis

This section of the DEIS provides a description of vegetative cover in the covered lands, the leased 6,860-acre Project area, and associated transmission line. The description includes a spatial layout of vegetation cover types and details on botanical character and composition relevant to habitat features. Information was gathered from publicly available databases, federal and state employees, and documents available through credible internet sources (e.g., State Natural Heritage Program, USGS, NRCS).

4.5.2 Existing Conditions

4.5.2.1 *Dominant Ecological Communities*

The 6,860-acre Project area lies within the Central Appalachian Broadleaf Forest Ecological Subregion in the southern portion of the Allegheny Mountains ecological section (Bailey 1995, McNab and Avers 1994). Vegetation of the Allegheny Mountains section is categorized in 4 forest groups influenced by elevation and aspect: red spruce, northern hardwoods, mixed mesophytic (moist forest of mixed deciduous hardwood and evergreen trees), and oak.

Of the 48,000 acres surrounding and within 0.5 mi of the site, most of the forested stands are greater than 26 years old (Project HCP). The Project area’s current primary use is timber production. Forests are a combination of mixed deciduous and northern hardwood with some pine plantations; beech-maple-cherry is the dominant association of tree species. The beech-maple-cherry association appears to replace Appalachian oak forests following logging (Canterbury 2006).

Dominant tree species include American beech, sugar maple, tulip poplar, black cherry, yellow birch, red oak, and cucumber tree as reported by Michael (1994). Striped maple, mountain maple, and mountain laurel are dominant in the understory. The shrub, herbaceous and ground layers consists of elderberry, blackberry, greenbrier, stinging nettle, jewelweed, goldenrods, and numerous fern species. Additionally, reclaimed and unreclaimed mine areas contain mainly grasses, vetch, clover, bush clovers, black locust, and pines. Table 4-5 and Figure 4-6 describe the land cover types (USGS classifications) found in and around the Phase I and Phase II Project area. [Scientific names of all plants and animals are provided in Appendix D, Table D-1.]

Michael (1994) documented 55 herbaceous species and 20 woody species in the Phase I Project area in August 1994. Uncommon plants included cucumber tree, mountain magnolia, eastern hemlock, American mountain-ash, and Allegheny menziesia.

Figure 4-6. Land cover types, Beech Ridge Energy Wind Project, Greenbrier and Nicholas Counties, WV.

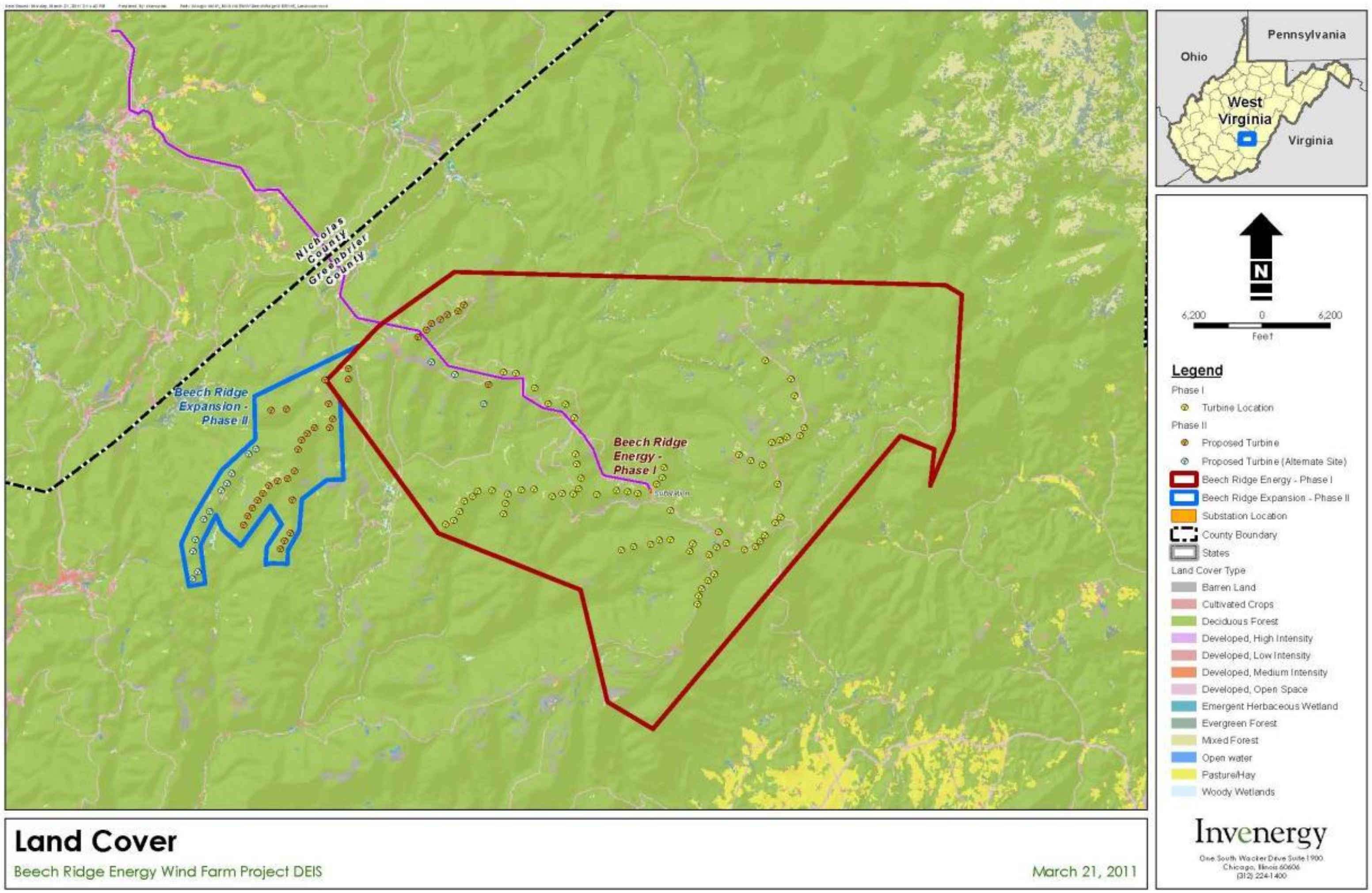


Table 4-5. 2003 land cover types in and around the Beech Ridge Energy Wind Project.

Habitat Type	Percent Cover
Deciduous forest	87.30
Pasture-hay	4.00
Mixed forest	2.74
Open space	2.30
Evergreen forest	1.56
Barren land	1.02
Cultivated crops	0.48
Low intensity developed	0.20
Open water	0.12
Emergent herbaceous wetlands	0.06
Woody wetlands	0.05
Medium intensity developed	0.02

Source: USGS Land Cover Analysis Tool (LCAT) Version 2 (http://lcat.usgs.gov/)

4.5.2.2 *Invasive Plants*

The State of West Virginia has declared 14 plant species as noxious weeds (§61-14A-5). Surveys in the Phase I and II Project areas did not document the occurrence of plant species designated by the state as noxious (Michael 1994, Potesta 2005b, 2010). BRE employees have observed invasive non-native Japanese stiltgrass, autumn olive, and bush honeysuckle in the planning area (E. Duncan, personal communication). Other invasive species that have the potential to occur in the Project area include kudzu, garlic mustard, tree-of-heaven, Morrow's honeysuckle, and multiflora rose. This potential for occurrence is based on the species documented occurrence in West Virginia (USDA-NRCS 2011) and habitat preference.

4.5.2.3 *Rare, Threatened, and Endangered Plants*

Plants designated by the Service as threatened, endangered, or of concern are not likely to occur in the Project area. There are 3 federally-listed plants with records of occurrence in Greenbrier and Nicholas counties: the shale barren rock-cress is listed endangered, and Virginia spiraea and small whorled pogonia are listed as threatened. The shale barren rock-cress occurs on south- and west-facing slopes in shale deposits at elevations ranging from 1,300 ft to 1,500 ft. The Virginia spiraea occurs along rocky, flood-scoured banks of high-gradient streams or rivers. These habitats are not found in the Project area, and it is unlikely that these species are present. To date, there are only 2 occurrences of small whorled pogonia in West Virginia. The WVDNR has a predictive model of habitat for this species. The model does not predict habitat for small whorled pogonia in the Project area. In addition, Michael (1994) did not detect any rare plants or unique plant communities during surveys conducted in the Phase I Project area.

4.6 Wildlife and Fisheries

4.6.1 Scope of Analysis

This section of the DEIS describes the affected environment associated with animals other than birds and bats. Due to the concern expressed during scoping about impacts to birds and bats at wind projects, these 2 animal resources are discussed separately in Sections 4.7 and 4.8.

The wildlife and fisheries analysis in this DEIS describes animal resources within the Phase I and Phase II Project areas. Generally speaking, animals are highly mobile; dispersal and migration are life strategies for many species. Between the 2 Phases, animals are expected to move, and habitat types are very similar. The wildlife and fisheries analysis in this DEIS is based on Michael (1994), Canterbury (2006), and information provided by the West Virginia Wildlife Diversity Program.

4.6.2 Existing Conditions

4.6.2.1 *Terrestrial Animals*

Vertebrate animals likely to use the Project area are represented by those often associated with extensively forested landscapes, altered by disturbances associated with timber harvesting and surface mining. Many of the animal species documented and expected to occur are common and widely distributed throughout the mountains of West Virginia. The extensive commercial timber harvest and surface mining over the past 2 centuries have affected native habitats in the Project area. Available habitat includes combinations of uninterrupted forest, forest patches, and clearings. Appendix D, Table D-2 provides lists of vertebrate terrestrial and aquatic animals likely to occur in the Project area and its vicinity based on Michael (1994), Lipton and White (1995), Canterbury (2006), Sauer et al. (2011), West Virginia Breeding Bird Atlas (2011), Young et al. (2012a, 2012c), and information provided by the West Virginia Wildlife Diversity Program.

Michael (1994) conducted an assessment of terrestrial animals in the Phase I Project area from May to November 1994. According to Michael (1994), the Project area is known or expected to support those animals often associated with multi-age hardwood forests with intermittent patches of conifers and herbaceous openings. Phase II is likely to possess similar suites of animals. Michael (1994) estimated 28 amphibians, 19 reptiles, 61 birds, and 29 mammals are likely to occur in the Project area.

Large carnivores are represented by black bear, coyote, and bobcat. Other large mammals such as white-tailed deer are also abundant. Over a century ago, as late as 1887, woodland bison and eastern elk were found in this area, but they have since been extirpated due to hunting. The red spruce vegetation zone (above 3,500 ft) contains various smaller species, such as rabbits, red squirrels, and southern flying squirrels. Gray squirrels and fox squirrels are more abundant within the lower vegetation zones of the area. Small mammals such as deer mouse, meadow jumping mouse, and various weasels are common within the Project area.

<u>Rare, Threatened, and Endangered Terrestrial Animals</u>
West Virginia Northern Flying Squirrel. The West Virginia northern flying squirrel, a subspecies, is endemic to the Allegheny Highlands and confined to montane boreal forests (USFWS 1990). The West Virginia northern flying squirrel primarily uses spruce and mixed spruce-northern hardwood forests; however, they will use hardwood-dominated forests that are adjacent to red spruce. In 1985, the Service listed the West Virginia northern flying squirrel as endangered due to rarity and extensive habitat loss. The Service delisted the squirrel (73 FR 50226-50247, August 26, 2008), but then relisted it (76 FR 35349-35350, June 17, 2011) as the result of a lawsuit challenging the delisting (Friends of Blackwater et al. v. Salazar et al., Case No 1:09-cv-02122-EGS, 2011).

The current known range of the West Virginia northern flying squirrel follows the spine of the high Allegheny Plateau from Blackwater Canyon/Dolly Sodds (Tucker County) to Cranberry/Upper Williams (Pocahontas and northwestern Greenbrier Counties), covering 7 counties in West Virginia and Highland County in Virginia (USFWS 2006).

The West Virginia northern flying squirrel is not thought to inhabit the Project area. Based upon the lack of suitable habitat found within the Project area and 3 years of negative nest-box data conducted by another private party on-site, it was concluded that it was unlikely for West Virginia northern flying squirrel to occupy the Project area. Potential harm to the West Virginia northern flying squirrel through habitat loss associated with the Project is not anticipated. The Service concluded the Project is not likely to adversely affect the West Virginia northern flying squirrel, and that no further consultation under the ESA would be required for this species (letter from the Service dated March 7, 2006).

Cheat Mountain Salamander. The Service listed the Cheat Mountain salamander as a threatened species on August 18, 1989 (54 FR 34464-34468). The Cheat Mountain salamander inhabits moist coniferous and mixed deciduous forests at higher elevations, above 2,000 ft and 3,500 ft in northern and southern portions, respectively, of their range (USFWS 2009a). The salamander's decline has been attributed to the loss and degradation of their relatively selective habitat conditions (USFWS 1991). Currently, the Cheat Mountain salamander is known from a 695-mi^2 area in Randolph, Pendleton, Pocahontas, Tucker, and Grant Counties in eastern West Virginia (USFWS 2009a). Known populations are discontinuous and restricted to the higher elevations (>2,000 ft amsl) of 12 mountains (USFWS 2009a).

The Project area is roughly 40 mi southwest of the nearest known Cheat Mountain salamander population at Thorny Flat at the south end of Cheat Mountain (Pauley 2007a as cited in USFWS 2009a). Although the species has been found in areas where some disturbance has occurred, the extent as well as the type of disturbances (i.e., clear cutting and surface mines) implemented in the Project area make occurrence of the species unlikely.

Northern Water Shrew. The northern water shrew is a West Virginia state species of special concern. It is often associated with high-elevation (>2,000 ft amsl) mountain streams and northern hardwood forests dominated by yellow birch, American beech, red spruce, red maple, and eastern hemlock trees and with dense, shrubby understory (WVDNR 2004). It occurs in forests along mountain streams characterized by cut banks, rocks, fallen logs, and abundant moss and leaf litter. It feeds on aquatic insects. To date, there are only 18 records of northern water shrews in Preston, Tucker, Randolph, Pendleton and Pocahontas counties. Surveys have not been done on the project site for the Northern water shrew, although potential habitat may exist on site.

4.6.2.2 *Aquatic Animals*

There are no major rivers or lakes situated within or near the Project area; however, the area includes perennial, intermittent, and ephemeral streams (described in Section 4.4.2.2) Additionally, numerous borrow pits and settling ponds from past mining activities are located in the Project area. Common fish species found in these small rivers and creeks include brook trout and sculpins at higher elevations, with bass, rock bass, minnows, and darters found within the lower elevations.

The WVDEP's Water Quality Standards Program has documented 15 streams as designated trout waters, and 4 streams are probably trout waters but have not been documented (Table 4-3, WVDEP Water Quality Standards Program, personal communication). Four other streams are not documented, but are probably trout waters, and 1 stream is a prospective trout stream. Trout waters are designated for the propagation and maintenance of fish and other aquatic life in streams or stream segments that sustain year-round trout populations.

Rare, Threatened, and Endangered Aquatic Animals

There are no federally listed endangered or threatened fish species found in West Virginia. However, 10 freshwater mussel species are listed as federally endangered. These mussels are associated with rivers and streams that are larger than the streams within and proximal to the Project area. Streams in the Project area are small, high-elevation streams that do not provide suitable habitat for listed mussels.

The candy darter is designated as a species of concern by the State. The WVNHP has assigned it to category S2 (6 to 20 documented occurrences, or few remaining individuals within the state; very rare and imperilled). The candy darter is found only in the upper Kanawha River System of West Virginia and Virginia. At least 80% of its range is within West Virginia's Gauley, Greenbrier, and Bluestone river drainages. It is not known if streams within and proximal to the Project area support the candy darter.

4.7 Avian Resources

4.7.1 Scope of Analysis

Based on studies of existing wind power projects in North America and Europe, the greatest potential for wildlife impacts are related to avian and bat species. Hence, this section devotes extensive discussion on avian resources, the majority of which are protected under the MBTA.

This DEIS describes avian resources within the Phase I and Phase II Project areas. Birds are highly mobile, and dispersal and migration are important aspects of their life strategies. Birds are expected to move between the 2 Project phases, which have similar habitat types. The avian resources analysis is based on information from the West Virginia Natural Heritage Program (WVNHP) database, West Virginia Breeding Bird Atlas II (2011), and studies conducted for the Project. Project area avian studies include:

- Environmental Assessment – Wildlife Impacts (Michael 1994)
- Raptor Migration Study (Lipton and White 1995)
- Avian Fatal Flaw Analysis (Curry & Kerlinger 2004)
- Avian Phase I Assessment of Bird Populations (Canterbury 2006)
- Spring and Fall Eagle And Osprey Surveys (Young et al. 2012a)
- Avian Migration Studies (Young et al. 2012c)
- Avian risk assessment (Young et al. 2012b)

Two avian resource studies are quite old (1994, 1995) and were conducted as part of a previous developer's environmental investigations. BRE contracted the more recent studies listed above. The study reports are provided in Appendix E.

4.7.2 Existing Conditions

Lipton and White (1995) and Canterbury (2006) described the Project area in terms applicable to bird use. Michael (1994) also assessed the Project area using a broader scope to include plants and other wildlife, as well as birds. All targeted bird surveys occurred relative to those areas proposed for turbine siting.

As mentioned previously, the leased lands largely have been used for timber production and coal mining. Much of the area was harvested in the first half of the 20^{th} century, resulting in extensive cleared areas (Michael 1994). More recently, commercial timber harvests were conducted systematically in 40-acre clear-cut units (Michael 1994). Although the regional landscape can be described as contiguously forested, the Phase I and Phase II Project areas are a mixture of managed forests, active and abandoned strip mines, herbaceous reclamation lands, old fields, man-made ponds, and wetlands. Recent clearing for the Phase I project has resulted in linear and small openings of brushy scrub/shrub habitat, which is expected to last for 5 to 6 years until natural succession advances to the immature tree stage. Contiguous forest patches tend to be larger ($\geq$ 500 acres) and more extensive in the eastern portion of the project area (Phase I), compared to the more fragmented western portion of the project area where Phase II is proposed. There are many forest patches $\leq$ 250 acres in the Phase II project area, as well as many small openings $\leq$ 40 acres with abrupt (hard) edges.

Using their knowledge of the avifauna of the region and experience with wind power development in West Virginia and elsewhere, Curry and Kerlinger (2004) reviewed topographic maps, available data, and literature in an attempt to identify potential risks to birds in association with the proposed Project. The review focused on identifying endangered, threatened, and species of special concern that may be found on and around the Project site. The habitat within the Project area does not exhibit characteristics unique to the landscape that may attract concentrations of birds. Curry and Kerlinger (2004) did not identify important stopover or staging sites where birds could rest and replenish resources such as large water bodies, agricultural fields, or wetlands. Curry and Kerlinger's (2004) interpretation of available information on the habitat and geographic location of the Project did not lead them to conclude that there were major bird migration and/or potential stopover sites within the Project boundary.

BRE conducted several pre-construction bird surveys in the Phase I Project area during the spring and fall of 2005 (Canterbury 2006). In addition, BRE conducted a post-construction osprey survey in the Phase I Project area in the spring of 2011 (Young et al. 2012a). BRE also conducted a pre-construction avian use survey in the Phase II Project area in the spring of 2011 (Young et al. 2012c). Survey methods generally followed established protocols: point counts, transects, and observations as described in the Service's land-based wind power guidelines (USFWS 2012c), with exception that winter bird surveys were not conducted, breeding bird surveys missed the early nesting season of the American woodcock, and raptor surveys missed the peak of bald and golden eagle migration, as well as some early and late migrating raptors (missing early fall osprey migration, and late fall migration of northern goshawks, red-shouldered hawks, and rough-legged hawks). Results are described briefly here and in detail in Canterbury (2006) and Young et al. (2012a, 2012c).

Appendix D, Table D-1 provides scientific names of all plants and animals referenced in the DEIS, and Table D-2 provides lists of birds and other vertebrate animals known or expected to occur in the Project area.

4.7.2.1 *Diurnal 50-m (165-ft) Radius Fixed Point Counts (Phase I Project Area)*

Diurnal 50-m (165-ft) radius fixed point counts were conducted at least twice a week at 100 points from May 10 to June 20, 2005, and from August 23 to November 15, 2005 (Canterbury 2006). The diurnal point counts provided information on species composition, habitat use, and flight characteristics. Passerines constituted 86.4% of the total birds observed during the spring and fall point counts.

During the spring, the most numerous species (total counted) observed were the red-eyed vireo, American crow, turkey vulture, American robin, yellow-rumped warbler (migrant through the area), and blue jay. Warblers were the most numerous passerine subgroup detected. Thrushes, corvids, and vireos were also frequently detected. A total of 366 raptors were observed during the spring point count surveys; 300 of these individuals were vultures.

During the fall, the 5 most numerous species were the European starling, blue jay, common grackle, turkey vulture, and cedar waxwing. Grassland birds and sparrows were the most numerous passerine group. Warblers and thrushes made up 21.3% of all passerines detected. A total of 1,390 raptors were recorded (9% of total birds observed); 829 of these individuals were vultures.

Habitats in the project area are a combination of contiguous forest, forest patches, and clearings. Species composition and frequency of occurrence varied with landscape and patch size, as well as tree diameter and percent canopy cover. Passerine use in the spring generally was higher in areas with the lowest overhead canopy (0-20%). This could be due to the preference of certain species for clear cuts, as well as increased delectability in these areas. Although considerably variable, the passerine species with an affinity for forest habitat were most often found in areas with greater than 70% forest cover.

With regard to flight characteristics of birds in the project area, most of the passerines observed in the spring were often below 25 m (82 ft), and therefore outside the "zone of risk" of the rotor-swept area (25-115 m; 82-377 ft). Of the passerines observed in flight, 32% were within the risk zone. Waterfowl, raptors, and other large birds were often observed at or slightly above the risk zone during spring and fall. As a group, 79% of raptors were within the risk zone during the spring study period. In the fall, 84% of raptors were observed flying within the "zone of risk." Corvids, starlings, waxwings, blackbirds, and finches appeared to be at greater risk than other passerine subgroups during the fall. Approximately 39% of warblers flying during the fall study were within the risk zone. Overall for both study periods, raptors appeared to be at the greatest risk for flying in the risk zone; this risk was higher in the fall than in the spring.

4.7.2.2 *Diurnal 500-m Line-Transects (Phase I Project Area)*

Canterbury (2006) surveyed diurnal 500-m (1,650-ft line-transects in 5 ridgetop locations during the breeding season from June 16 to June 20, 2005. Line-transects provided information on relative abundance and bird-habitat associations. Observers recorded 69 species among 640 individuals. The 5 most abundant species were red-eyed vireo, chestnut-sided warbler, black-throated green warbler, veery, and dark-eyed junco (Canterbury 2006).

4.7.2.3 *Spring Diurnal Raptor Surveys (Phase I Project Area)*

Spring diurnal raptor surveys were conducted using 2 methods, the broadcast call and quiet observer methods (Canterbury 2006). Spring raptor surveys provided information on relative abundance, and nesting.

The broadcast method was used at 50 of the point count locations from May 10 to June 15, 2005, from sunrise to 1300 hours. The broadcast call method is originally based on that described by Mosher et al. (1986 as cited in Canterbury 2006). Recorded vocalizations of targeted raptor species are broadcasted from a designated survey point for a specified duration. Vocalizations are broadcast using a trumpet speaker that is directed in at least 2 directions from the survey point. The broadcast period is followed by a period of the observer listening and recording bird responses to the vocalizations. The combined periods are often 10 to 20 minutes at each survey point.

The quiet observer method was used at 32 of the point count locations during 2 periods of the day, from daybreak until noon and 1300 to 1800 hours. The quiet observer method is the standard raptor survey method where an individual observes birds without the aid of call vocalizations. Observer points are usually surveyed for longer periods than 10 to 20 minutes.

During the spring, observers recorded 107 raptors of 10 species. Red-shouldered hawks were sighted at the greatest frequency in the spring, and northern harriers and American kestrels were sighted more often in the spring than the fall. Eastern screech-owl, Cooper's hawk, and broad-winged hawk were confirmed breeding in the study area.

4.7.2.4 *Fall Diurnal Raptor Surveys (Phase I Project Area)*

Fall diurnal raptor surveys were conducted using 2 methods (Canterbury 2006). The broadcast call method was used at 50 of the point count locations from September 1 to November 12, 2005, from sunrise to 1300 hour. In addition, 8 ridgetop locations were surveyed during this same timeframe using the quiet observer method. Each of the 8 ridgetop locations was surveyed only once for 12.5 hours and thus likely underestimated raptor use. Fall raptor surveys provided information on migratory patterns and relative abundance.

During the fall, observers detected 715 raptors of 16 species. More than 500 of these raptor sightings were vultures. Other commonly observed raptors were broad-winged, sharp-shinned, and red-tailed hawks. Eighty-four percent of raptors detected in flight during the fall surveys were observed to be within the rotor-swept zone. Raptor migration peaked during September. Raptor passage rates were similar across the study area, but a few more eagles were noted along Cold Knob (location of the existing Phase I, 67 turbines) and Grassy Knob (outside of the existing Phase I and planned Phase II, 33-turbiine expansion area).

During fall 1994, Lipton and White (1995) conducted raptor surveys from 6 observation points (Beech Knob, Five Points, Job Knob, Cold Knob, Craters Knob, and Joe Knob), 3 of which were within the Phase I Project area. Between September 10 and November 29, 1994, Lipton and White (1995) reported 974 raptors. Of these, 2 points, Beech Ridge and Cold Knob—located within the existing Phase I turbine strings, had the highest raptor migration rates in 1994 (Lipton and white 1994), as well as in 2005 and 2011 (Canterbury 2005, 2006, Young et. al 2011). Cold Knob and Beech Knob also had the highest number of observed resident raptors in 1994 (Lipton and white 1994). During 2005 surveys, Cold Knob also had the highest rates of eagle and songbird migration during fall (Canterbury 2005, 2006).

Lipton and White (1995) compared their survey results to those of Hanging Rock Tower, an established hawk migration observation point in Waiteville, West Virginia (<40 mi south of the Project area). Comparing counts from corresponding days and hours from both sites, Hanging Rock Tower had an overall passage rate more than 10 times that observed by Lipton and White (1995). Thus, the study area appears to have low to moderate raptor use, although certain locations such as Grassy Knob, Cold Knob, and Beech Ridge may be more attractive to raptors than others.

4.7.2.5 *Woodcock and Nocturnal Bird Surveys (Phase I Project Area)*

Woodcock and nocturnal birds were surveyed using 2 methods. During spring 2005, playback call surveys consisted of 5 minutes of broadcasting vocalizations followed by 5 minutes of observation/listening time (Canterbury 2006). Playback calls included those of owls, whip-poor-will, bitterns, and rails. Playback calls were conducted at point counts located on the existing timber company access road for only 12 nights, a limited timeframe that may have underestimated use. The playback call surveys provided information on the presence or absence of woodcock and nocturnal birds.

In fall 2005, Canterbury (2006) surveyed nocturnal migrants using a method described in Evans and Rosenberg (1999). For 12 nights in the fall, stationary points in the Project area were sampled for 4 to 5 hours using a sensitive microphone and recorder. These limited acoustic surveys provided some basic information on nocturnal migration in the Project area but did not represent the full migration season.

Five whippoorwills were heard in the spring of 2005. Fall nocturnal surveys yielded 11 species and 11,000 individuals, the most common of which were the Swainson’s thrush, gray-cheeked thrush, and common nighthawk.

4.7.2.6 *Golden-Winged Warbler and Cerulean Warbler (Phase I Project Area)*

Golden-winged warbler and cerulean warbler were surveyed from each of the 100 point count locations using song playbacks of both species (Canterbury 2006). Each point count location was surveyed 1 time for 10 minutes. Due to the short time frame, results may underestimate use. Playback songs of both species were broadcast. The survey results were used to locate breeding warblers; observers measured vegetation in occupied sites to assess habitat conditions.

Canterbury (2006) detected 2 golden-winged warblers during the point count survey, and an additional 7 territorial males while conducting activities associated with site visits (3 of these were just outside of the Project area). All detections occurred in clear-cut and mid-successional forest habitats. Golden-wing warblers were absent from 85% of the suitable habitat in the project area. Canterbury (2006) did not detect cerulean warblers.

During May 26 to June 2, 2010, the Brooks Bird Club conducted a rapid bio-assessment of various locations in Greenbrier County, including the location of the existing Beech Ridge wind project (Fox 2011). One golden-winged warbler was found at a reclaimed strip mine; however, it is unclear from the report whether this warbler was on the Beech Ridge project site. The report notes that cerulean warblers were uncommon in Greenbrier County and only found at low elevations; thus, we presume they were not found on the high elevation Beech Ridge project site by the Brooks Bird Club. However, they were seen in the Phase II expansion area by Western Ecosystems Technology during spring bird surveys in 2011 (Young et al. 2012c).

4.7.2.7 *Fall Migrant Songbirds (Phase I Project Area)*

Canterbury (2006) conducted mist-net surveys for fall migrant birds along the ridgetop access road in the Phase I Project area. Licensed banders ran from 10 to 15 mist-nets each day at road access areas on 40 days within the proposed Project area. Mist-netting results provided information on migrant species composition and migration patterns. Netting efforts captured 75 species among 1,612 individuals. The most numerous species captured were dark-eyed juncos and Cape May warblers. Several species were captured that were not observed during the fall point counts such as golden-winged warblers and Kentucky warblers.

4.7.2.8 *General Observations from 2005 Surveys (Phase I Project Area)*

Observers detected 124 species during the 2005 surveys (Canterbury 2006). Observers confirmed 100 species during the spring study and 121 species during the fall survey. Of the 100 species observed during the spring survey, all but 7 likely used the Project area for breeding, as determined by the presence of territorial, singing males well into mid-June. Wood duck, whip-poor-will, and eastern kingbird were observed during the spring, but not during the fall survey. [See Appendix E, Report E-4 to see Canterbury (2006)].

Overall, 2,578 raptors consisting of 18 different species were observed within the Project area during all survey efforts. The only shorebird observed in the surveys was the American woodcock. Waterfowl detected were the wood duck and mallard. The size and number of wetlands within the Project area are very limited and therefore would not be expected to attract abundant water birds.

4.7.2.9 *Post-Construction Osprey Survey (Phase I Project Area)*

The WVPSC siting certificate issued to BRE contains a condition for a post-construction study of eagles and osprey. BRE conducted a spring raptor survey in 2011 to specifically address osprey occurrences in the Phase I Project area (Young et al. 2012a).

Surveys were conducted from 5 locations (point stations) within the Phase I Project area. Each station was surveyed 3 times per week from March 16 to May 31, 2011, the period of time when migrant ospreys are likely to be observed, based on information from other regional hawk surveys (Young et al. 2012a). Mean bird use (including raptors, vultures, and owls) in the area varied among the point stations, from 1.74 birds per observer-hour at Station 2 to 7.78 birds per observer-hour at Station 5. Station 5 was located near Turbine J-03 and the transmission line.

Observers detected 126 individual raptors representing 9 species. One individual osprey was observed, accounting for 0.8% of total observed raptors. Seven eagles were observed, 1 bald eagle and 6 golden eagles, representing 5.5% of total observed raptors. It is important to note that the surveys likely missed the peak of golden eagle spring migration, which generally occurs prior to March. Hence, golden eagle use over the Project area probably is higher in late winter. Turkey vulture was the most commonly recorded species, representing 79.9% of all observations. The full report for the osprey survey (Young et al. 2012a) is provided in Appendix E, Report E-5. It should be noted that BRE is conducting a fall/winter/spring survey during 2011 and 2012 in the Phase I and Phase II Project areas to better sample the peak of bald and golden eagle migration and to further address the presence of ospreys, eagles, and other raptors in the Project area in winter.

Raptor use within the Phase I Project area was 0.62 birds per observer-hour. Buteos were observed in 35.7% of the surveys; their mean use was 0.48 birds per observer-hour. Broad-winged hawk was the most common buteo observed, with 39 individuals observed during the survey period. Eagles were observed during 3.6% of the surveys, and eagle use was 0.04 birds per observer-hour. Ospreys had the lowest use of all raptors detected (less than 0.01 birds per observer-hour) and were observed in only 0.7% of all surveys.

Raptor detections were highest in the middle of the day (1200 hours) from late-April through early-May. Based on estimated flight heights, 44% of detected raptors were within the rotor-swept zone (i.e., 35 m to 130 m [115 ft to 427 ft] agl).

Young et al. (2012a) compared data from the fall 2011 Phase I raptor surveys to similar data on corresponding days from 4 sites in the same geographic region that are used regularly for hawk migration studies (HMANA 2011). Excluding vulture observations, the average number of raptors per observer-hour was substantially lower at the Phase I Project (1.30 raptors per observer-hour) than at 4 other established sites (ranging from 9.15 to 56.85 raptors per observer-hour in fall (Young et al. 2012a).

4.7.2.10 *Pre-Construction Avian Use Surveys (Phase II Project Area)*

BRE conducted bird surveys between March 17 and May 31, 2011, in the Phase II Project area (Young et al 2012c). Surveys included fixed-point bird use surveys and raptor migration surveys.[25]

Bird Use Survey

From April 8 to May 31, 2011, bird use in the Phase II Project area was surveyed from 34 points; each point was surveyed approximately weekly. After completing 292 20-minute counts in 34 50-m (165-ft) radius plots, observers recorded 2,552 individuals consisting of 80 species (Young et al. 2012c). Mean species richness was 3.62 species per 20-minute survey per plot (Young et al. 2012c). Passerines represented 90% of all detections (Young et al. 2012c). The most common species observed (based on frequency of occurrence) were eastern towhee, red-eyed vireo, chestnut-sided warbler, and black-throated green warbler. The full report for the Phase II pre-construction surveys (Young et al. 2012c) is provided in Appendix E, Report E-6.

Diurnal raptor use in the bird use surveys was 0.01 birds per 20-minute survey per plot and raptors comprised 1% of all bird use (Young et al. 2012c). Twenty-four individual raptors of 5 species were recorded, with red-shouldered hawk most commonly observed. Diurnal raptor use within the 50-m plots included buteos and northern harrier. One barred owl was the only owl detected.

Spring Raptor Survey

Raptor surveys were conducted from 3 locations (point stations) within the Phase II Project area (Young et al. 2012c). Each station was surveyed approximately 3 times a week (totalling 32 or 33 times) from March 17 to May 31, 2011.

Observers detected 661 individual raptors representing 11 species. For all 3 stations in the Phase II Project area, mean bird use (includes raptors, vultures, and owls) was 4.88 birds per observer-hour. Mean bird use in the area varied slightly among the 3 point stations, from 4.36 birds per observer-hour at Station 3 to 6.82 birds per observer-hour at Station 2. Turkey vulture was the most commonly recorded species, representing 73.1% of all observations, and vulture use was 3.62 birds per observer-hour. Six golden eagles were observed, representing 1.0% of total observed raptors, and golden eagle use was 0.05 birds per observer-hour. As previously indicated, the spring raptor survey likely missed the peak of golden eagle migration, which generally occurs prior to March. Hence, golden eagle use over the Project area probably is higher in late winter. BRE is conducting a fall/winter/spring survey in 2011/2012 in the Phase I and Phase II Project areas to further address the presence of ospreys, eagles, and other raptors in the Project area during migration and winter. The first report for the 2011 Phase II pre-construction surveys (Young et al. 2012c) is provided in Appendix E, Report E-6.

Raptor use within the Phase II Project area was 3.68 birds per observer-hour during spring 2011 and represented 25.7% of all observations (Young et al. 2012c). Buteos represented 23% of all observations; their mean use was 1.08 birds per observer-hour (Young et al. 2012c). Red-shouldered hawk and broad-winged hawk were the most common buteos observed, with 71 and 47 individuals observed, respectively, during the survey period (Young et al. 2012c).

Based on estimated flight heights, 46.4% of detected raptors were within the rotor-swept zone (i.e., 35 m to 130 m [115 ft to 427 ft]) agl.

[25] BRE's pre-construction surveys included fall surveys that are also described in Young et al. (2012c), which was made available in July 2012. This was too late to summarize in the DEIS; this information will be summarized in the FEIS. However, the full report is provided in Appendix E, Report E-6.

Young et al. (2012c) compared data from the spring 2011 Phase I raptor surveys to similar data on corresponding days from 3 sites in the same geographic region that are used regularly for hawk migration studies (HMANA 2011). Including vulture observations, the average number of birds per observer-hour (0.91) was slightly lower at the Phase II Project area than at 3 established sites (ranging from 2.58 to 4.39) (Young et al. 2012c). Overall raptor use within the Phase II Project area appeared to be lower than raptor use recorded at other hawk migration study sites in the region.

4.7.2.11 *Rare, Threatened, and Endangered Birds*

The Service is responsible for implementing the ESA and BGEPA. Although the bald eagle is no longer listed under the ESA, BGPEA continues to offer protection and prohibits the take of this species, as well as golden eagles. West Virginia does not have state threatened and endangered species legislation; species listed as either threatened or endangered in the state are those on the Service's list of federally-threatened and endangered species. The MBTA provides additional protections to all migratory birds.

Passerines

No ESA federally-listed passerine species were observed during Phase I and Phase II surveys. Two bird species known from the region are currently on the Service's list of Birds of Conservation Concern (USFWS 2008a), golden-winged warbler and cerulean warbler. Both have been observed on the project site and surrounding lands. The Service received petitions to list both these warblers under the ESA. The Service determined that listing of cerulean warblers was not warranted (71 FR 70717). The Service will initiate a status review within the next year to determine if listing the golden-winged warbler is warranted. Approximately 9 golden-winged warblers were recorded within Phases I and II of the Project area (Michael 1994, Canterbury 2006, Young et al. 2012c) and in surrounding areas (Fox 2011). Seventeen cerulean warblers were identified during 2011 spring avian use surveys in the Phase II expansion area (Young et al. 2012c).

Observers detected several passerine species that are designated rare in the state by the WVNHP (WVNHP 2007) in both Phase I and II Project areas (Table 4-6 and Table 4-7).

Table 4-6. Rare passerines and other perching birds, as designated by the West Virginia Natural Heritage Program, that were observed during bird use surveys conducted for the Beech Ridge Wind Energy Phase I Project area in spring and fall of 2005.

Species	Status	Spring survey		Fall survey	
		No. of groups	No. of individuals	No. of groups	No. of individuals
Red-headed woodpecker	S2B S3N	2	2	4	4
Yellow-bellied flycatcher	S1B	3	3	10	10
Alder flycatcher	S3B	8	8	2	2
Swainson's thrush	S3B	61	49	33	90
Golden-winged warbler	S2	2	2	0	0
Nashville warbler	S1	0	0	14	14
Blackburnian warbler	S3	5	5	31	55
Vesper sparrow	S2N S3B	0	0	26	41

S1 = West Virginia State critically imperilled and/or extremely rare species (less than 5 known occurrences; WVDNR 2007)
S2 = West Virginia State imperilled or rare species (5 to 20 known occurrences; WVDNR 2007)
S3 = West Virginia State species of concern (21 to 100 known occurrences; WVDNR 2007)
B = Breeding
N = Non-breeding
Source: Canterbury (2006)

Of the species listed in Table 4-7, Canterbury (2006) indicated yellow-bellied flycatcher and Swainson's thrush were not observed as breeding birds in the Project area. Additionally, Nashville warblers were observed only during fall surveys.

Table 4-7. Rare passerines and other perching birds, as designated by the West Virginia Natural Heritage Program, that were observed during spring surveys conducted for the Beech Ridge Wind Energy Phase II Project area in spring of 2011.

Species	Status	Spring survey	
		No. of groups	No. of individuals
Alder flycatcher	S3B	3	3
Swainson's warbler	S3B	1	1
Golden-winged warbler	S2	9	9
Nashville warbler	S1	5	6
Blackburnian warbler	S3	2	2

S1 = West Virginia State critically imperilled and/or extremely rare species (less than 5 known occurrences; WVDNR 2007)
S2 = West Virginia State imperilled or rare species (5 to 20 known occurrences; WVDNR 2007)
S3 = West Virginia State species of concern (21 to 100 known occurrences; WVDNR 2007)
B = Breeding
N = Non-breeding
Source: Young et al. (2012c)

The results of the West Virginia breeding bird atlas indicate that all species listed in Table 4-6 and Table 4-7 are possible, probable, or confirmed breeders in West Virginia (West Virginia Breeding Bird Atlas 2011), with the exception of the yellow-bellied flycatcher. Based on habitat requirements and known conditions in the Project area, vesper sparrows likely did not use the Project area for breeding.

Raptors

Bald and golden eagles are raptors that are afforded protection under the MBTA and BGEPA. The WVNHP designates rare status to other raptors, but these species are not protected under state law. A summary of raptors is provided for Phase I in Table 4-8 and Table 4-9.

Table 4-8. Rare raptors and vultures, as designated by the West Virginia Natural Heritage Program, that were observed during pre-construction raptor surveys conducted for the Beech Ridge Wind Energy Phase I Project area during spring and fall 2005.

Species	Status	Spring survey		Fall survey	
		No. of groups	No. of individuals	No. of groups	No. of individuals
Black vulture	S3B	4	15	9	30
Osprey	S2B	0	0	6	6
Northern harrier	S1B S2N	3	3	8	8
Golden eagle	EA	0	0	1	1
Bald eagle	EA S2B S3N	0	0	1	1

EA = Protected under Eagle Act
S1= West Virginia State critically imperilled and/or extremely rare species (less than five known occurrences; WVDNR 2007)
S2= West Virginia State imperilled or rare species (five to 20 known occurrences; WVDNR 2007)
S3= West Virginia State species of concern (21 to 100 known occurrences; WVDNR 2007)
B = Breeding population
N = Non-breeding population
Source: Canterbury (2006)

Table 4-9. Rare raptors and vultures, as designated by the West Virginia Natural Heritage Program, that were observed during spring post-construction surveys conducted for the Beech Ridge Wind Energy Phase I Project area during spring and fall 2011.

Species	Status	Spring survey		Fall survey	
		No. of groups	No. of individuals	No. of groups	No. of individuals
Black vulture	S3B	4	7	2	5
Osprey	S2B	1	1	3	3
Northern harrier	S1B S2N	0	0	1	1
Golden eagle	EA	4	6	4	4
Bald eagle	EA S2B S3N	1	1	0	0

EA = Protected under Eagle Act
S1= West Virginia State critically imperilled and/or extremely rare species (less than five known occurrences; WVDNR 2007)
S2= West Virginia State imperilled or rare species (five to 20 known occurrences; WVDNR 2007)
S3= West Virginia State species of concern (21 to 100 known occurrences; WVDNR 2007)
B = Breeding population
N = Non-breeding population
Source: Young et al. (2012c)

During the Phase II pre-construction birds surveys (2012c), there were few observations of rare raptors (Table 4-10) One golden eagle was observed during point-count surveys in addition to the 6 golden eagles seen during the raptor survey (Young et al. 2012c). The Service

Table 4-10. Rare raptors, as designated by the West Virginia Natural Heritage Program, observed during spring 2011 pre-construction surveys conducted for the Beech Ridge Wind Energy Phase II Project area.

Species	Status	Spring survey	
		No. of groups	No. of individuals
Golden eagle	EA	3	7
Northern harrier	S1B S3N	5	5

EA = Protected under Eagle Act
S1= West Virginia State critically imperilled and/or extremely rare species (less than five known occurrences; WVDNR 2007)
S3= West Virginia State species of concern (21 to 100 known occurrences; WVDNR 2007)
B = Breeding population N = Non-breeding population
Source: Young et al. (2012c)

Suitable nesting habitat for bald eagles has not been identified in the Project area (Curry & Kerlinger 2004, Canterbury 2006). Bald eagles are known to migrate through the region. They were observed in low numbers in the Project area during spring and fall migration. Because these surveys missed peak eagle migration periods, they may underestimate use by bald eagles of the project site.

Currently, there are no known active golden eagle breeding territories in the eastern U.S. (USFWS 2011c). Hundreds of golden eagles that breed in eastern Canada migrate into the U.S. and winter primarily in the Appalachian Mountain region, including West Virginia. A telemetry study documented a golden eagle moving through the Project area in December 2006 (Miller 2011, T. Katzner, personal communication with BRE, November 29, 2011). This same study found migrant and wintering golden eagles concentrating largely to the east and southwest of the Project (Miller 2011); however, this should not be interpreted to mean that golden eagles are not using the Project area. Radio-marked birds tend to stay near the area where they are captured, and none of the radio-marked eagles was captured on the Project area. Because radio-marked birds caught near the Project area spent the winter all around the Project area, and habitat conditions are similar throughout this area, the Service assumes that golden eagles migrate through and winter in the Project area. Because surveys by BRE's consultants missed peak eagle migration periods, additional surveys for bald and golden eagles are being conducted in 2012 and 2013 to better evaluate abundance and risk.

4.7.3 Effect of Stipulation Modification

During the period from April 1 through November 15, 2012, the 67-turbine Project will operate during night-time hours when wind speeds are 6.9 m/s or higher. This is a change from the previous 2 years (2010 and 2011) when turbines did not operate at night during this period. The limited operations during this seasonal period results in a changed environment for night-time migrating birds due to the spinning turbines, which were not operating during this season in 2010 and 2011. There was no post-construction monitoring in years 2010 and 2011, so it will not be possible to calculate actual differences in bird mortality under the 2 scenarios. It is possible that curtailment strategies designed for bats could reduce bird mortality by removing the risk of spinning blades in the birds' air space; however, birds are also known to strike stationary objects. The Service is aware of no evidence to date that supports an assumption that curtailment strategies for bats also reduce mortality of birds. Curtailment studies published to date focus on bat mortality, whereas studies currently being conducted are beginning to shift focus to birds as well. Until there is new information available, the analysis in this DEIS assumes that curtailment strategies for bats have no effect on bird mortality. Hence, this analysis assumes that implementation of the limited operations from April 1 to November 15, 2012, will not result in changes in bird mortality as compared to the previous 2 years (2010 and 2012) when turbines did not spin during this period. Estimates of bird mortality for the 67 existing turbines from March 2010 (when operations began) until November 15, 2012, are included in the cumulative effects section of Chapter 5 as a past and present effect of the Project.

Turbine noise being created during the limited 7.5-month night-time operations period may affect birds. However, as described in Section 4.2.3, the affected noise environment will not be substantially different than the existing ambient conditions. The effects of turbine noise on birds are not well understood and are discussed in more detail in Chapter 5.

4.8 Bats

4.8.1 Scope of Analysis

This DEIS describes bat resources within the Phase I and Phase II Project areas. Bats are highly mobile, and dispersal and migration are important aspects of their life strategies. Similar bat species can be expected to occur throughout the Project area as habitat is similar in both the Phase I and Phase II areas. For the purposes of this NEPA analysis, federally-listed and non-listed bats (those species not listed as threatened or endangered under the ESA) are addressed together in this Section. The bat resources analysis is based on consultations with staff of the WVDNR and the Service, as well as information in the WVNHP database and studies conducted for the Project, which include the following:

- Mist Net Surveys (BHE 2005);
- Chiropteran Risk Assessment (BHE 2006);
- Bat Mist Netting and Acoustic Surveys (Young and Gruver 2011), and
- Bat Risk Assessment (Young et al. 2012b).

The study reports are provided in Appendix F.

4.8.2 Existing Conditions

Fourteen species of bats have been documented in West Virginia. Most have potential to occur in the Project area (Table 4-11). The gray bat (federally endangered), Rafinesque's big-eared bat, Seminole bat, and the evening bat are considered rare in West Virginia. WVDNR notes the gray bat as an accidental occurrence (only two individuals observed [WVDNR 2010]). The 10 additional bat species in West Virginia include year-round residents and migrants (BRE 2006).

Table 4-11. Bats potentially present during summer, winter and spring/fall migration in West Virginia and in the Beech Ridge Project area.

Species	Fed/State Status	Potential Seasonal Presence within Project Area			Identified in Greenbrier and Nicholas Counties*
		Summer	Winter	Migration	
Indiana bat	FE/S1	Yes	No	Yes	Winter
Virginia big-eared bat	FE/S2	Yes	No	Yes**	No
Northern long-eared bat	None	Yes	No	Yes	Summer/Winter
Eastern small-footed bat	None/S1	Yes	Yes	Yes	Summer/Winter
Little brown bat	None	Yes	No	Yes	Summer/Winter
Tri-colored bat	None	Yes	Yes	Yes	Summer/Winter
Big brown bat	None	Yes	Yes	Yes**	Summer/Winter
Eastern red bat	None	Yes	Yes	Yes	Summer
Hoary bat	None	Yes	Unlikely	Yes	Summer
Silver-haired bat	None/S2	No	Yes	Yes	Winter
Gray bat	FE/S2	No	No	No	No
Rafinesque's big-eared bat	None/S1	No	No	No	No
Evening bat	None/SH	Unlikely	No	Unlikely	No

*Absence of records in the county likely reflects survey effort and does not indicate absence of the species.
**Species is not migratory, but may be present in spring and fall.
WVNHP Rank: S1 = Five or fewer documented occurrences, or very few individuals remaining in the state. Extremely rare and critically imperilled, or because of factor(s) making the species vulnerable to extirpation. S2 = Six to 20 documented occurrences, or few individuals remaining in the state. Very rare and imperilled, or ranked because of factor(s) making the species vulnerable to extirpation. S3 = Historically located in the state, not relocated in past 20 years, may be rediscovered.
Source: BHE (2006).

Of the 10 species of bats potentially occurring within the Project area, the Indiana bat and Virginia big-eared bat are federally-listed as endangered. The remaining 8 species of bats— the northern long-eared bat, eastern small-footed bat, little brown bat, tri-colored bat (formerly eastern pipistrelle), big brown bat, eastern red bat, hoary bat, and silver-haired bat— currently have no federal regulatory status. However, the eastern small-footed bat and the silver-haired bat are considered rare by the West Virginia Nongame Wildlife and Natural Heritage Program (NWNHP). The NWNHP tracks populations of rare species; however, the state of West Virginia does not list species as threatened or endangered. The largest numbers of hibernating eastern small-footed bats are found in caves of Greenbrier and Monroe counties, but the total number known to hibernate in the state is less than 50 individuals (WVDNR 2010).

Due to the rapid spread of WNS and its impact on various bat species, the Service has been petitioned to consider listing the eastern small-footed bat and northern long-eared bat. The Service considers the information provided in these petitions as substantial and has solicited information on the species to consider in its review (76 Federal Register 38095). The Service is also evaluating the status of the little brown bat due to the impact of WNS. BRE has opted to not include these species as covered species in the HCP.[26] Should any of these species be listed in the future, BRE would need to avoid take of these species or seek a permit amendment to add newly listed species to the permit.

Of the 10 species of bats likely to be present during some portion of the year in the Project area, most have been killed at 1 or more operating wind energy sites. Based upon results of mortality monitoring

[26] Early in the development of the HCP, the Service recommended that BRE include the eastern small-footed bat, northern long-eared bat, and little brown bat as covered species.

completed to date at similar wind energy sites, hoary bats and eastern red bats would be expected to account for the majority of bat mortality at Beech Ridge (BHE 2006).

Wind projects have been cited as a potential threat to migrating bats for a number of years, and emerging evidence suggests that tree-roosting migratory bats[27] could be at a greater risk of collision than birds. Little is known about the migration patterns and numbers of tree-roosting migratory bats and the factors contributing to levels of risk.

Concern about tree-roosting bats arose mainly from a 2003 study at the 44-turbine Mountaineer Wind Energy Facility in Tucker County, West Virginia where 475 dead bats (including many tree-roosting bats) were documented between April 20 and November 9, 2003 (Johnson and Strickland 2004). The 2003 Mountaineer study reported that 475 dead bats were found, however, this is not the adjusted mortality estimate based on searcher efficiency and scavenger efficiency trials. The researchers conducted searcher efficiency and scavenger removal trials for birds only and had a small sample size of 30 birds. Searcher efficiency and scavenger efficiency is likely different for birds versus bats, and is highly influenced by sample sizes. Presumably using birds as substitutes for bats in searcher efficiency trials, Kerns and Kerlinger (2004) estimated that 2,092 bats (47.5 bats per turbine per year) were killed at the Mountaineer Wind Energy Facility during the study period. This number should therefore be interpreted with caution because it may be biased high or low. It is among the highest reported rates of bat fatality at any wind power project.

Mortality of bats has been documented at wind energy facilities in the eastern United States (Kunz et al. 2007b), with most fatalities occurring during what is generally considered the fall migration period (August to November; Arnett et al. 2008, Cryan 2003, Cryan and Brown 2007, Johnson et al. 2005). Species documented under turbines in the East include little brown bat, northern long-eared bat, tri-colored bat, Seminole bat, silver-haired bat, hoary bat, red bat, Indiana bat, and big brown bat.

Researchers currently have a limited understanding of the actual mechanism of bat collisions. Evidence from the timing of fatalities documented at existing wind facilities and other structures suggests that migrating bats are most at risk. Some authors consider resident bats during the summer feeding and pup-rearing period to be at low risk of collision (Johnson et al. 2003a, Johnson and Strickland 2004); however, risk could be high if a breeding bat's home range overlaps with the turbines and the bat flies repeatedly at the height rotor-swept area. Certain species of bats that tend to fly at heights of the rotor-swept area appear to be at higher risk than others.

Fatalities at Mountaineer and other northeastern wind energy facilities are heavily skewed toward tree-roosting migratory bats, including red bat, silver-haired bat, and hoary bat (Johnson et al. 2011). Although several wind energy facilities report mortality rates drastically lower than those observed at Mountaineer (Erickson et al. 2003a, Johnson et al. 2003a, Arnett et al. 2008), the increasing number of wind energy facilities being constructed in the eastern United States has led some to suggest that populations of tree-roosting bats may decline as a result of the long-term cumulative impacts of present and future wind power developments (Kunz et al. 2007a, Kuvlesky et al. 2007, Arnett et al. 2008).

In addition, studies show that all species are exposed to collision risk at different times of the year in various geographic areas. Nightly detection rates of silver-haired, hoary, and eastern red bats during fall migration peaked earlier in the year in the two northernmost geographic regions compared to the mid-Atlantic region (Johnson et al. 2011). Additionally, nightly detection rates of the three species during spring migration peaked earlier in the year in the mid-Atlantic compared to geographic regions farther north (northeast region and northern Allegheny plateau) (Johnson et al. 2011).

A summary of a study on migratory routes of tree-roosting bats (Cryan 2003) indicates seasonal differences in migratory routes exist. Other studies (Johnson et al. 2011) contend that these differences

[27] Tree bats (or lasiurines) roost in trees throughout the year and make seasonal long-distance migrations to spend winters in warmer climates. They include hoary bat, eastern red bat, and silver-haired bat.

do not adequately explain the difference between spring and fall detection rates observed over such a large geographic scale. Flight behaviour may be a factor. It may be that bats emerging from winter hibernacula quickly fly to summer breeding habitat and in so doing fly at high enough elevations so as to avoid the rotor swept area. Some authors have hypothesized that the tree-roosting bats fly at lower heights during fall than spring migration, as suggested by Cryan and Veilleux (2007) and Valdez and Cryan (2009). This argument is supported by studies showing mortality at wind energy facilities occur primarily during fall migration in the eastern United States (Johnson 2005, Kunz et al. 2007a, and Arnett et al. 2008).

4.8.2.1 *Indiana Bat*

The Indiana bat was included on the list of endangered species in 1967 prior to the enactment of the ESA (USFWS 2007; 32 FR 4001, March 11, 1967). At the time of listing, primary threats to the species were believed to include loss of habitat and human disturbance, especially at winter hibernacula, and a general lack of knowledge about the species biology and distribution (USFWS 2007).

The range of the Indiana bat extends throughout much of the eastern U.S. and includes 22 different states (Gardner and Cook 2002, USFWS 2007). Indiana bats have two distinct habitat requirements: a stable environment in which to hibernate during the winter, and woodland habitat for maternity roosts in the summer. Indiana bats in the Appalachian Mountain Recovery Unit typically hibernate between November 15 and March 31. Full description of life history and habitat requirements are found in the Project HCP (Section 3.2.1).

<u>Indiana Bat Status and Occurrence</u>
Appalachian Mountain Recovery Unit. The revised Draft Indiana Bat Recovery Plan divides the species range into 4 recovery units based on several factors such as traditional taxonomic studies, banding returns, and genetic variation (USFWS 2007). The Project area falls within the Appalachian Mountain Recovery Unit, which includes the range of Indiana bat within the states of Pennsylvania, Maryland, Virginia, West Virginia, North Carolina and the far eastern tier of Tennessee. According to the 2011 Rangewide Population Estimates (USFWS 2012a), the Indiana bat population in the Appalachian Mountain Recovery Unit was approximately 30,568 in 2009 and 32,529 in 2011 (Table 4-12). These estimates represent approximately 7.3% and 7.6% of the rangewide 2009 and 2011 Indiana bat population, respectively (USFWS 2012a). The overall population estimate for the Appalachian Mountain recovery unit increased 6.4% between 2009 and 2011 (Table 4-12, USFWS 2012a). However, this trend is not expected to continue due to the spread of WNS, a fungus that has killed over 5.5 million bats of different species (USFWS 2012d). Within the Appalachian Mountain Recovery Unit, approximately 62% of the Indiana bats hibernated in West Virginia in 2011 (USFWS 2011b).

Table 4-12. Indiana bat population estimates for the Appalachian Mountain Recovery Unit by state and year. Estimates are based primarily on winter surveys at known Priority 1 and 2 hibernacula. Additional data from Priority 3 and 4 hibernacula were included when available; however, survey efforts for these smaller hibernacula vary over time.

State	2001	2003	2005	2007	2009[1]	2011	2009-2011 percent change
West Virginia	9,714	11,443	13,417	14,745	17,965	20,358	13.3
Tennessee (East)	5,372	6,556	8,853	5,977	11,058	11,096	0.3
Pennsylvania	702	931	835	1,038	1,031	518	-49.8
Virginia	596	728	567	535	513	556	8.4
North Carolina	0	0	0	0	1	1	0
Maryland[2]	-	-	-	-	-	-	-
Recovery Unit Total	16,384	19,659	23,672	22,295	30,568	32,529	6.4
Rangewide Total	328,617	363,608	425,372	467,947	415,512	424,708	2.2

[1] The 2009 and 2011 estimates do not reflect the total effect of WNS. Population declines appear to occur the 3rd winter after discovery of the fungus in caves. Trends will become better known following the winter of 2012.
[2] No data reported for Maryland.
Source: USFWS 2012a.

There are 88 known Indiana bat hibernacula in the Appalachian Mountain Recovery Unit, 55 of which have extant (at least one record since 1995) winter populations (USFWS 2007). There are 2 Priority One[28] hibernacula in the recovery unit, Hellhole Cave (WV) and White Oak Blowhole (TN), both of which are designated Critical Habitat for Indiana bats. These 2 hibernacula had estimated populations of 12,858 and 5,481 Indiana bats, respectively, in 2007 (USFWS 2009b) and 14,855 and 11,058 Indiana bats, respectively, in 2009, which represent approximately 96% of the total number of Indiana bats in the Appalachian Mountain Recovery Unit (USFWS 2011b).

West Virginia. West Virginia is located in the Appalachian Mountain Recovery Unit for Indiana bat (USFWS 2007). In 2009, approximately 4.3% of the estimated range-wide population of Indiana bats hibernated in West Virginia (USFWS 2012a). This increased to approximately 4.8% in 2011 (USFWS 2012a). Numbers of hibernating Indiana bats in West Virginia have steadily increased from approximately 9,714 in 2001 to 20,358 individuals in 2011, which is the most recent year that field data are available (Table 4-12; USFWS 2012a). Increases in the number of bats hibernating in Hellhole Cave have accounted for most of this growth. The entrance to this cave was fenced in 1985, limiting human access.

Although counts of most Indiana bat hibernacula were not conducted in 2010, surveys in Hellhole Cave in February 2010 documented 18,557 Indiana bats. This is the highest count ever recorded for this site and is an increase of nearly 5,700 from the 2007 survey. This could indicate a total population of slightly over 20,000 Indiana bats hibernating in West Virginia. However, the survey confirmed the presence of WNS in the cave. Approximately 2% of the visible Indiana bats in Hellhole Cave showed signs of WNS, and the number of little brown bats in surveyed areas was 53% less than the 2007 count, indicating the potential level of WNS-associated mortality in that species. Based on data from 3 WNS-affected sites in West Virginia, 43% mortality of Indiana bats has already been observed in these affected caves. Continued monitoring in future years should provide more information on the extent of WNS-related impacts to populations in West Virginia and the Appalachian Mountain Recovery Unit.

[28] Priority 1 hibernaculum includes ≥ 10,000 individual bats
Priority 2 hibernaculum includes 1,000-9,999 individual bats
Priority 3 hibernaculum includes 50 – 999 individual bats
Priority 4 hibernaculum includes 1-49 individual bats

There are 37 known Indiana bat hibernacula in the state and of these, 27 have extant winter populations (USFWS 2007). Of the West Virginia hibernacula, 1 is classified as Priority 1, 1 is classified as Priority 2, 11 are Priority 3, 22 are Priority 4 hibernacula, and 2 are unclassified (USFWS 2007). Thirteen of the 22 Priority 4 hibernacula are considered extinct or had a maximum population size of zero since 2000 (USFWS 2007). The Priority 1 hibernaculum, Hellhole Cave, is located in Pendleton County in the east-central part of the state.

All of the hibernacula in West Virginia are found in the eastern part of the state in the Appalachian Mountains, Central Appalachian Broadleaf Forest Ecoregion, including in Greenbrier and adjacent counties (USFWS 2007). Caves known to be important to the Indiana bat relative to the Project are illustrated in Figure 4-7.

As of the 2007 Draft Indiana Bat Recovery Plan (USFWS 2007), only 3 maternity colonies, located in Boone and Tucker Counties, were recorded for the state. Since 2007, 2 additional maternity colonies have been located in Marshall and Wetzel counties. This is believed to represent a very small portion of maternal colonies due to the limited nature of surveys for maternal colonies (C. Stihler, WVDN, personal communication). Six counties (Clay, Nicholas, Pendleton, Raleigh, Randolph, and Tucker) have summer records of Indiana bats other than reproductive females or maternal colonies (Project HCP). Figure 4-7 illustrates known summer and winter occurrences of Indiana bats within West Virginia.

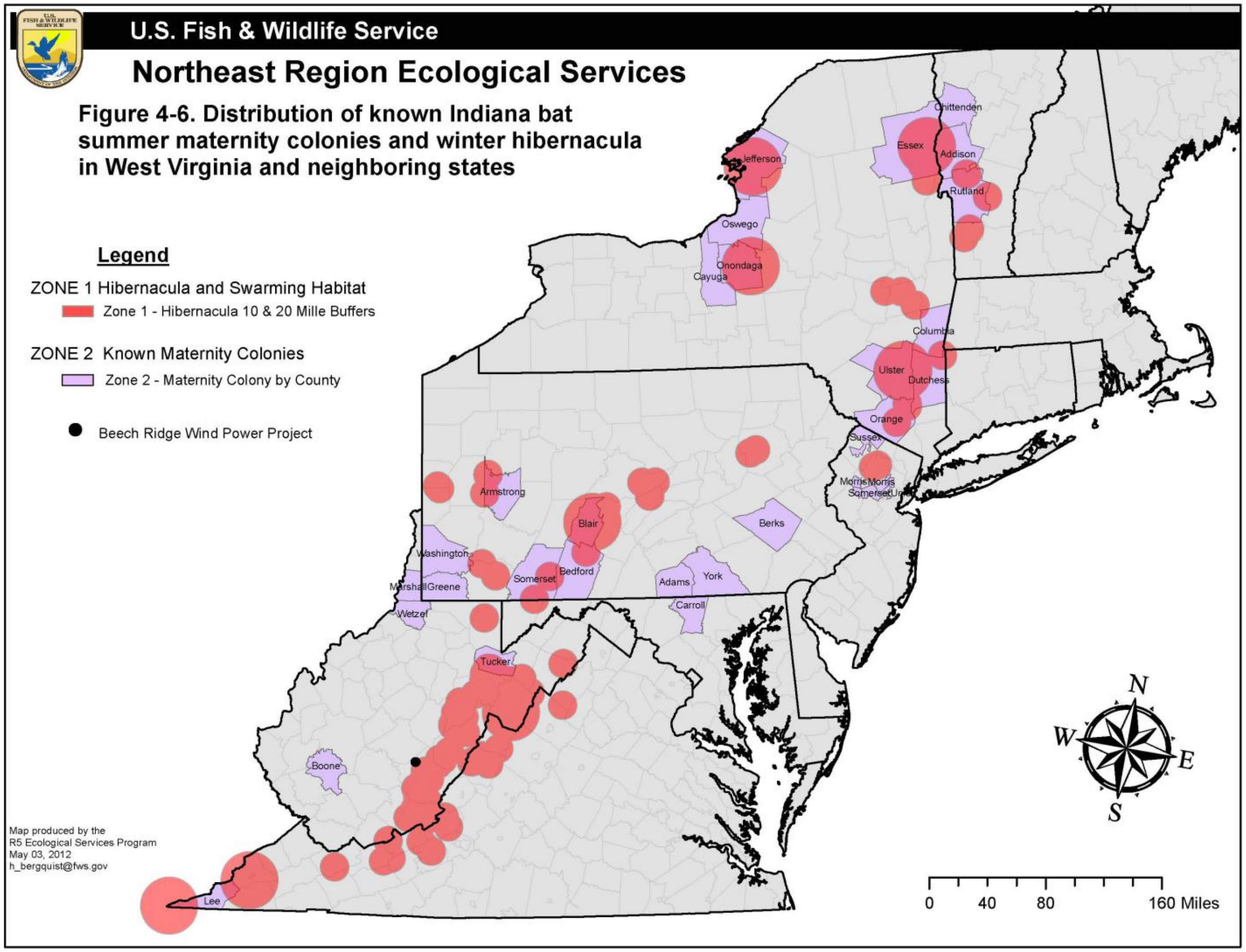
Local Population/Project Area. Existing information suggests that the occurrence and abundance of Indiana bats in the Project area is probably variable over time. Based on the available information, results of site surveys, and distance to the nearest known hibernacula, it is assumed that Indiana bats may migrate through or occupy the Project area from approximately April 1 through November 15. On-site summer and fall mist net surveys did not capture any Indiana bats on site in 2006 or 2010 (BHE 2006, Young and Gruver 2011). No Indiana bats are expected to be in the Project area from November 15 through March 31 when they are hibernating.

Acoustic data collected during the on-site mist net surveys in 2005, which was limited to the late July period, recorded between 3 to 8 calls that had characteristics of Indiana bat vocalizations, depending on the method of analysis used to screen the calls (Animal Welfare Institute et al. v. Beech Ridge Energy et al. Memorandum Opinion 2009).

BRE collected additional acoustic data on the Project site between July 21 and November 23, 2010. The analysis involved 2 quantitative screens and 1 qualitative screen. Quantitative screens included a call analysis filter and a multivariate statistical model developed from a set of known calls. In addition, an Indiana bat biologist assessed calls visually to make identifications (Young and Gruver 2011).

Of the 12,431 call files examined, 2 screening methods identified 6 Indiana bat calls, and all 3 screening methods identified 1 Indiana bat call (Young and Gruver 2011). Three of these files were recorded on the same night (July 28), and of those 3, 2 were from the same station (Station 3559 located at ground level). The 1 file identified by all 3 screening methods as a potential Indiana bat call was recorded at Station 3559 on the night of July 29.

Figure 4-7. Distribution of known Indiana bat summer maternity colonies and winter hibernacula in West Virginia and neighboring states.



The acoustic information provides evidence that an unknown number of Indiana bats are likely using the project area, at a minimum during July, which corresponds to the transition between the maternity season and fall swarming/early migration. It is not known whether the calls reflect one bat repeatedly circling an area or multiple bats using the air space. It is also not known if the calls were made by male or female Indiana bats, or if they were reproductively active. However, the timing of the calls and circumstances leave open the possibility of an undiscovered maternity area or male bachelor colony somewhere nearby, despite the fact that Indiana bats have not been caught on site during repeated mist-net surveys.[29] Considering the rarity of Indiana bats on the landscape, one can surmise potentially greater use of the site by Indiana bats than the limited acoustic sampling indicates. Calls were heard in 2005 and again in 2010 within the project area, using only a few detectors with a limited field of detection, which encompassed only a small portion of the project air space. The chance of detecting Indiana bats with such limited sampling efforts seems remote if, in fact, few individuals are using the site; however, Indiana bats were detected every year that detectors were placed out, perhaps indicating greater use of the Project area than limited sampling would indicate. A more extensive sampling effort to represent the full extent of the Project footprint would have required many more detectors.

Information on Indiana bat movements from West Virginia is limited; 4 Indiana bats have been documented traveling between 30 and 100 mi from summer locations in Pennsylvania to hibernacula in Randolph, Pendleton, and Tucker Counties, West Virginia (C. Stihler, WVDNR, personal communication). Two other Indiana bats have been documented traveling up to 64 mi from a hibernaculum in Pennsylvania to a maternity site in Ohio County, West Virginia (C. Butchkoski, Pennsylvania Game Commission, personal communication).

BHE (2006) identified 24 caves within 3 mi of the Phase I footprint (Table 4-13). All 24 caves were assessed for hibernacula suitability and bat presence in March 2006. BHE used standard, literature-supported protocols and criteria to assess caves, including cave length, entrance and structural access by bats, flooding potential, air flow, floor and ceiling temperatures, bat presence, and amount and composition of water in the cave. Based on these assessments conducted by BHE, 12 of the 24 caves may provide suitable habitat for hibernating bats, including the Indiana and Virginia big-eared bat. The BHE report (2006) can be found in Appendix F, Report F-2.

Table 4-13. Caves within 3 mi of Phase I of the Beech Ridge Wind Energy Project.

Caves – *Unsuitable Hibernacula	Caves – *Potential Hibernacula
DePriest Cave No. 2	Bob Gee Cave
Roadside Cave	Thrashe Cave
Jarvis Collapsed Dome Cave	Roaring Creek Cave
Mashed Finger Well	Carr Branch Cave
Hanging Tree Cave	Ben’s No. 5/Smokehole Cave
Little Bird Cave	Williamson Cave No. 2
McCoy Thunderdome Cave	Windmill Water Cave
Bore Hole	Bransford’s Cave
Wolfe’s Blowhole	Casteret Cave
Dogwood Sink Cave	Portal Cave
McCoy’s Thunderdome South	Knight Saltpeter Cave
Miller’s Cave No. 1	Cadle Cave

Source: BHE (2006)
*Based on site assessments.

Of the 12 caves BHE deemed as potential habitat, Portal Cave, located between 4 and 5 mi from the nearest proposed turbine location, contained the greatest number of unlisted bats (n=637); followed by Bransford’s Cave (located between 3 and 4 mi from turbine locations, n=224); and Bob Gee Cave

[29] See the changed circumstances section of the HCP for a description of the response should mortality of reproductive female or juvenile Indiana bats occur on the Project site.

(located between 2 and 3 mi from turbine locations, n=206). No bats were found in 2 of the 12 caves, and the remaining 7 caves contained 50 or fewer bats. No endangered bats were identified in any of the surveyed caves. Four bat species were observed within the caves in descending order of abundance: tri-colored bat (n = 566), little brown bats (n = 490), big brown bats (n = 86), and northern long-eared bats (n-3) (BRE 2006). Based on these results, fall swarming and spring emergence mist-net surveys were not conducted at cave sites in Phase I or Phase II.

There are no known caves within the Project area that support hibernating Indiana bats (BRE 2006). Table 4-14 summarizes the distance, last survey, and number of Indiana bats found during the last survey of caves within 10 mi and from 10 to 20 mi from the BRE Project. Figure 4-8 shows the location of these caves in relationship to the Project. There are 4 Priority 3 and 4 caves within 10 mi of the Project area. Of these, Snedgar's Cave (P3) is an active Indiana bat hibernaculum, whereas Bob Gee Cave (P4), Lobelia Saltpeter Cave (P4), and Mcferrin Cave (P4) have served as hibernacula for Indiana bats in the past but are not known to be currently occupied. Within 10.1 to 20 miles of the Project area, there are 3 Priority 3 and 4 caves. Of these, Martha's Cave (P3) and Piercy's Cave (P3) are considered active Indiana bat hibernacula, whereas Tubb Cave (P4) was occupied in 2001 but has not been surveyed since then. Snedegar's Cave, Martha's Cave, and Piercy's Cave are approximately 9.3 mi, 12.9 mi, and 16.5 mi. respectively, from the eastern edge of the Project area (BRE 2006). There are no Priority 1 or 2 caves within 20 mi of the Project area. No mines in the Project area have records of either Indiana or Virginia big-eared bats.

Based upon radio-telemetry studies, the Service believes that swarming Indiana bats typically forage within 20 mi of known Priority 1 and 2 hibernacula, and within 10 mi of known Priority 3 and 4 hibernacula, although longer distances are possible (USFWS 2011a). The eastern-most portion of the Project area (approximately 14 of the existing 67 Phase I turbines) occurs within the 10-mi swarming zone of a known Indiana bat hibernacula, Snedegar's Cave (see Figure 4-9). It is likely that the eastern portion of the project area poses the greatest risk to Indiana bats because they are likely to spend substantial portions of time within the 10-mi swarming zone.

Table 4-14. Caves and Indiana bat survey results within 10 miles, and between 10 and 20 miles, of the Beech Ridge Wind Energy Project.

Cave Name	**Last Survey**		**Maximum number of Indiana bat ever recorded**
	Year	**Number of Indiana bats**	
Located within 10 miles of a Beech Ridge turbine:			
Bob Gee	2002	0	33
Snedegars	2010	304	304
Lobelia Saltpeter	2001	0	4
Mcferrin	1984	0	41
Higginbothams	1998	0	Unknown1
Located within 20 miles of a Beech Ridge turbine:			
Marthas/Upper Marthas	2008	251	285
Tubb	2001	20	23
Piercys	2008	34	57

[1] Data from Higginbothams Cave survey in 1976 are not available.

Figure 4-8. Indiana bat hibernacula relative to the Beech Ridge Energy Wind Project.

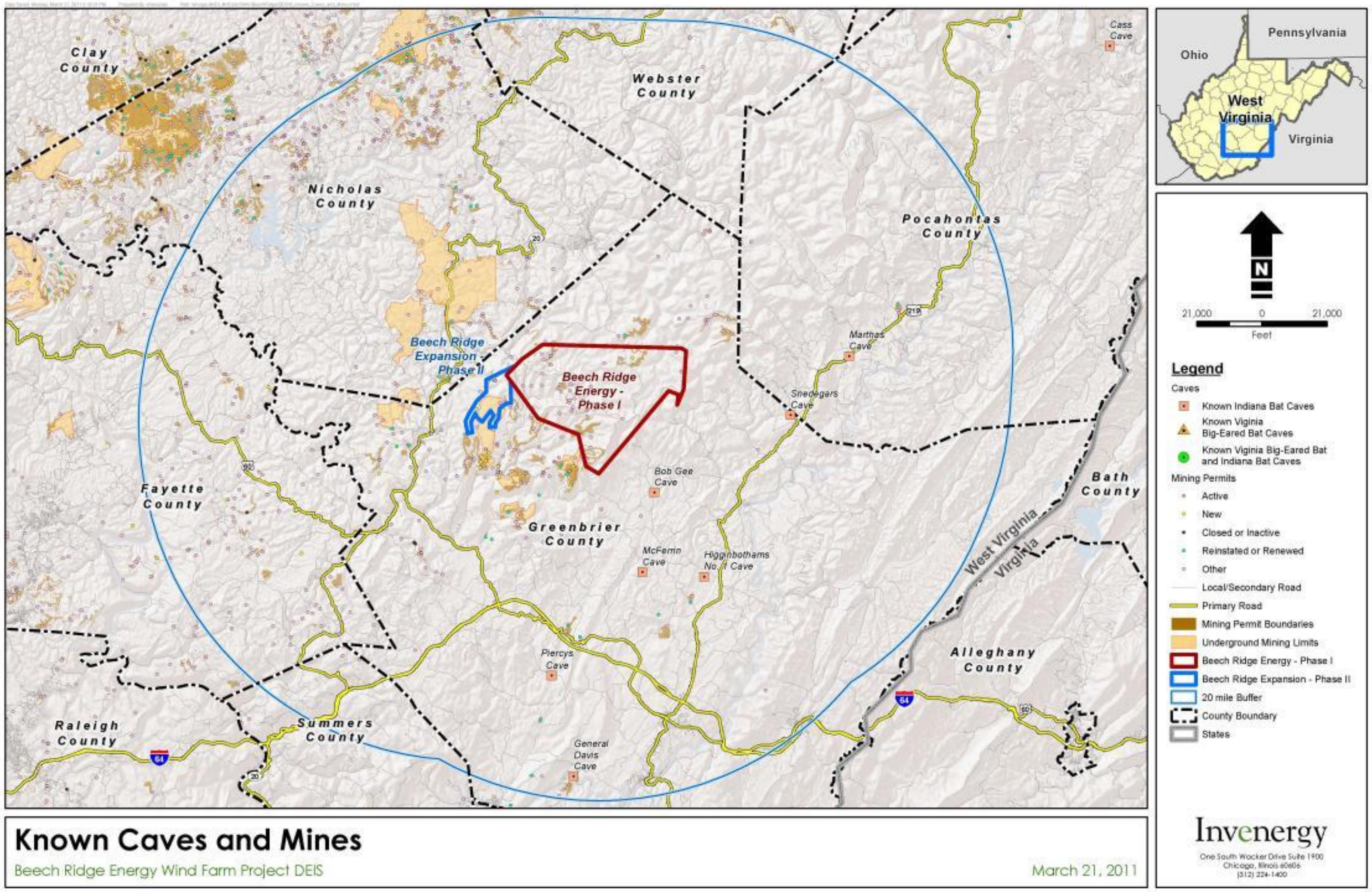
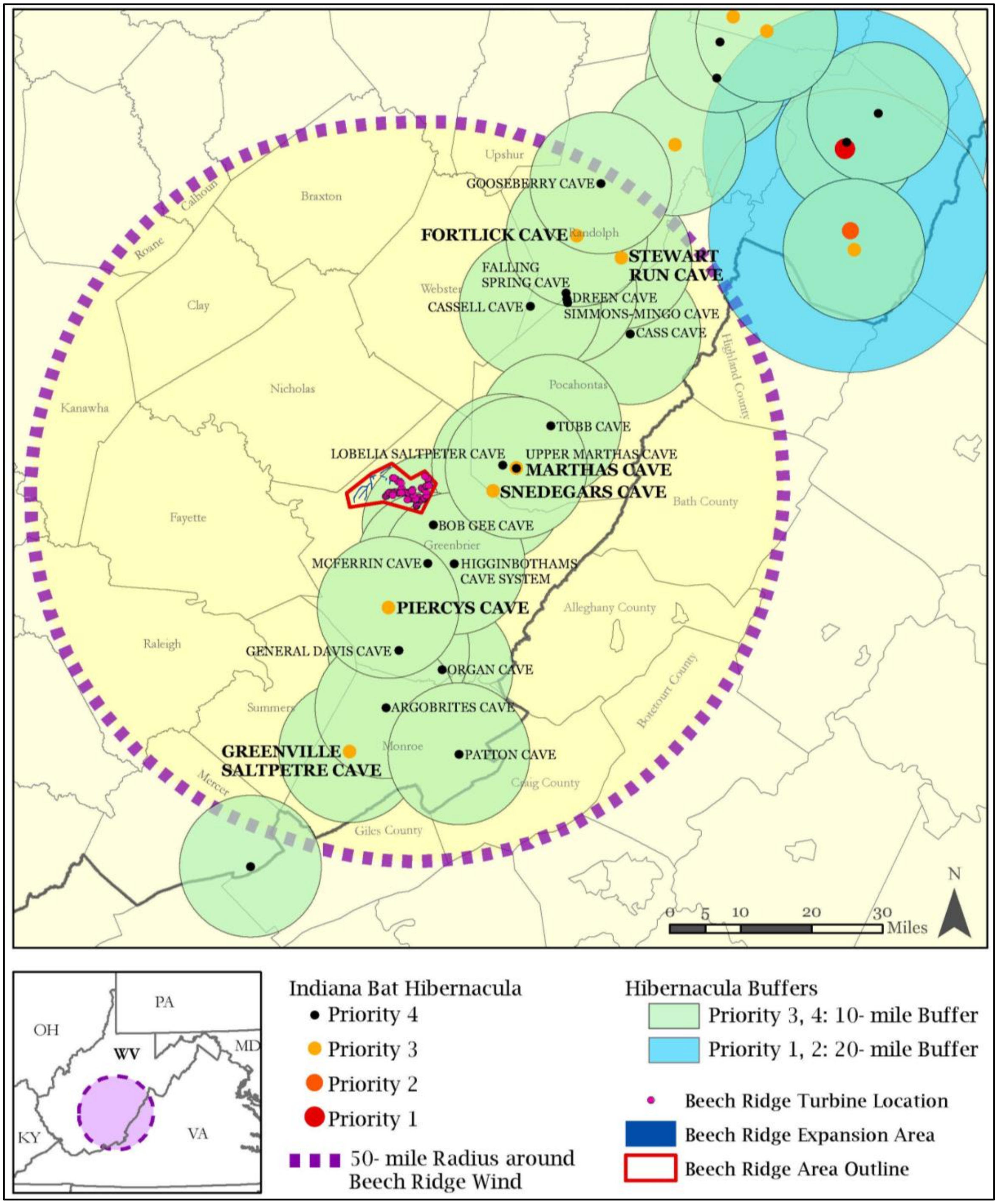


Figure 4-9. Indiana bat hibernacula relative to the Beech Ridge Energy Wind Project.



The Draft Indiana bat recovery plan (USFWS 2007) reports an additional 94 Indiana bats in caves in Greenbrier and Pocahontas counties that occur within roughly a 30-mi radius of Beech Ridge. Between 13,442 and 14,855 Indiana bats have been recorded in 37 caves since 2000 within roughly a 100-mi radius of the Beech Ridge site (with greatest numbers in Hellhole, approximately 70 mi away; USFWS 2007). Based upon the acoustic data, bat numbers, and distances to caves, it is assumed that Indiana bats will travel through the Project area during the 25-year operating life of the project.

There are no records of Indiana or Virginia big-eared bats hibernating in any nearby mines, and none were surveyed in conjunction with this Project.

Summer Maternity/Pup-rearing Season. An important characteristic for the location of Indiana bat maternity roost sites is a mosaic of woodland and open areas, with the majority of maternity colonies having been found in agricultural areas with fragmented forests (USFWS 2007). Primary roosts are often found near clearings or edges of woodland where they receive greater solar radiation, a factor that may be important in reducing thermoregulatory costs for reproductive females and their young (Vonhof and Barclay 1996, Callahan et al. 1997).

In the summer, Indiana bats predominantly roost under slabs of exfoliating bark or cracks in trees (Kurta 2005). Cool summer temperatures may force female Indiana bats to use torpor to conserve energy, which could, in turn, slow reproductive functions (e.g., gestation, milk production, juvenile growth) and could be costly when the reproductive season is short (Wilde et al. 1995, 1999 as cited in Garroway and Broders 2008, Barclay and Kurta 2007). Due to these factors, maternal colonies are typically located in lower elevation areas that have higher summer temperatures for longer periods. However, elevation alone cannot be used to determine maternity site suitability. Within the Appalachian Mountains, suitable microclimates with adequate solar radiation and tree structure are found at a wide variety of elevations and aspects, including the Beech Ridge Project site and surrounding forest. Four of 7 known maternity areas in West Virginia are located on ridges and upper slopes (above 984 ft in elevation). In Tucker County, West Virginia, a maternity colony was found roosting in direct sunlight at an elevation of 3,001 ft (Sanders Environmental, Inc. 2004 as cited in Project HCP). In the mountainous areas of western North Carolina, a maternity colony was found roosting in direct sunlight at an elevation of 3,798 ft (Britzke et al. 2003), comparable to the Beech Ridge site (average elevation of 3,650 ft). Because warmer temperatures generally occur at lower elevations, one would expect a greater chance of a maternity area being located downslope of the ridges where the Beech Ridge turbines are or will be located; however, it is possible for a maternity area to be located near the ridge.

In the event that an Indiana bat maternity colony does occur on-site or nearby at lower elevation, it is likely that female Indiana bats would utilize the ridges in the Project area for foraging. This event would trigger a changed circumstance in the HCP, requiring consultation with the Service, additional bat surveys, monitoring, and potential changes in project operations to reduce the risk of mortality to reproductive Indiana bats.

Less is known about the summer habitat of male Indiana bats. Compared to female Indiana bats, males tend to roost alone or in bachelor colonies and use a wider range of roost trees in terms of size and location (Butchkoski and Hassinger 2002, Gumbert 2001). Due to these factors and the location of the Indiana bat hibernacula closest to the Project area, it is assumed that some male Indiana bats could occur in the Project area during the summer months of June, July, and August during the life of the Project and ITP. It is unknown whether the Indiana bat-like calls heard on the Project site in late July 2006 and 2011 (the late maternity season/early fall swarming and migration season) were made by reproductively active or non-reproductive males and/or females.

Late Summer Mating/Swarming Season and Fall Migration. Indiana bats have been documented traveling up to 19 mi in a night during the late-summer mating/swarming season (Hawkins et al. 2005 as cited in USFWS 2007). However, most appear to roost within a 2-mi to 5-mi radius of the hibernaculum; this is especially evident for those individuals associated with Priority 3 hibernacula (USFWS 2007). Indiana bats have been documented traveling considerable distances during the fall season, but it is unknown if the size of the hibernating population influences the swarming, and therefore mating, behaviour (USFWS 2007). During the fall period, Indiana bats, particularly males, are not necessarily associated with only 1 cave and may travel between caves, presumably in search of mates. In West Virginia, 1 male was observed traveling up to 23 mi between caves in different years, and 1 bat captured in Pennsylvania was found in Hellhole Cave (West Virginia) over 100 mi away in a subsequent winter (C. Stihler, WVDNR, personal communication cited in Project HCP; Section 3.2.1.9).

As previously noted, the Service has recently compiled information from 10 hibernacula studies to further determine the approximate distance bats regularly travel from hibernaculum during swarming (or mating) activities (USFWS 2011a). The results of these analyses help to identify the area of potential exposure surrounding hibernaculum during swarming. The 2011 analysis conducted by the Service compared Indiana bat winter population data over time and determined that positive changes in population size (N) at some hibernacula could not be solely explained by high survival and recruitment. Therefore, immigration and emigration of bats from other hibernacula likely played a role in some of the observed population changes. When population data from multiple Priority 3 and Priority 4 hibernacula that were located within 10 mi of one another were combined in this analysis (i.e., hibernacula complexes were examined together), the changes in population sizes could likely be explained by recruitment. Thus, it is reasonable to assume that swarming Indiana bats may be exposed to wind turbines that are sited within at least 10 mi of P3 and P4 (small) hibernacula. The analysis also suggests that it is reasonable to assume that swarming Indiana bats may be exposed to wind turbines that are sited within 20 mi of Priority 1 and Priority 2 (large) hibernacula, although this assumption is only made from data associated with 3 caves.

By September, it is assumed that Indiana bats have returned to caves for the mating season (swarming); and by November 1, most bats have entered the cave or are closely associated with the cave for the on-set of hibernation. Depending on weather conditions, Indiana bats are believed to be active outside the caves until approximately November 15. From limited tag returns, it appears that Indiana bat movements in West Virginia are in all directions (C. Stihler, WVDNR, personal communication cited in Project HCP; Section 3.2.19). Movements from Snedegar and Martha Caves in all directions during the spring emergence and fall migration periods (April-May and August-October, respectively) likely will result in Indiana bats traversing the Project area at these times.

In 2009, bat experts provided testimony concerning all data collected in regards to Indiana bats on the Project site (Animal Welfare Institute et al. v. Beech Ridge Energy et al. Memorandum Opinion 2009). In considering and weighing contradictory expert testimony, the court concluded the following:[30]

- the acoustic data confirm the presence of Indiana bats on site;
- potential roost sites exist at the Project site;
- construction has increased, rather than diminished, the likelihood that Indiana bats are present at the site (i.e., created summer habitat);
- maternity colonies may be present nearby during the summer and that Indiana bats may still use the site during migration, fall swarming, and spring staging.
- Indiana bats are likely present at the Project site during the spring, summer, and fall; and
- Indiana bats will be harmed, wounded, or killed by the Beech Ridge Project during the spring, summer, and fall.

As such, in consideration of the data available and the conclusions of the court, this DEIS assumes the Project area is or will be utilized by Indiana bats at times and that take of Indiana bats will occur at some point during the 25-year operating life of the turbines.

[30] *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.

4.8.2.2 *Virginia Big-Eared Bat*

Virginia big-eared bat is a subspecies of the Townsend's big-eared bat, a species common throughout the western U.S. The Virginia big-eared bat was listed as endangered under the ESA in 1979. Virginia big-eared bats predominantly roosts in caves, although individuals have been found in abandoned coal and hard rock mines in both the summer and during the winter. The species is generally sedentary and does not migrate far between summer and winter habitat (Bagley 1984, Johnson et al. 2005).

The Virginia big-eared bat is found in a few isolated populations within northwest Virginia, northeast and south-central West Virginia, eastern Kentucky, and northwest North Carolina. Additional description of life history and habitat requirements are found in the Project HCP (Section 3.2.2).

<u>Virginia Big-Eared Bat Status and Occurrence</u>
Regional. State agency data show occurrence records for Virginia big-eared bat in 10 Kentucky counties, 3 counties in North Carolina, 3 counties in Virginia, and 6 counties in West Virginia. Range-wide, the population of Virginia big-eared bats has increased from 1,300 to more than 13,000 (winter counts) since the bat's listing in 1979 (USFWS 2008b). To date, WNS has not been detected in Virginia big-eared bats, even in caves where the fungus has affected other species of bats.

In West Virginia, the greatest movement recorded between summer and winter roosts is 19.8 mi (C. Stihler, unpublished data in Piaggio et al. 2009). Based on this distance, an approximate range map was created to include a 20-mi buffer around Kentucky, West Virginia, Virginia, and North Carolina counties with recent records of Virginia big-eared bat. The distance between the geographic populations is outside the known dispersal range of these bats; therefore, it is unlikely that there is interbreeding (Humphrey and Kunz 1976, Piaggio et al. 2009). Recent genetic studies, which include data from individuals in 4 of these populations (the NC population was not included in the study), showed that they are significantly differentiated from each other and suggest a complete loss of connectivity among regional populations for females, and between all but the northeastern and central West Virginia populations for males (Piaggio et al. 2009).

West Virginia. Virginia big-eared bat winter hibernacula are known from 9 caves in 4 West Virginia counties: Tucker, Grant, Hardy, and Pendleton. These caves are censused approximately every 2 years (C. Stihler, WVDNR, personal communication), although quite a few caves were not surveyed in 2010. Nevertheless, the estimated number of hibernating Virginia big-eared bats in West Virginia in 2010 was at least 11,092 (approximately 85% of the known rangewide population; Table 4-15).

Most known Virginia big-eared bat maternity colonies have been censused 3 times over the past 4 years (Table 4-16) and may give a better indication of trend than winter hibernacula surveys. Steady increases in numbers over the last few years for both summer and winter colonies have been observed at most West Virginia caves (C. Stihler, WVDNR, personal communication cited in Project HCP; Table 4-21). Figure 4-10 illustrates known occurrences of Virginia big-eared bats relative to the Project and other wind projects in West Virginia.

Figure 4-10. Documented Virginia big-eared bat caves relative to the Beech Ridge Energy Wind Project and other wind projects in West Virginia.

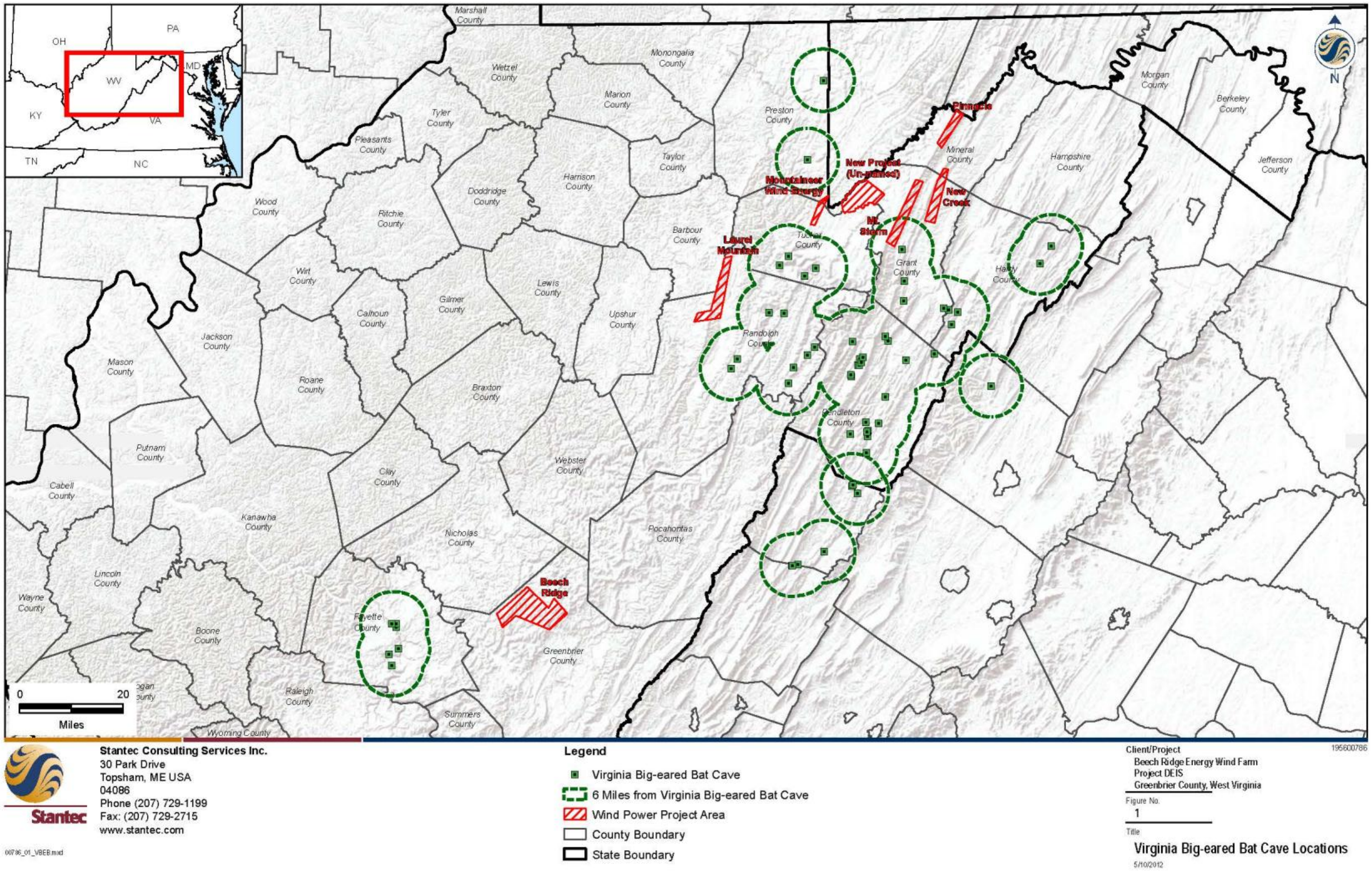


Table 4-15. Virginia Big-eared bat winter hibernacula censuses in West Virginia.

Cave	County	2007	2009	2010	Change (#/%) between most recent surveys
Arbogast/Cave Hollow	Tucker	543	586	ns	+43 / 7.1
Cliff	Pendleton	87	138	ns	+51 / 58.6
Green Hollow	Hardy	14	ns	ns	- / -
Hellhole	Pendleton	5,006	ns	10,025	+5,019 / 100.3
Hoffman School	Pendleton	9	6	ns	-3 / -33.3
Minor Rexrode	Pendleton	203	163	ns	-40 / -19.7
Peacock	Grant	84	68	ns	-16/ 19.0
Schoolhouse	Pendleton	1,285	941	948	-337 / -26.2
Sinnett	Pendleton	75	124	119	+44 / 58.7
TOTAL		7,306	2,026	11,092	+ 3,786 / 51.8

ns = not surveyed
Source: C. Stihler, WVDNR.

Table 4-16. Virginia big-eared bat maternity colony censuses and percent change in West Virginia.

Cave	RP[1]	2007	2008	2009	Change (#/%) between most recent surveys	Comments
Arbogast/Cave Hollow	350	756	728	850	+ 122 / 16.8	Highest since 1988
Cave Mountain	600	432	424	357	- 67 / 15.8	Only declining cave
Cliff	-	880	-	1,151	+ 271 / 30.8	Highest since 2001
Hoffman School	755	1,029	1,077	1,208	+ 131 / 12.2	Highest ever
Lambert	-	295	305	430	+ 125 / 41.0	Highest ever
Mill Run	-	178	203	235	+ 32 / 15.8	Highest since 2000
Mystic	250	569	598	618	+ 20 / 3.3	Highest ever
Peacock	160	985	1,013	1,119	+ 106/10.4	Highest ever
Schoolhouse	338	710	726	795	+ 69 /9.5	Highest since 2003
Sinnett/Thorn	153/14	430	419	482	+ 63 / 15.0	Highest since 1991
Minor Rexrode	95	ns	ns	ns	-	Census not completed
Smoke Hole	1	ns	ns	ns	-	Census not completed
TOTAL	3,381	6,264	6,373	7,245	+ 872 / 13.7	Highest total ever 2009

[1]RP = Estimate from the Recovery Plan 1984
ns = not surveyed
Source: Craig Stihler, WVDNR.

Local Population/Project Area. There are no records of Virginia big-eared bats in Greenbrier County, West Virginia (C. Stihler, WVDNR, person communication cited in Project HCP; see Figure 4-10). The closest known occupied cave or portal is in Fayette County, West Virginia, which is adjacent to Greenbrier County, approximately 27 to 30 mi to the southwest of the Project. In September 2002, 27 Virginia big-eared bats were captured here at the entrance to 1 of 5 mine portals. These captures included mostly males and non-reproductive females. Based on surveys conducted in the vicinity of the Project area and information provided by the WVDNR, there are no records for Virginia big-eared bat in the Project area (Project HCP). No Virginia big-eared bats were captured during in the Project area during the 2005, 2006, and 2011 mist net surveys.

While it is unlikely that Virginia big-eared bats currently inhabit the Project area, the greatest movement recorded between summer and winter roosts was 19.8 mi (C. Stihler unpublished data in Piaggio et al. 2009), suggesting that over time, they could pass through the Project area if the species range changes due to climate change or other factors. Therefore, it is possible that over of the life of the Project and ITP, Virginia big-eared bats could occur in the Project area.

To better understand the bat composition in the Project area, BRE implemented pre-construction mist net and cave surveys.

4.8.2.3 *Pre-Construction Mist Net Surveys (Phase I Project Area)*

Winter and summer pre-construction bat surveys were completed for Phase I of the Project (BRE 2005, BRE 2006). These studies included mist net surveys within Phase I, along the transmission line corridor, and of specific caves within 5 mi of Phase I turbine sites.

Six species, the little brown bat, big brown bat, eastern red bat, tri-colored bat, northern long-eared bat, and hoary bat, were captured during the 2005 and 2006 summer maternity season (Table 4-17 and

Table **4-18**). No federally-listed species were captured during these surveys (BRE 2006). However, as previously discussed, AnaBat acoustic data collected during the on-site mist net surveys in 2005, which was limited to the late July period, recorded between 3 and 8 echolocation calls that had characteristics of Indiana bat vocalizations, depending on the method of analysis used to screen the calls (Animal Welfare Institute et al. v. Beech Ridge Energy et al. Memorandum Opinion 2009). Because of this information, it cannot be assumed that federally-listed bats will not occur in the BRE Project area.

Table 4-17. Bat species captured during mist net surveys of 15 sites within Phase I of the Beech Ridge Project site, July 2005.

Species	Juvenile	Adult Male	Adult Female			Escape	Total	Percent
			PL	L	NR			
Little brown bat	4	12	3	0	2	1	22	27.5
Northern long-eared bat	4	4	2	0	0	0	10	12.5
Tri-colored bat	1	8	0	0	0	1	10	12.5
Big brown bat	2	9	4	0	0	2	17	21.25
Hoary bat	2	3	0	1	0	0	6	7.5
Red bat	0	7		0	0	6	13	16.25
Unknown	0	0	0	0	0	2	2	2.5
Total	13	43	9	1	2	12	80	

PL = Post-lactating; L = Lactating; NR = Non-reproductive.
Source: BHE (2005).

Table 4-18. Bat species captured during mist net surveys of 12 sites along the Beech Ridge Wind Energy Project transmission line from June 12 to 22, 2006.

Species	Juvenile	Adult Male	Adult Female			Escape	Total	Percent
			PL	L	NR			
Little brown bat	6	5	0	0	0	0	11	26
Northern long-eared bat	3	4	2	0	3	0	12	28
Tri-colored bat	6	7	0	0	0	0	13	30
Big brown bat	0	1	0	1	0	2	4	9
Red bat	0	1	0	1	0	0	2	5
Unknown	0	0	0	0	0	1	1	2
Total	15	18	2	2	3	3	43	

PL = Post-lactating; L = Lactating; NR = Non-reproductive.
Source: BHE (2006)

4.8.2.4 *Cave Surveys (Phase I Project Area)*

The Service's Indiana bat draft recovery plan (USFWS 2007) summarizes information that describes ambient temperatures in occupied hibernacula. Most Indiana bats hibernate in caves or mines with relatively stable temperatures between 10°Celsius (C; 50.0°F) and 3°C (37.4°F) (Hall 1962, Myers 1964, Henshaw 1965, Humphrey 1978, Tuttle and Kennedy 2002). Caves with the highest Indiana bat populations are typically large complex systems that allow air flow, but the volume and complexity often buffer or slow changes in temperature. These complexes often have large rooms or vertical passages below the lowest entrance that allow entrapment of cold air that is stored throughout the summer, providing arriving bats with relatively low temperatures in early fall (Tuttle and Kennedy 2002).

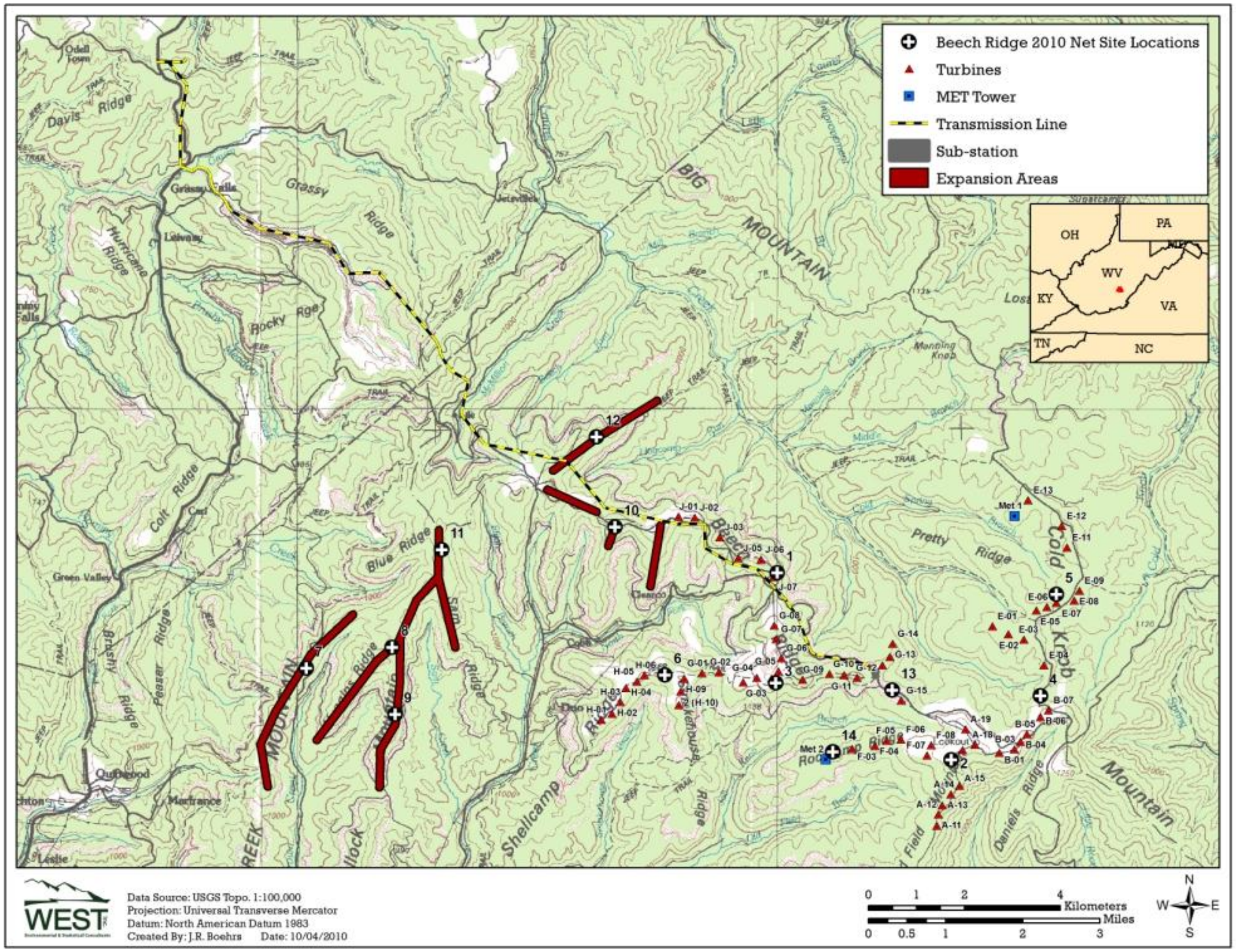
BHE (2006) describes a GIS database identifying approximately 140 known caves within 5 mi of Phase I turbine locations. Based upon information available prior to field surveys, BHE (2006) concluded that 115 (82%) of the 140 caves within 5 mi of the Project area did not provide suitable winter habitat for Indiana or Virginia big eared-bats. These caves are less than 100 ft in length, and presumably, temperatures in these small caves would closely reflect outside air temperatures, fluctuating too widely to support hibernating bats. Additionally, these caves would reach temperatures below freezing, which are fatal to hibernating bats. Twenty-four caves were evaluated in the field. One cave was not evaluated, and the circumstances surrounding this 1 cave are unknown. Of these 24 caves, the entrances and/or portions of the interiors of 12 caves were evaluated and found to be unsuitable for use by Indiana or Virginia big-eared bats. Twelve other caves, including Bob Gee Cave, a historic Indiana bat hibernaculum, were surveyed and data were collected, including number and species of bats present, a description of the cave entrance, floor and ceiling temperatures, a description of air flow, and amount of water within the cave (BHE 2006).

No endangered bats were identified in any of the surveyed caves. Four bat species were observed within the caves: little brown bats, big brown bats, tri-colored bat, and northern long-eared bats (BHE 2006). Based on these results, fall swarming and spring emergence mist net surveys for Indiana and Virginia big-eared bats were not conducted at cave sites in the Phase I or Phase II Project areas.

4.8.2.5 *Post Phase I Construction Mist Net Surveys (Phase I and Phase II Project Area)*

In 2010, BRE contracted Sanders Environmental to mist-net at 14 sites in the Project area during the summer and fall seasons. Sanders Environmental surveyed 8 sites in Phase I and 6 sites in the Phase II to assess species composition (Figure 4-11).

Figure 4-11. 2010 mist-netting survey locations, Beech Ridge Energy Project.



2010 Summer Mist-Net Survey

The summer mist-net survey was conducted between July 27 and August 9, 2010. Mist net arrays captured 209 bats of 7 species (Table 4-19), which did not include Indiana bats or Virginia big-eared bats (Young and Gruver 2011). The red bat was the most common species in terms of numbers and distribution during the summer mist-netting (>35% of all bats captured). Seventy-four red bats were captured at 13 of the 14 net sites. On average, 5.3 red bats were captured per night during the 2010 summer netting. The most common Myotis captured during the 2010 summer was little brown bat (slightly more than 24% of all bats captured). Fifty-one individual little brown bats were captured at 12 of 14 net sites (Young and Gruver 2011).

During the 2010 summer netting, 65% of the bats captured were adults (26% females, 39% males), 28% were juveniles, and 7% were of undetermined age and sex (Table 4-20; Young and Gruver 2011). Signs of reproduction were noted in adult females of 5 species: northern long-eared bat, little brown bat, eastern small-footed bat, red bat, and big brown bat (Young and Gruver 2011). Juveniles were captured among 6 species: northern long-eared bat, little brown bat, eastern small-footed bat, red bat, tri-colored bat, and big brown bat.

Table 4-19. Bat species captured during summer 2010 mist net surveys of 14 sites within the Beech Ridge Wind Energy Project.

Site	Little brown bat	Northern long-eared bat	Eastern small-footed bat	Big brown bat	Tri-colored bat	Red bat	Hoary bat	Total
1	1	7	2			5		15
2	4	1	2	1	2	4		14
3		6				1		7
4	11	2	1	3		6		23
5	4				4	4		12
6		2				2		4
7	7	5	4	3	1	18		38
8	4	2		4				10
9	1	5		1	2	1		10
10	2	1						11
11	10	5	2	2	4	17		40
12	4	1	1	6		4	1	17
13	2					3		5
14	1				1	1		3
Total	51	37	12	20	14	74	1	209
Percent of total	24.4%	17.7%	5.7%	9.6%	6.7%	35.4%	0.5%	
Average per site	3.6	2.6	0.9	1.4	1.0	5.3	0.1	14.9

Source: Young and Gruver (2011)

Table 4-20. Bat species composition during summer 2010 mist net surveys of 14 sites within the Beech Ridge Wind Energy Project.

Species	Juvenile	Adult Male	Adult Female	ND	Total
Little brown bat	12	29	8	2	51
Northern long-eared bat	19	15	3	0	37
Eastern small-footed bat	1	3	8	0	12
Red bat	17	23	23	11	74
Hoary bat	0	1	0	0	1
Tri-colored bat	5	7	1	1	14
Big brown bat	5	4	11	0	20
Total	59	82	54	14	209
Percent of Total	28%	39%	26%	7%	

ND = not determined
Source: Young and Gruver (2011)

<u>2010 Fall Mist-Net Survey</u>

The 2010 fall mist-net survey was conducted between September 13 and September 24, 2010 (Young and Gruver 2011). Biologists captured 116 bats of 8 species (Table 4-21). No Indiana bats or Virginia big-eared bats were captured during the fall survey (Young and Gruver 2012).

The red bat was the most common species in terms of numbers and distribution (45% of all bats captured). Fifty-three red bats were captured, and this species was caught at 12 of the 14 net sites (~86%). On average, 3.8 red bats were captured per night during the 2010 fall netting. The most common *Myotis* captured during the fall was northern long-eared bat; 22 individuals (19% of all bats) were captured at 8 of 14 net sites (Young and Gruver 2012).

Table 4-21. Bat species captured during fall 2010 mist net surveys of 14 sites within the Beech Ridge Wind Energy Project area.

Site	Little brown bat	Northern long-eared bat	Eastern small-footed bat	Big brown bat	Tri-colored bat	Red bat	Hoary bat	Silver-haired bat	Total
1		6				7			14
2						1			1
3		2				3			5
4	4		5		1	5		1	16
5	2	2				11			15
6	2					1			3
7	3			1		2			6
8		1				2			3
9									0
10	1	1				2			4
11		3	3		1	5			12
12		1				3			4
13	2	6	3		2	11	2	6	32
14				1					1
Total	14	22	11	2	4	53	3	7	116
Percent of total	12.1%	19.0%	9.5%	1.7%	3.4%	45.7%	2.6%	6.0%	
Average per site	1.0	1.6	0.8	0.1	0.3	3.8	0.2	0.5	8.3

Source: Young and Gruver (2011)

During the 2010 fall netting, 36% of the bats captured were adults (9% females, 27% males), 58% were juveniles, and 6% were individuals of undetermined age and sex (Table 4-22; Young and Gruver 2011). Juveniles were observed among all species captured.

Table 4-22. Bat species composition during fall 2010 mist net surveys of 14 sites within the Beech Ridge Wind Energy Project area.

Species	**Juvenile**	**Adult Male**	**Adult Female**	**ND**	**Total**
Little brown bat	8	4	2	0	14
Northern long-eared bat	14	4	2	1	21
Eastern small-footed bat	4	1	6	0	11
Red bat	30	18	0	6	53
Hoary bat	1	2	0	0	3
Tri-colored bat	3	0	1	0	4
Big brown bat	1	1	0	0	2
Silver-haired bat	6	1	0	0	7
Total	67	31	11	7	116
Percent of Total	58%	27%	9%	6%	

ND = not determined.
Source: Young and Gruver (2011)

4.8.2.6 *Post Phase I Construction Acoustic Surveys (Phase I and Phase II Project Area)*

A passive acoustic survey using AnaBat SD1 acoustic detectors at 2 fixed stations was conducted from July 21 to November 15, 2010. AnaBat stations were located within the existing Project area to take advantage of the turbines as a platform for elevating AnaBats to the rotor swept area. The fixed stations were spatially separated to provide coverage in the eastern and western halves of the Project. The stations utilized 2 AnaBat units (paired sampling). One AnaBat was deployed at ground level near the base of the turbine. The second AnaBat was mounted on top of the turbine nacelle, approximately 260 ft agl (Young and Gruver 2011).

In addition to the 2 fixed stations, an AnaBat survey station was established near a net site on each night that netting was conducted. The AnaBat was operated during the mist-net survey effort from approximately sunset to the end of the netting survey period, and remained fixed (i.e., the Anabat detector was not moved) for the sampling period each night. The AnaBat data were analyzed to investigate temporal changes in bat activity within the Project (Young and Gruver 2011).

Four AnaBat detectors collected data for 433 detector-nights. For all stations, the mean bat activity for the period was 33.08 bat passes per detector-night. On a weekly basis, peak detection was approximately 105 passes per detector-night during the week of August 16, and a low of 0.04 passes per detector-night during the week of November 1 (Table 4-23). The highest overall activity occurred on August 16 (203.75 passes), and the 3 highest nights occurred between August 16 and August 22.

Table 4-23. Beech Ridge Wind Energy Project weekly bat activity (bat passes per detector-night) over all 2010 AnaBat stations. Results are presented by call frequencies[1].

Week	Low-Freq.	Mid-Freq.	High-Freq.	All Bats
7/21-7/25	5.79	7.46	9.38	22.63
7/26-8/1	3.43	5.68	15.29	24.39
8/2-8/8	12.00	13.04	14.96	40.00
8/9-8/15	22.04	36.43	37.29	95.75
8/16-8/22	15.25	36.00	53.39	104.64
8/23-8/29	16.93	24.21	17.04	58.18
8/30-9/5	16.21	19.82	18.86	54.89
9/6/-9/12	10.61	9.71	17.75	38.07
9/13-9/19	15.71	8.18	10.18	34.07
9/20-9/26	10.07	5.89	6.11	22.07
9/27-10/3	4.43	4.82	3.11	12.36
10/4-10/10	1.41	0.82	0.50	2.73
10/11-10/17	1.05	1.86	1.14	4.05
10/18-10/24	0.52	0.24	0.76	1.52
10/25-10/31	0.19	0.57	0.71	1.48
11/1-11/7	0.00	0.04	0.00	0.04
11/8-11/15	0.00	0.14	0.19	0.33
Totals	**8.67**	**11.18**	**13.22**	**33.08**

[1] Low-frequency species: big brown bat, silver-haired bat, hoary bat
Mid-frequency species: red bat (Note: pulses can range into high frequency.)
High-frequency species: Indiana bat, little brown bat, northern long-eared bat, eastern small-footed bat, tri-colored bat
Source: Young and Gruver (2011)

The ground-based AnaBat at each station recorded between 5 and 10 times more bat passes than the AnaBat on the turbine nacelle (Table 4-24). When divided by call frequency type, high-frequency calls (given by small bats, e.g. Myotis sp.) were the most abundant call type at ground level stations and low-frequency calls (given by larger bats; e.g. silver-haired, big brown, and hoary bats) were most abundant at the nacelle-level stations (Young and Gruver 2011). Caution must be used in making an assumption that these data show that bats of the Myotis species are at a lesser risk of collision at the Project site than larger bats. Call frequency, as measured by bat passes per detector-night do not directly relate to abundance of bats present. Bat passes per detector could be greatly influenced by bat behaviour at the site. For instance, only several bats may have been responsible for all or the majority of the passes as they forage in the area. Conversely, each of the bat passes may represent individual bats. However, the pattern measured by these studies is consistent with other projects where Myotis bats calls are more abundant near tree canopy level and calls of larger bats are more abundant at higher altitudes. Anecdotal observations generally confirm that Myotis bats are more commonly observed near the tree canopy based on light tag studies.

Table 4-24. Beech Ridge Wind Energy Project 2010 bat activity (bat passes per detector-night) at ground versus nacelle AnaBat stations (A17 and G5 are turbine numbers, g = ground, n = nacelle).

Station			
A17g	**A17n**	**G5g**	**G5n**
86.24	8.60	43.24	8.16

Source: Young and Gruver (2011)

Two AnaBats were used to investigate bat activity near mist-net sites by deploying the units at ground level within approximately 50 m of a mist-net site on each night of netting. The number of sites netted per night during the summer period ranged from 1 to 4 and during the fall period from 2 to 3. On a nightly basis at both AnaBats during the summer netting period, there was a distinctive pattern in bat activity with increasing activity through approximately 11:00 PM followed by a decrease in activity to the end of the netting period, which usually occurred around 1:00 or 2:00 AM (Young and Gruver 2011; see Appendix F, Report F-3, Figure 6). The majority of bat passes recorded during the summer netting period were high frequency (i.e., *Myotis*) calls (Table 4-25). During the fall netting period, bat activity was highest during the first 2 hours of netting and dropped off after approximately 9:00 PM (Young and Gruver 2011; see Appendix F, Report F-3, Figure 7). Bat passes recorded during the fall netting period were predominantly in the high-frequency call group. However, the relative percentage of high-frequency calls was lower during the fall netting period (Table 4-25).

Table 4-25. Summary of echolocation passes recorded by survey night during the 2010 summer and fall mist-net surveys at the Beech Ridge Wind Energy.

Survey Night	HF	MF	LF	Total
7/28/10	57	0	3	60
7/29/10	900	4	0	904
7/30/10	203	12	16	231
8/1/10	37	0	0	37
8/2/10	25	0	5	30
8/3/10	64	1	6	71
8/7/10	210	1	0	211
8/8/10	45	0	0	45
8/9/10	44	1	3	48
Total	**1,585**	**19**	**33**	**1,637**
Percent of Total	**97%**	**2%**	**1%**	
9/13/10	59	10	6	75
9/14/10	93	0	0	93
9/15/10	582	91	69	742
9/18/10	32	1	4	37
9/19/10	33	5	1	39
9/20/10	31	0	4	35
9/21/10	141	50	42	233
9/22/10	9	0	4	13
9/23/10	16	9	33	58
9/24/10	6	0	1	7
Total	**1,002**	**166**	**164**	**1332**
Percent of Total	**75%**	**12.5%**	**12.5%**	
Grand Total	**2,587**	**185**	**197**	**2,969**

[1] Low-frequency species (LF): big brown bat, silver-haired bat, hoary bat
Mid-frequency species (MF): red bat (Note: pulses can range into high frequency.)
High-frequency species (HF): Indiana bat, little brown bat, northern long-eared bat, eastern small-footed bat, tri-colored bat
Source: Young and Gruver (2011)

The 2010 bat survey report (mist net and acoustics) is provided in Appendix F, Report F-3. The 2010 summer mist net surveys did not capture Indiana bats or Virginia big-eared bats. This suggests that there is a low likelihood of an Indiana bat or Virginia big-eared bat maternity area being on or within 2.5 miles of the areas surveyed. Furthermore, the fall mist-netting effort caught no Indiana bats among 116 total bat captures.

The 2010 acoustic survey data suggest that Indiana bats were potentially recorded onsite in very low numbers from late July to early August which coincides with the start of their fall migration. Of the 12,431 files examined for characteristics of Indiana bat calls, 3 different screening filters identified 8 files as potentially coming from Indiana bats. Of these 8 files, 6 were identified by 2 screening tools, and 1 was identified by all 3 screening tools. All 8 of these files were from detectors located near the ground. Only on 1 night during the study period, were there at least 2 potential Indiana bat call files per; this occurred on July 28 at Station 3559.

4.8.3 Effect of Stipulation Modification

During the period from April 1 through November 15, 2012, the 67-turbine Project will operate during night-time hours when wind speeds are 6.9 m/s or higher. This is a change from the previous 2 years (2010 and 2011) when turbines did not operate at night during this period. The limited operations during this seasonal period could result in a new source of mortality to tree-roosting migratory bats due to the spinning turbines, which were not operating at night during this season in 2010 and 2011.

The cut-in speed during this period of limited nighttime operation is 6.9 m/s, a rate that slightly exceeds the values investigated in available reports of curtailment studies (Baerwald et al. 2009, Arnett et al. 2010, 2011, Good et al. 2011). These studies showed an average 76% reduction in overall bat fatality rates (range of 74 to 79% across studies) when turbines were curtailed below wind speeds of 6.5 m/s. While we cannot assume that no tree-roosting migratory bats will be affected; we anticipate that the number of migratory bats killed will be low during this period and reduced by at least 76% compared to the regional average bat fatality rates for turbines operating normally. This does present a change in the existing condition for migratory bats relative to the assumed zero number of migratory bats killed under the no-nighttime operations scenario under the original stipulation. We quantify and analyze this low level of bat mortality from April 1 through November 15, 2012, in the cumulative effects section of this EIS as an ongoing effect of the operation of the existing 67-turbine Phase I project.

4.9 Socioeconomics

4.9.1 Scope of Analysis

This section of the DEIS describes the socioeconomic elements relative to the Project area, including population, housing, employment, tax structure, property values, and environmental justice for the area surrounding the Project. Depth of analysis (both spatially and temporally) varies depending on applicability to the analysis and many times, availability of data.

4.9.2 Existing Conditions

4.9.2.1 *Population*

The intent of an affected environment discussion on population and employment is to identify the human element associated with the Project. Typical sources for this information range from the US Census and the Bureau of Labor Statistics, to state, county, and local governments. The results of the 2010 U.S. Census were released in March 2011. The rural settlement patterns associated with the Project area and the general low population, and employment numbers have resulted in the focus on county and state-level demographic data rather than on the small settlements dispersed amidst the surrounding 63,000 acres of commercial timber lands and mining properties in the area.

Greenbrier (population 35,480) and Nicholas (population 26,233) Counties support rural population densities of 34.8 and 40.6 persons per square mile, respectively, compared to the statewide average of 77.1, Table 4-26. Populations in these counties have shown little growth or population loss from 2000 to 2010.

The nearest settlements to the Project area are Anjean, Cobb, Clearco, Duo, Flynn’s Creek, Little Beech Knob, Leonard, Cordova, Trout, and Friars Hill. Populations of these unincorporated settlements are too small to pick up from the US Census except at the block level. Rupert and Williamsburg are larger communities set adjacent to the Project area. These settlements and communities are located in Greenbrier County. The transmission line intertie with Grassy Falls Substation in Nicholas County is in the small settlement of Grassy Falls between Tolbert and Leivasy on State Route 20.

Rupert's population as of July 2009 was 916, and Williamsburg's population is estimated at 446. Lewisburg and Charleston are larger cities, approximately 35 mi and 55 mi from the Project area, respectively. Lewisburg's population as of July 2009 was 3,497, and Charleston's population was 50,846. All of these cities recorded loss of population since 2000.

Table 4-26. Demographic information summary for Greenbrier and Nicholas counties and State of West Virginia.

Demographic Information	Greenbrier County	Nicholas County	West Virginia
Population, 2010 estimate	35,480	26,233	1,852,994
Population,% change 2000 to 2010	3.0%	-1.2%	2.5%
Persons under 18 years old,%, 2010	20.1%	21.2%	20.9%
Persons 65 years old and over,%, 2010	19.3%	17.1%	16.0%
Female persons,%, 2010	51.3%	50.8%	50.7%
White persons,% 2010 [a]	94.6%	98.4%	93.9%
Black persons,% 2010 [a]	2.8%	0.2%	3.4%
American Indian and Alaska Native persons,% 2010	0.3%	0.2%	0.2%
Asian persons, % 2010	0.4%	0.3%	0.7%
Persons of Hispanic or Latino origin, % 2010	1.2%	0.6%	1.2%
Housing units, 2010	18,980	13,064	881,917
Homeownership rate, 2006-2010	75.0%	82.05%	74.6%
Median value of owner-occupied housing units, 2006-2010	$93,900	$73,400	$94,500
Households, 2006-2010	15,302	10,304	740,874
Persons per household, 2006-2010	2.26	2.53	2.42
Median household income, 2006-2010	$33,732	$38,457	$38,380
Persons below poverty level,%, 2006-2010	19.4%	18.7%	17.4%
Land area, 2010 (square miles)	1,019.57	646.82	24,038.21
Persons per square mile, 2010	34.8	40.6	77.1

[a] Includes persons reporting only one race
Source: U.S. Census State and County Quick Facts (2010). Accessed 5/3/2012; http://quickfacts.census.gov/qfd/states

4.9.2.2 *Employment*

Employment and labor force data by county are shown in Table 4-27. Employment rose slightly, and unemployment dropped slightly, from 2010 to 2011 in both counties and statewide.

Table 4-27. West Virginia labor force statistics by county and statewide.

County	Civilian Labor Force			Total Employment			Total Unemployment			Unemployment Rate		
	Nov 2011	Oct 2011	Nov 2010	Nov 2011	Oct 2011	Nov 2010	Nov 2011	Oct 2011	Nov 2010	Nov 2011	Oct 2011	Nov 2010
Greenbrier	15,320	15,410	14,480	14,250	14,310	13,150	1,070	1,100	1,320	7.0	7.1	9.1
Nicholas	10,430	10,510	9,560	9,590	9,380	9,560	870	920	1,100	8.3	8.8	10.5
Statewide	775,600	780,800	777,200	720,600	723,600	706,100	55,000	57,100	71,100	7.1	7.3	9.1

Source: Workforce West Virginia (2010)

Residents of Greenbrier County derive their income from sectors that include natural resources and mining ([e.g., dairy products, hay, grain, poultry, limestone and coal); transportation and utilities; leisure and hospitality services; education and health services; and government services (Table 4-28). Nicholas County residents work in similar sectors, with the exception of the computer and electronic product manufacturing sector.

Table 4-28. Second quarter 2011 employment by industry in Greenbrier and Nicholas Counties and West Virginia.

Industry	Employment by Location		
	Greenbrier	Nicholas	West Virginia
Total, All Industries	13,537	8,770	701,658
Total, Private Sector	11,251	6,907	559,668
Natural resources and mining	235	1,332	34,071
Construction	441	251	33,278
Manufacturing	752	707	49,621
Wood product manufacturing [a]	226	379	4,995
Computer and electronic product manufacturing [a]	299	NA	1,374
Trade, transportation and utilities	2,441	1,835	131,809
Retail trade [b]	1,970	1,470	86,710
Information	89	47	10,327
Financial activities	335	257	25,695
Professional and business services	883	405	62,287
Education and health services	2,644	1,017	117,217
Leisure and hospitality	3,006	855	73,951
Other services	422	198	20,942
Government	2,287	1,862	141,991

[a] A subset of manufacturing employment.
[b] A subset of trade, transportation and utilities.
Source: Workforce West Virginia (2011).

4.9.2.3 *Environmental Justice*

Executive Order 12898 requires federal agencies to incorporate consideration of environmental justice populations into the NEPA evaluation process for federal actions or federally-funded projects. The purpose of the Executive Order is to ensure that minority and low-income communities do not suffer a disproportionate share of adverse environmental impacts resulting from actions that are not offset by project benefits. Executive Order 12898 also requires that these parties have adequate access and opportunity to participate in project planning by receiving information, attending meetings, or providing input into public decisions.

CEQ guidance indicates that where a *potential* environmental justice issue has been identified by an agency, the agency should state clearly in the EIS, in light of all of the facts and circumstances, whether a disproportionately high and adverse human health or environmental impact on minority populations, low-income populations, or Indian tribe is likely to result from the proposed action and any alternatives (CEQ 1997). When determining whether human health effects are disproportionately high and adverse, agencies are to consider the following three factors to the extent practicable: (a) whether the health effects, which may be measured in risks and rates, are significant (as employed by NEPA), or above generally accepted norms. Adverse health effects may include bodily impairment, infirmity, illness, or death; (b) whether the risk or rate of hazard exposure by a minority population, low-income population, or Indian tribe to an environmental hazard is significant (as employed by NEPA) ***and appreciably exceeds or is likely to appreciably exceed the risk or rate to the general population or other appropriate comparison group***; and (c) whether health effects occur in a minority population, low-income population, or Indian tribe affected by cumulative or multiple adverse exposures from environmental hazards (CEQ 1997).

Minority and low-income data are summarized for the state and the 2 counties in Table 4-26.[31] Generally, the counties closely mirror the statewide demographics, in terms of minorities and low income people. Based on the 2010 census, minorities (Black, American Indian, Asian, and Hispanic or Latino persons) made up 4.7% of the population of Greenbrier County and 1.3% of the population in Nicholas County, compared to 5.5% statewide. The 2006-2010 median household income in Greenbrier County was $33,732, which is about $4,650 lower than the state average of $38,380. The 2006-2010 median household income for Nicholas County was $38,457, which was about the same (0.2% higher) as the state average. In 2010, approximately 19% of the population was below poverty level in both Greenbrier County and in Nicholas County, which is approximately 2% higher than the state average of 17%.

Block group data available in 2000 confirm the trends noted above. Based on the 2000 census, minorities made up 5% of the population of Greenbrier County and 1% of the population in Nicholas County. The block groups in the Project area had lower percentages of minorities than the counties. The 1999 per capita income in Greenbrier County was $16,247, slightly lower than the state average of $16,477. The 1999 per capita income for Nicholas County was $15,207, which was also lower than the state average. The block groups in both Greenbrier and Nicholas counties within the Project area had per capita incomes lower than the county averages. In 2000, 18% of the population was below poverty level in Greenbrier County and 19% in Nicholas County, approximately the same as the state average of 17%. Two of the block groups within the Project area had higher percentages of their populations below the poverty level than the county percentage.

Therefore, based on the CEQ factor “(b)” above, none of the potential impacts that are discussed in Chapter 5 that may occur in these minority or low-income populations would raise the issue of environmental justice because neither of these populations would be affected at rate that appreciably exceeds the potential impacts to the general population of comparison; in this case the state demographic group. The state demographic shows a low number of minorities in the state, with a lower than average number in both of the counties in which the project occurs. Low-income families, which are a relatively

[31] Many Tribes have ancestral ties to West Virginia; however, no Tribal reservations exist. The census data show a small percentage of residents of West Virginia (0.2%) identify themselves as American Indian; the percentages are similar in Greenbrier (0.3%) and Nicholas (0.2%) counties (Table 4.26).

significant percentage of the overall state population, are generally dispersed throughout the state and are found in these two counties at nearly the same rate as the rest of the state. However, they occur at significantly reduced population densities in these two counties compared to the statewide average, which indicates any project impacts would occur to significantly lower numbers of low-income individuals compared to higher density population areas in the state.

4.10 Land Use and Recreation

4.10.1 Scope of Analysis

This section of the DEIS provides a discussion of current and future land use; state, regional, county, and municipal comprehensive plans and regulations; residential structures; agricultural programming; and recreation within and in the vicinity of the Project area. The Project has the potential to affect land use patterns and recreational resources beyond the actual Project area. Both spatial and temporal scale of the analysis was determined by resource and availability of data.

The land use analysis was based on publicly available state, regional, county, and municipal-level planning documents and U.S. Census Bureau and USDA data.

4.10.2 Existing Conditions

4.10.2.1 *Existing and Projected Land Use*

Existing and future land uses are identified for the Project area and surrounding areas.

Forest Products and Mining
The primary and historical land use in the Project area is timber production and contour surface mining. Although forested, the area is not densely forested or pristine. A number of small towns are nested within the forested areas. Small amounts of agricultural uses are indicated as well. Areas disturbed from historic surface mining are shown as barren land (see Figure 4-6 in Section 4.5.2).

No changes in land use are foreseen in the future. Exclusive of the proposed Phase II Project, continued timber harvest and mining are likely future land uses.

Farmland
Prime farmland is defined by the NRCS as land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. This information is based on individual soil series characteristics and cannot be derived from soil associations. The NRCS has 3 levels for prime farmland. The most important farmland is “prime farmland” because it contains the most productive category of soils. Soils that are categorized as “prime farmland if drained” include areas that have the potential to be prime farmland but require drainage or hydrologic alteration to achieve high productivity. Soils that are “farmland of statewide importance” are nearly prime farmland but are not as productive due to factors such as permeability, slope, and erosion potential.

Less than 1 acre of land in the Project area is considered prime farmland or prime farmland when drained, and less than 1 acre of land in the Project area is considered farmland of statewide importance.

4.10.2.2 *Tourism and Recreation*

This resource is of importance to Greenbrier County and as such is identified in this analysis. It is directly reflected in the West Virginia Labor Market Information under “Leisure and Hospitality” (Table 4-28).

Tourism is a major component of Greenbrier County’s economy; the county ranks fifth in the state for overall travel spending, behind 4 counties that offer gaming (e.g., casinos). The Greenbrier County Convention and Visitors Bureau Annual Report for the 2008-2009 Fiscal Year reported that visitors to the county spent $214 million in 2008. The industry provided 2,460 jobs in the county, which impart nearly

$87 million in earnings. Tourism generates over $1.8 million in local government revenue and $14.2 million in state revenue (Greenbrier County Convention and Visitors Bureau 2009). Data from 2010 show a slight decrease in employment for that sector.

The tourism industry in Greenbrier County tends to be focused away from the Project area in communities such as Williamsburg.

Recreation activities (e.g., hunting, fishing, hiking, water sports, and other sports) are also abundant in Greenbrier County, and likely play a significant role in its economic status. However, specific financial contributions of such activities are impossible to quantify with existing census and economic data available. These activities cross many of the traditional economic boundaries defined by various datasets.

Public access to private lands is already restricted by the landowner and will continue to be restricted in accordance with easement agreements. The substation and O&M building will be fenced as required for public safety, but no other fencing is proposed at this time.

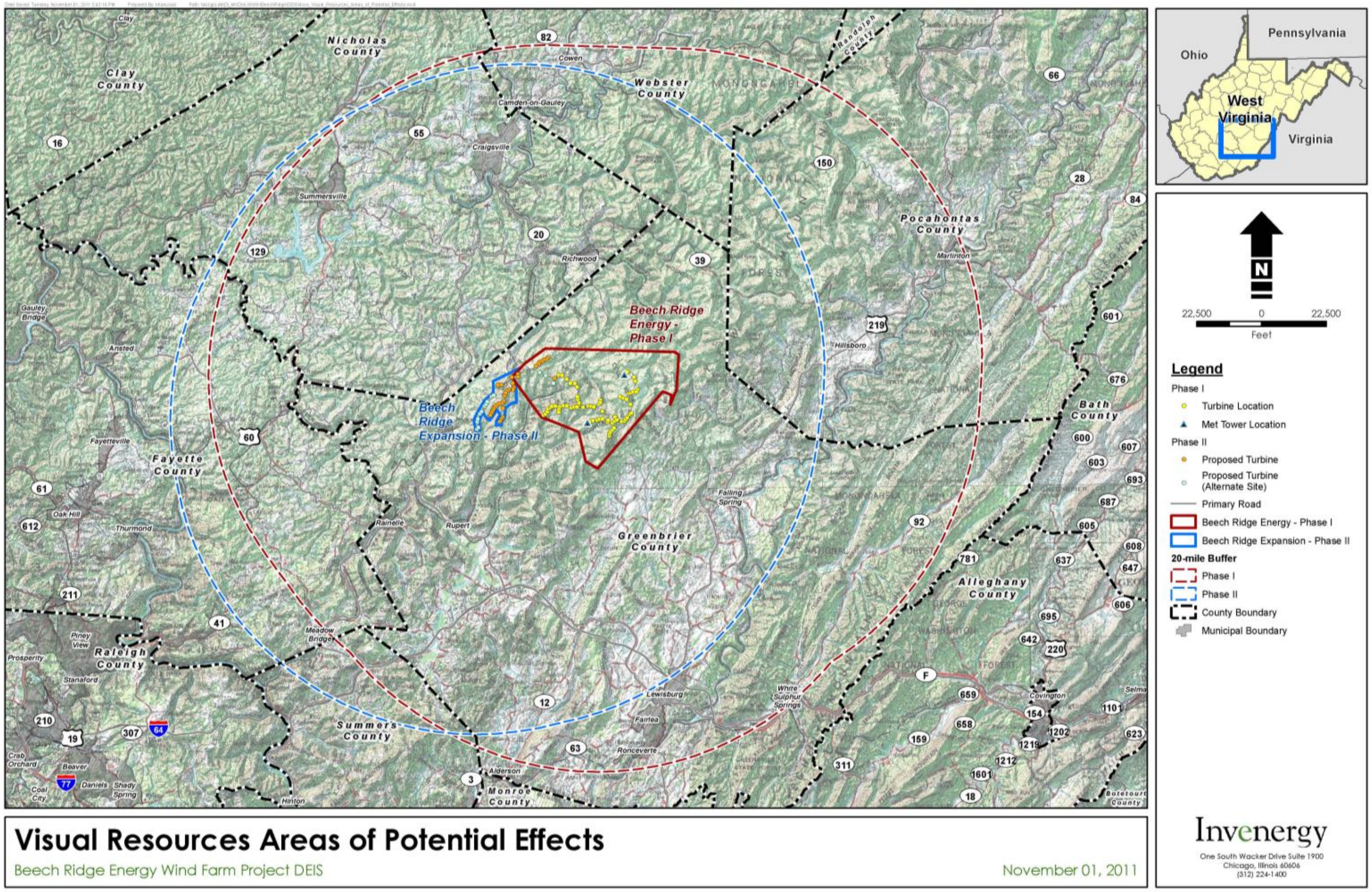
4.11 Visual Resources

4.11.1 Scope of Analysis

For the purpose of this DEIS, the assessments of visual resources are focused on characterizing the visual environments of both the 67-turbine built project (Phase I) and the proposed 33-turbine expansion project (Phase II), and on identifying existing and potential visual and aesthetic effects of the wind turbines. As a part of the WVPSC Energy Facility Siting Certificate process, BRE contracted with Saratoga Associates Landscape Architects, Architects, Engineers, and Planners, P.C. (Saratoga) to conduct visual resource assessments (VRAs). VRAs have included two efforts by Saratoga, one in 2005 for the Phase I Project (Saratoga 2005) and one in 2011 for the Phase II Project (Saratoga 2011). The Saratoga studies followed accepted methodologies for visual assessment. In accordance with the WVPSC Series 30 Rules (150CSR30), both the Phase I and Phase II assessments utilized study areas that extended up to 20 mi from the outermost turbine locations. These 20-mi study areas are considered the Areas of Potential Effects (APE) for the Projects. The term APE in these assessments is used specifically in the context of compliance with implementing regulations for the NHPA. The term is relevant to this NEPA analysis as it represents the geographic areas within which there is a relatively high probability that portions of the Projects (i.e., the wind turbine structures) would be visible. The VRA reports are provided in Appendix G, Reports G-1 and G-2, and summarized below.

The Phase I Project APE included the areas within 20 mi of the initially-proposed 124 turbine locations, while the Phase II APE encompassed the areas within 20 mi of the proposed 33 turbine expansion sites and the 14 alternate turbine expansion sites (Figure 4-12). Note that the Phase I and Phase II APEs overlap to a great extent (exact overlap not reported by Saratoga), whereby approximately all but the outer 5 mi of the western portion of the Phase II APE was included in the Phase I VRA. Also note that only 67 of the initial 124 turbines associated with the Phase I Project have been constructed (and are considered existing), and that the visual effects of these existing turbines were assessed by Saratoga (2011) along with the proposed expansion sites where the Phase I and Phase II APEs overlapped.

Figure 4-12. Visual resources areas of potential effect for Beech Ridge Energy Phase I and Phase II Project areas.



The VRAs consisted of desk-top viewshed mapping, field evaluations, and photo simulations from various points within the APEs, with a focus on identifying geographic areas within which there would be a relatively high probability that some portion of the Project would be visible, and on assessing the potential visual effects of the turbines on publicly-accessible viewpoints such as roads, parks, and other areas with open views. The VRAs were completed using assumed maximum turbine blade-tip heights of 401.5 ft for the Phase I Project and 497 ft for Phase II. For the viewshed mapping, the effects of topography and vegetation were factored in as elements that had the potential to screen the turbines from surrounding areas, effects that were confirmed in the field evaluations. The viewshed analyses used a conservative 40-ft vegetation height to estimate the effect of vegetative screening, even though, based on field observation, most trees in forested portions of the APEs are taller than 40 ft. In the photo simulations, it was assumed that atmospheric and weather conditions (e.g., clouds, haze) also play a significant role in the evaluation of Project visibility. To assist in evaluating potential night-time visibility, a viewshed map was also created using an assumed approximate height of 275 ft for the red strobe lights that the FAA would require on select turbines (i.e., not all turbines would have FAA strobes).

Field reconnaissance surveys for the Phase I Project were performed on August 10-11, 2005, and September 19, 2005, in order to evaluate the accuracy of the viewshed maps, and to identify and photograph potential locations where simulations would best illustrate the Project. Similar field surveys were conducted for the Phase II Project.

4.11.2 Existing Conditions

The Phase I and Phase II Visual Resource APEs overlap to a great extent, and the visual and aesthetic resources are much the same in each. The Phase II APE contains additional lands in Summers and Fayette Counties to the southwest of the proposed expansion area. Also, existing wind turbine generators from the built Phase I Project are visible from portions of both the Phase I and Phase II APEs.

The topography of the 20-mi VRA APEs for the Phase I and Phase II Project areas consists of ridges and valleys typical of the Appalachian Mountains of West Virginia. Ridges and higher elevations are predominantly forested. Steep topography between valleys and high ridges is typical. On-going and past timber harvest areas are common visual features on the ridges and slopes, as are surface coal mines. These heavily vegetated tracts experience dynamic states of cover as active logging and mining activities occur. Valleys and rolling hills, particularly in the southeastern portion of the APEs, are interspersed with open farmlands, pastures, and farmsteads. Population centers within the APEs vary in size, but are limited to small rural towns, including Camden-on-Gauley, Cowen, Craigsville, Richwood, Marlington, Williamsburg, Trout, and others. Scattered rural residences are found throughout portions of the APEs. Several U.S. and county roads crisscross the outer portions of the VRA APEs, and local roads are found throughout.

The proclamation boundary of Monongahela National Forest encompasses much of the northeastern portions of the VRA APEs. The Forest Service has no control over lands within this proclamation boundary, an area identified for future potential expansion of the forest. No Project components occur on lands under current administrative ownership of the USDA Forest Service. There are several scenic and recreational resources located 5 mi to 20 mi from the Project, including the Calvin Price State Forest, Watoga State Park, Droop Mountain Battlefield State Park, Beartown State Park, Cranberry Wilderness, Hill Creek Falls Scenic Area, and Meadow River Wildlife Management Area (Saratoga 2005). Hiking trails are common on the public lands, including the Cranberry Wilderness in the north and some of the state parks in the APEs. Many of the existing Phase I wind turbine generators are visible from open areas and vista points within the APEs (Saratoga 2011).

Saratoga (2011) identified landscape units within the Phase II APE that characterize common landforms, vegetation, land use, and land use intensity, representing relatively homogenous and unified landscapes related to visual character. These units included:

- Community Center Unit – Residential and commercial centers with built structures and streets dominating the visual landscape. There are several community center units in the Phase II APE, where views are filtered or obstructed by existing structures and vegetation.
- Mountain Forest Unit – Numerous mountain ranges, peaks and ridges, and national and state forests. This unit is primarily wooded but includes occasional open views, as well as filtered views during leaf-off seasons. It is mostly undeveloped and has low population densities.
- Agricultural Landscape Unit – Patchworks of open lands, including both active croplands and fallow fields. Population densities are low and buildings are sparse. This unit includes small community centers as well as scattered residences.

Saratoga (2011) identified 68 visually sensitive resources within the Phase II APE. These resources have national, state-wide, or county-wide significance and are generally considered to be of cultural and/or aesthetic importance. They include 25 Cultural Resource sites, 12 Highways, 6 National Recreation Resources, and 25 State and County Recreational Resources, and are listed in the Saratoga (2011) report as to their name, location, distance to nearest proposed turbine, and theoretical visibility status based on the viewshed analysis.

4.12 Cultural Resources

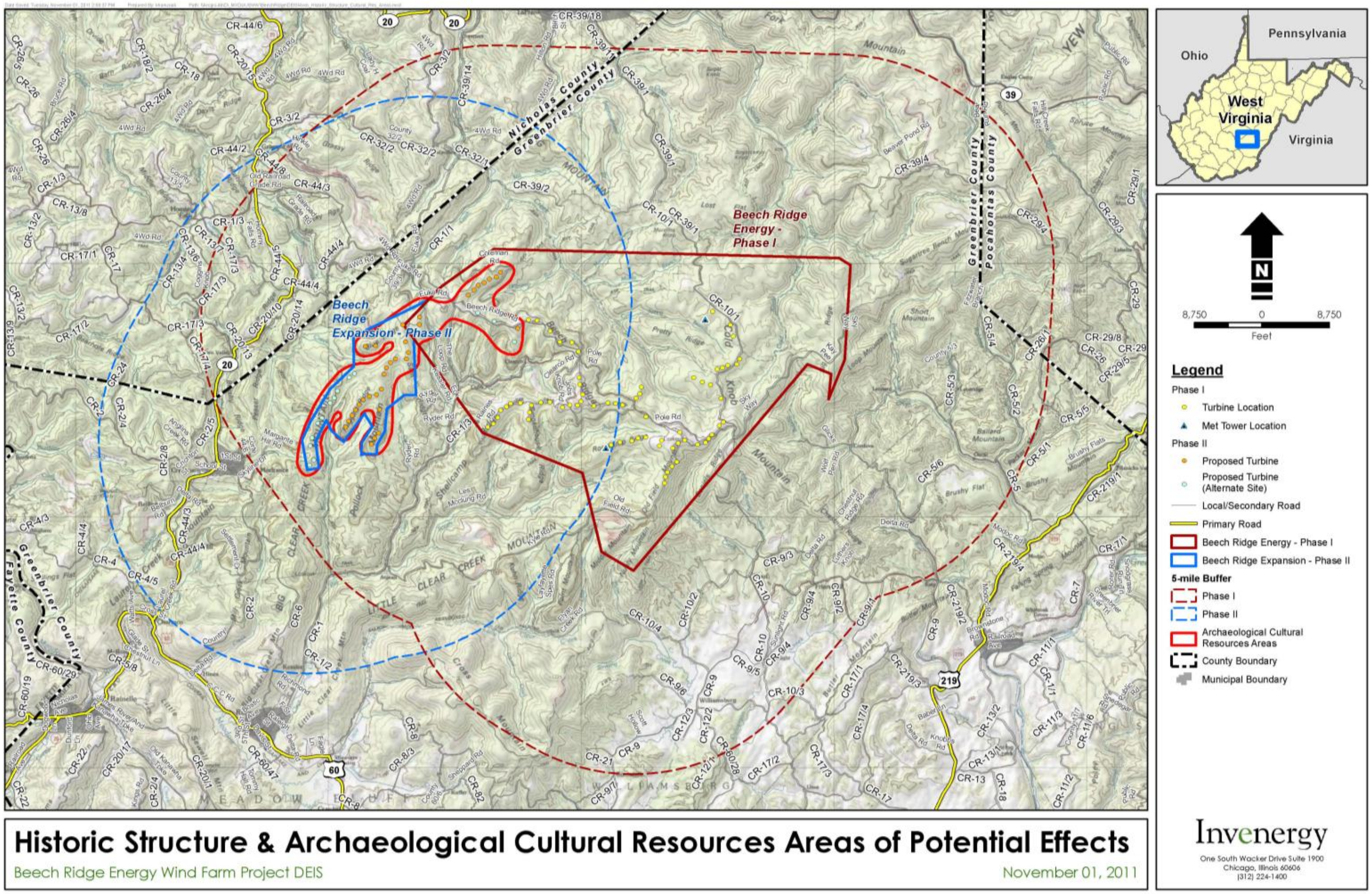
4.12.1 Scope of Analysis

For the purpose of this DEIS, the assessments of cultural resources are focused on historic properties, cultural heritage of Native Americans and others, and archaeological data and properties, particularly as they relate to the requirements of Section 106 of the NHPA and eligibility for inclusion on the NRHP. The NHPA gives the following criteria for eligibility of cultural resources for listing on the NRHP. The quality of significance in American history, architecture, archeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling and association, and:

a) that are associated with events that have made a significant contribution to the broad patterns of our history; or
b) that are associated with the lives of persons significant in our past; or
c) that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
d) that have yielded, or may be likely to yield, information important in prehistory or history (33 CFR Part 60, NPS 1997).

Cultural resource studies have included reconnaissance-level historic architectural surveys (O'Bannon and Sweeten 2007, Gray & Pape 2011) and reconnaissance-level archaeological surveys (CRA 2009, 2010, 2011). Cultural resources have been assessed within the APEs of both the Phase I and Phase II Project areas. The Phase I Project Cultural Resources APEs included the areas within 5 mi of the initially-proposed 124 turbine locations, as well as the connecting transmission line, operations facilities, and various temporary construction storage and laydown areas. The Phase II Cultural Resources APE encompassed the areas within 5 mi of the proposed turbine expansion sites. Figure 4-13 illustrates that the APEs for the Phase I and Phase II cultural resource studies overlap to a great extent.

Figure 4-13. Cultural resources areas of potential effect for Beech Ridge Energy Phase I and Phase II Project areas.



As part of the permit application process, BRE coordinated with the WVDCH to request input on the Phase I Project's potential to affect sensitive cultural resources in portions of Greenbrier, Nicholas, and Pocahontas counties. BRE retained the services of BHE Environmental (BHE) and Gray & Pape, Inc. (Gray & Pape) to work with the WVDCH on their behalf to address cultural resource management issues. The archaeological survey firm Cultural Resource Analysts, Inc. (CRA) was retained to conduct the archaeological surveys of areas where the Phase I Project and its associated transmission line and facilities would result in ground-disturbing activities. Gray & Pape initiated contact with the WVDCH in 2005, and continued coordination through 2011. An MOA was signed by the WVDCH and BRE in 2008. The purpose of the MOA was to address adverse effects on 20 NRHP-eligible historic buildings and structures in the Phase I Project APE and to identify archaeology survey requirements. Table 6-1 in Chapter 6 of this DEIS provides a record of consultation with the WVDCH.

4.12.2 Existing Conditions

4.12.2.1 *Historic Structure Resources*

Phase I Project

Gray & Pape conducted reconnaissance-level architectural history reviews for the Phase I Project APEs based on guidance received from the WVDCH in 2005, 2006, and 2007. The intent of these surveys was to identify structures and sites within the APEs that were potentially eligible for listing on the NRHP, with a goal of avoiding direct impacts (including visual and noise impacts) to those resources. The historic structure APE for Phase I was initially defined as extending 5 mi around the locations of the 124 wind turbines (approximately 165,000 acres or 258 mi^2), which encompassed areas within Greenbrier, Nicholas, and Pocahontas counties of West Virginia. Surveys were also completed for an additional APE that was later established for the transmission line portion of the Phase I Project. Within the historic structures APE, a March 2007 architectural history report (O'Bannon and Sweeten 2007; Appendix K, Report K-2) identified a total of 51 recommended eligible resources, including:

- 4 historic districts - the Duo Historic District; the Robins Fork/Boggs Run Roads Historic District; the Williamsburg/Trout Historic District; and the Friars Hill Historic District;
- 9 NRHP-eligible rural churches as both individually eligible and eligible as a thematic group - Eureka Church, Liberty Methodist Church, Beulah Methodist Church, Rock Camp Community Church, Olive Baptist Church, McMillion Methodist Church, First Baptist Church of Trout, New Salem Methodist Church, and Lacy Presbyterian Church;
- 4 rural schoolhouses recommended as individually eligible and eligible as a thematic group - Boggs Run School, Old Rock Camp School, Old McMillion School, and an unnamed school located on a former farmstead;
- 13 rural cemeteries recommended as eligible; and
- 21 other buildings and structures as individually eligible. They include 8 farmsteads, 11 dwellings, 1 commercial building, and 1 gristmill.

The WVDCH concurred with the results of the architectural history report on March 28, 2007. Through further consultation, WVDCH and Gray & Pape concluded that there were 51 eligible historic properties within the historic structure APE of the Phase I Project, including 4 historic districts and 47 individual resources.

During the summer of 2007, additional work was conducted to identify historic buildings and structures within the transmission line APE, including an assessment of the effects the Phase I Project may have on historic properties located in that APE. BHE submitted a study plan for the transmission line APE on July 3, 2007, and a transmission line APE was established in consultation with the WVDCH. It extended 0.25 mi on both sides of the transmission poles. Because approximately 70% of the transmission line would be constructed within the previously surveyed historic structures APE, the 14-mi-long transmission line would have an un-surveyed historic structures APE of only 3 mi in length and approximately 960 acres in size. The WVDCH concurred with the proposed methodology on July 19, 2007. O'Bannon and Sweeten (2007) identified 18 buildings within the transmission line APE that were 50 or more years old. No historic districts were identified within the transmission line APE, and no architectural or structural resources located within the transmission line APE were listed on, or determined to be eligible for, the NRHP. The WVDCH concurred with that finding, and indicated on November 27, 2007, that no further consultation was required for the transmission line APE. The WVDCH accepted the additional information and reaffirmed on January 11, 2008, that there was no need for additional consultation regarding architectural or structural resources within the transmission line APE.

Phase II Project

Gray & Pape (2011a) also conducted reconnaissance-level architectural history reviews for the Phase II Project APE to identify structures that were potentially eligible for listing on the NRHP, with a goal of avoiding direct impacts (including noise and visual impacts) to such structures. Gray & Pape's historical architectural investigations of the Phase II APE focused on identification and evaluation of NRHP-eligible resources that may have their viewsheds altered if the Phase II wind turbines were constructed. The Phase II historic structure APE was defined as extending 5 mi around the 47 wind turbine sites being evaluated for construction, comprised of up to 33 proposed sites and 14 alternate sites (Figure 4-13). The Phase II APE encompasses approximately 103,450 acres (162 mi^2) within Greenbrier and Nicholas counties of West Virginia, though approximately 72,654 of these acres (114 mi^2) overlap with the Phase I historic structures APE (O'Bannon and Sweeten 2007).

Within the Phase II historic structures APE, Gray & Pape (2011a and 2011b) identified 206 additional historic-period resources (i.e., not included in the Phase I investigations) that would likely have one or more of the wind turbines in their viewshed if Phase II were constructed. Of these 206 resources:

- Only the Mt. Urim Baptist Church and its associated cemetery are recommended for inclusion in the NRHP based on eligibility criteria. The Mt. Urim Baptist Church is located on County Route 17 in southeastern Nicholas County.
- No other rural churches or cemeteries are recommended eligible for inclusion in the NRHP.
- No newly-identified historic districts (e.g., towns or portions of towns) are recommended eligible for inclusion in the NRHP.
- No rural and historic landscapes are recommended eligible for inclusion in the NRHP.
- No other individual resources (i.e., sites, buildings, structures, and objects) are recommended eligible for inclusion in the NRHP.

Of the historic architectural resources previously-identified in the Phase I investigation as eligible for NRHP:

- Only the Duo Historic District is within the Phase II APE, and is likely the only historic district in both the Phase I and Phase II APEs to have views of Phase II wind turbines.
- Only the Eureka Church and Liberty Methodist Church are located in the Phase II APE, and only the Eureka Church is anticipated to have views of the Phase II wind turbines if constructed.
- None of the 13 rural cemeteries, 11 farmsteads, 8 dwellings, 1 commercial building, and 1 gristmill recommended as individually eligible for the NRHP is anticipated to have views of the Phase II wind turbines if constructed.

4.12.2.2 *Archaeological Resources*

Phase I Project

BRE coordinated the archaeological survey of the Phase I Project with the WVDCH. On March 6, 2006, the WVDCH concurred with the proposed methodology for archaeological investigation of the Phase I Project. The APE was identified based on the expected area of ground disturbance associated with construction of the Project. The correspondence from the WVDCH did not note any known sites of Native American concerns. In their letter, WVDCH stated, “we concur with the methodology proposed and are confident that it will result in the identification of any archaeological sites that may [be] present.” In the summer of 2008, the WVDCH and BRE signed an MOA that included detailed information regarding the completion of an archaeological survey once sufficient information was known regarding the location of ground disturbing activities.

The archaeological survey for the Phase I Project was subsequently completed by CRA in 2008. A records search was completed on July 17, 2008, and the field investigation was conducted between August 25 and September 26, 2008, prior to any construction. The archaeological survey, as detailed in the initial report (CRA 2009), resulted in the identification of 6 newly-recorded archaeological sites.

- Site 46Gb445 is a potential stone mound.
- Site 46Gb446 is a multi-component artifact scatter containing prehistoric lithic debris and historic-period refuse.
- Sites 46Gb447 and 46Gb448 are possible historic-period gravesites.
- Sites 46Gb449 and 46Gb450 are prehistoric lithic scatters of unknown cultural and temporal affiliation.

Based on extant information, there was insufficient evidence to determine the origin, age, or cultural affiliation of sites 46Gb445, 46Gb447, and 46Gb448. The eligibility of these 3 sites was indeterminable, and the recommendation was made that the sites be avoided by all Phase I construction activities by no less than 100 ft. The remaining sites (46Gb446, 46Gb449, and 46Gb450) were recommended as not being eligible for NRHP listing. The WVDCH concluded on March 9, 2009, that archaeological sites 46Gb449 and 46Gb450 were not eligible for NRHP listing and recommended that no further archaeological surveys were required for these 2 sites. The WVDCH also concluded that the portion of archaeological site 46Gb446 that was within the Phase I area was not eligible, and no further work was warranted for this site. These recommendations were followed during Phase I construction. Impacts to Sites 46Gb445, 46Gb447, and 46Gb448 were avoided entirely, as these sites were located in areas that were not constructed as part of the 67 Phase I built Project.

CRA also conducted a phase I archaeological survey for a 22.1-acre construction laydown and concrete batch plant site for the Phase I Project. CRA provided WVDCH with a copy of the technical report on April 13, 2009 (CRA 2009, Appendix K, Report K-1, Addendum I). The survey resulted in the identification of site 46Gb467, a previously undocumented prehistoric site of unknown age and cultural affiliation. CRA recommended that this archaeological site not be eligible for NRHP listing. The WVDCH approved the report on April 17, 2009, and concurred with the recommendation that 46Gb467 was not eligible, and indicated that no further consultation was required for the site. Therefore, it was concluded that the construction of the layout and concrete batch plant would have no adverse effects to archaeological resources.

CRA conducted a second phase I archaeological survey in 2009 for a small tract of land associated with proposed construction of the Project’s O&M facility in the Williamsburg Historical District. One new site, 46Gb468, was identified in the area, and CRA recommended that the site be considered not eligible for the NRHP and that no further work be conducted. WVDCH reviewed the report addendum (CRA 2009, Appendix K, Report K-1, Addendum II) and concurred with CRA’s recommendation regarding Site 46Gb468.

CRA conducted a third phase I archaeological survey in March 2010 for 7 turbines sites for the Phase I Project (F-1, F-2, G-13, G-14, G-16, G-17 and H-10 turbines) and associated access roads. Systematic pedestrian survey failed to discover evidence of archaeological sites (CRA 2010, Appendix K, Report K-1, Addendum III).

In summary, surveys in the Phase I Project's direct APE resulted in the discovery of 8 new archaeological sites prior to construction. Of the 8 sites, 5 were determined not eligible for inclusion on the NRHP, and no further survey work at these sites was warranted. The remaining 3 sites were indeterminable but were avoided entirely because the turbines and towers in those areas were not constructed as part of Phase I.

Phase II Project

At the request of the Service, BRE coordinated the completion of a reconnaissance-level archaeological survey of the Phase II Project to assess the probability that the Project area contains significant archaeological sites. The study (CRA 2011) included a desktop analysis and archaeological reconnaissance survey of the direct APE. The direct APE was defined as the estimated potential area of temporary and permanent ground disturbance associated with the construction of the Phase II Project, encompassing an approximate 0.25-mi buffer surrounding the 33 proposed turbine sites and the 14 alternate sites. Figure 4-13 illustrates the limits of the Phase II direct APE for archaeological resources.

Based on desktop analyses and reconnaissance field surveys of the direct archaeological resources APE for Phase II, CRA (2011) found no evidence of NRHP-eligible resources, and concluded that the majority of the APE has a low probability to contain archaeological sites, especially those that would qualify for inclusion on the NRHP. Four previously-recorded sites were identified within or near the APE, all located on ridgetops and landforms with slopes less than 15-20% and in areas mapped as Mandy channery silt loam. Each of these 4 prehistoric sites was previously identified by CRA in the assessment of the Phase I Project, and each was determined by the WVDCH to be not eligible for the NRHP. No further examination of the sites was recommended by CRA or WVDCH. CRA (2011) recommends that further surveys should be conducted to examine ridgetops and other landforms with slopes less than 20% and not previously examined in the reconnaissance survey, with specific attention to the areas of Mandy channery silt loam soil type.

4.13 Communications

4.13.1 Scope of Analysis

The potential for communications conflicts exists for microwave paths, television broadcast signals, cellular and two-way radio, and wireless internet signals. This section in the DEIS describes the communications facilities and transmissions in the vicinity of the Project area, including radio and television broadcasts, microwave, and cellular/Personal Communication Services telephone communications. The analysis is based on publicly available information.

4.13.2 Existing Conditions

Microwave Paths

Microwave telecommunication systems transmit and receive line-of-sight signals across the Project area. The microwave beam band range is generally 960 megahertz to 23 gigahertz frequency band range.

Television

Television broadcast signals pass through and are received within the Project area.

Cellular and Two-way Radio

Cellular and two-way radio signals are transmitted through the Project area.

Wireless Internet

Wireless communication has become an indispensable tool for providing data communications in a variety of industries. Point-to-Multipoint links are frequently used to connect a central tower or "master" site to a group of subscriber devices. A common application of this arrangement is broadband internet service. Point-to-Point wireless links typically connect one or more towers together or connect a tower to a network operation center, which provides access to fiber-optic or other communications media. Point-to-Point links are found in a wide range of sectors, from public safety to telecommunications to utilities.

Wireless system reliability and performance is strongly affected by the strength of an incoming signal. To maximize signal strength, links are usually designed with a clear line-of-sight between antennae. Wireless systems in the Project area are unknown.

4.14 Transportation

4.14.1 Scope of Analysis

The existing roadway transportation infrastructure is described for the Project area and adjacent access roads. Airport implications are also examined.

4.14.2 Existing Conditions

The Project area is predominately rural and does not contain any state highway or interstate connections. Most of the access to the Project area is via county roads or local access roads related to ongoing timber harvest and mining activities and linkages to small communities. The main access route for the Project is via County Road 1 North, which runs from Rupert to Clearco. Rupert connects with U.S. Route 60 and State Highway 20. U.S. Route 60 provides access to Interstate 64. Local roads in the Project area include: CR 1 and Anjean Road, Beech Ridge Road, and Pole Road.

The nearest public airport to the Project is the Greenbrier Valley Airport, located along U.S. Route 219 near Lewisburg, approximately 13 mi away from the Project.

4.15 Safety and Security

4.15.1 Scope of Analysis

The safety and security analysis in this DEIS examines the issues related to public health and safety as they relate to a wind power facility located in a rural mountain landscape. The safety issues primarily are related to operation and/or failure of one or more Project components and are confined to the Project area. The safety and security analysis is based on scientific studies and data from currently operating wind projects in the United States.

4.15.2 Existing Conditions

Public safety concerns associated with the operation of a wind project are largely related to potential injury or death associated with falling overhead objects. Wind turbine noise also is a concern associated with human health; this is addressed in Section 4.2. Examples of such safety concerns include ice throw, tower collapse, and blade throw. Other safety concerns include stray-voltage and fires associated with electricity generation facilities.

To date, the Phase I Project has not experienced any failures in Project components. BRE continues to operate Phase I based on the conditions of their Siting Certificate. BRE restricts public access to all of the turbine locations. The substation and O&M building are fenced as required for public safety. Project area access is limited to public and private roads that are regularly open to the public. Hunting is not permitted on lands leased for Phase I.

Safety signs are posted at the towers (where necessary), transformers and other high voltage facilities, and along roads, in conformance with applicable state and federal regulations. Although the 425-ft distance exceeds the safety setback of 388 ft (1.1 times full turbine height), ice throw has been documented to within 500 ft of turbines. County Route 10/1 is the only public road that is less than 500 ft from a turbine, and this road has an average daily traffic of 30 vehicles. Although it cannot be eliminated, risk to the public from ice throw is low.

BRE installed an electrical grounding system at each turbine location to protect them from damage caused by lightning strikes and to provide grounding for electrical components.

Public Access

Public access to private lands is restricted by the landowner in accordance with easement agreements. The substation and O&M building is fenced as required for public safety; no other fencing is proposed at this time. Safety signing will be posted around those towers where needed, transformers and other high-voltage facilities, and along roads in conformance with applicable state and federal regulations.

Structure Lighting

For aircraft safety, the FAA typically requires every structure taller than 200 ft agl to be lighted. In the case of wind power developments, the FAA allows a strategic lighting plan that provides ample visibility to aviators but does not require lighting every turbine. BRE has an approved lighting plan for the 67-turbine phase and will develop a lighting plan for the 33-turbine phase to be submitted for FAA approval. An estimated 20-25% of the Project's turbines will be designated for lighting with medium intensity dual red synchronously flashing lights for night-time use and, if needed, for daytime use.

Structural Failure and Ice Throw

Turbine structural failures include tower collapse and blade shear. Blade shear occurs when a turbine blade unattaches and is thrown due to the spinning motion. Ice throw occurs when ice builds up on a turbine blade and either sheds straight to the ground or is thrown if the turbine is spinning. In the rare event of structural failure or ice throw, danger to public safety is expected to be minimal. The required setbacks from residential structures and roads are established to minimize this potential impact.

The following security measures have been incorporated into the Project to reduce the chance of physical and property damage, as well as personal injury, at the site.

- Phase I turbines are a minimum of 3,500 ft from residences that are not participating in the Project (i.e., do not lease land to BRE for Project development and operation) and a minimum of 425 ft from public ROWs. Although the 425ft distance exceeds the safety setback of 388 ft (1.1 times full turbine height), ice throw has been documented to within 500 ft. County Route 10/1 is the only public road that is less than 500 ft from a turbine, and this road has an average daily traffic of 30 vehicles.
- Phase II turbines will be a minimum of 3,500 ft from non-participating residences and a minimum of 545 ft from public ROWs (the expansion turbines may be up to 489 ft in total height).
- Security measures will be taken during the construction and operation of the Project, including temporary (safety) and permanent fencing, warning signs (including signs warning of high voltage), and locks on equipment and wind power facilities.

Turbines will sit on solid steel enclosed tubular towers in which all electrical equipment will be located, except for the pad-mounted transformer. Access to the tower is only through a solid steel door that will be locked when not in use.

Occupational Safety

BRE prepared emergency response plans that comply with Occupational Safety and Health Administration regulations. All construction and operational personnel will be trained to handle emergency situations that could arise at the site.

Lightning Protection and Grounding

To protect the wind turbines from damage caused by lightning strikes and to provide grounding for electrical components of the wind turbine, an electrical grounding system will be installed at each turbine location. Parts of the grounding system are built into the wind turbine blades, nacelle, and tower. In addition, a buried grounding system will be constructed as part of the wind turbine foundation pad. Design of the buried grounding system will consider local soil electrical conductivity conditions to ensure that electricity from lightning strikes will be dissipated into the ground. The design of the grounding system will also comply with all applicable local electrical codes.

Hazardous Materials

The only hazardous chemicals anticipated to be on-site are the chemicals contained in diesel fuel, gasoline, coolant (ethylene glycol), and lubricants in machinery. BRE and its contractors will comply with all applicable hazardous material laws and regulations existing or hereafter enacted or promulgated regarding these chemicals and will implement a SPCCP, as necessary. Hazardous chemicals contained in diesel fuel, gasoline, ethylene glycol, and lubricants will not be stored in or near any stream; nor will any vehicle refuelling 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.