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ENVIRONMENTAL ASSESSMENT

BURKESVILLE, KY 161-KILOVOLT TRANSMISSION LINE

Cumberland County, Kentucky

PREPARED BY:
TENNESSEE VALLEY AUTHORITY

MARCH 2012

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ACRONYMS, ABBREVIATIONS, AND GLOSSARY OF TERMS USED

acre	A unit measure of land area equal to 43,560 square feet
APE	Area of potential effect
AR	Access road
BMPs	Best management practices, i.e., accepted construction practices designed to reduce environmental effects
CFR	Code of Federal Regulations
conductors	Cables that carry electrical current
danger tree	A tree located outside the right-of-way (ROW) that could pose a threat of grounding a line if allowed to fall near a transmission line or a structure
dB	Decibels
dBA	A-weighted decibel
distribution line	A series of electrical conductors used to transfer electric power locally between substations or from substations to power consumers; distribution lines carry less electric power than the transmission lines and substations that feed them
DNL	Day/Night levels
easement	A legal agreement that gives TVA the right to use property for a purpose such as a right-of-way for constructing and operating a transmission line
e.g.	Abbreviation for the Latin term, exempli gratia, meaning “for example”
endangered species	A species in danger of extinction throughout all or a significant part of its range
EMF(s)	Electric and magnetic field(s)
EO(s)	Executive Order(s)
ESA	Endangered Species Act
feller-buncher	A piece of heavy equipment that grasps a tree while cutting it, which can then lift the tree and place it in a suitable location for disposal; this equipment prevents trees falling into a sensitive area, such as a wetland
FICON	Federal Interagency Committee on Noise
GIS	Geographic information system
groundwater	Water located beneath the ground surface in the soil pore spaces or in the pores and crevices of rock formations
guy	A cable connecting a structure to an anchor that helps support the structure
HP	Hydro Plant
HUD	Department of Housing and Urban Development
IBCF	Indiana Bat Conservation Foundation
ibid	Abbreviation for the Latin term *ibidem*, meaning “in the same place”; refers to the immediately preceding work cited
i.e.	Abbreviation for the Latin term, id est, meaning “that is”
KHC	Kentucky Heritage Council
KYNPC	Kentucky State Nature Preserves Commission
KYSHPO	Kentucky State Historic Preservation Officer
kV	Symbol for kilovolt (1 kV equals 1,000 volts)

load	That portion of the entire power in a network consumed within a given area; also synonymous with “demand” in a given area
loop	A transmission line loop is accomplished by building two circuits into a switching station from two tap points in an existing line and removing the line between the two tap points; this loop would connect into two new circuit breakers
MOA	Memorandum of agreement
n.d.	Indicates “no date,” or date which Web site was accessed is unknown
NEPA	National Environmental Policy Act
NERC	North American Electric Reliability Corporation
NESC	National Electric Safety Code
NHPA	National Historic Preservation Act
NIEHS	National Institute of Environmental Health Sciences
NRHP	National Register of Historic Places
NRI	Nationwide Rivers Inventory
OSHA	Occupational Safety and Health Administration
outage	An interruption of the electric power supply to a user
PI	Point of intersection
riparian	Related to or located on the banks of a river or stream
RM	River mile
ROW	Right-of-way, a corridor containing a transmission line
runoff	That portion of total precipitation that eventually enters a stream or river
SHPO	State Historic Preservation Officer
SMZ(s)	Streamside management zone(s)
SR	State Route
structure	A pole or tower that supports a transmission line
substation	A facility connected to a transmission line used to reduce voltage so that electric power may be delivered to a local power distributor or user
surface water	Water collecting on the ground or in a stream, river, lake, or wetland; it is naturally lost through evaporation and seepage into the groundwater
switch	A device used to complete or break an electrical connection
tap line	An electric power line that connects an existing transmission line to a substation
tap point	A connection point between a tap line and an existing transmission line
TCEMC	Tri-County Electric Membership Corporation
threatened species	A species likely to become endangered within the foreseeable future
transmission line	A series of electrical conductors (“wires”) and their supporting structures used to transmit electric power from one location to another
TVA	Tennessee Valley Authority
TVARAM	TVA Rapid Assessment Method, a version of the Ohio Rapid Assessment Method for categorizing wetlands, designed specifically for the TVA region
Undertaking	Any project, activity, or program that has the potential to have an effect on a historic property and that is under the direct or indirect jurisdiction of a federal agency, or is licensed or assisted by a federal agency
US	United States Highway

USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
viewshed	A region visible to an observer
WHO	World Health Organization
wetland	A marsh, swamp, or other area of land where the soil near the surface is saturated or covered with water, especially one that forms a habitat for wildlife

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CHAPTER 1

1.0 PURPOSE OF AND NEED FOR ACTION

1.1. Proposed Action - Improve Power Supply

Tri-County Electric Membership Corporation (TCEMC), a distributor of Tennessee Valley Authority (TVA) power, plans to upgrade their existing Burkesville 69-kilovolt (kV) Substation in Burkesville, Kentucky, to a new 161-kV substation. This upgrade would require the removal of the existing 69-kV facilities and expansion of the substation property to accommodate the new 161-kV equipment. The distributor would purchase additional property to facilitate the construction of their new 161-kV substation. TVA proposes to supply electric power to this substation by constructing and operating approximately 8.5 miles of new 161-kV transmission line (i.e., a “tap line”) that would connect the planned substation to TVA’s existing Wolf Creek Hydro Plant (HP)-Summer Shade 161-kV Transmission Line (see Figure 1-1). The new transmission line would utilize all new right-of-way (ROW), which would be 100 feet wide and would occupy a total of about 103 acres.

TVA’s proposal also includes the installation of three switch structures. Two switch structures would be installed within the Wolf Creek HP-Summer Shade 161-kV Transmission Line and the other would be installed within the new tap line ROW. TVA would construct a new access road off Pine Branch Road in order to access the switch east of the tap point. TVA would also utilize a construction laydown area of approximately 4-acres. TCEMC would retire the existing 13-kV capacitor banks and metering package at their existing 69-kV substation and TVA would dispose of this equipment. TVA would provide revenue metering equipment to TCEMC for installation at its new substation. The TVA system’s map board display at TVA’s System Operations Center and Regional Operations Center in Chattanooga would be modified to include the names and numbers of the new facilities. The proposed line would be completed by November 2012, or as soon as possible after that date.

1.2. Need for the Proposed Action

TVA plans its transmission system according to industry-wide standards provided by the North American Electric Reliability Corporation (NERC) and the National Electrical Safety Code (NESC). The standards state that the system must be able to serve customer loads with adequate voltage and no equipment damage while maintaining adequate line clearances.

TCEMC serves the Burkesville, Kentucky, area from their Burkesville 69-kV Substation. Power is presently supplied to this substation from the Dale Hollow HP 69-kV Switching Station by a single-source, the 18-mile long Dale Hollow HP-Burkesville 69-kV Transmission Line. The switching station is owned by the United States Army Corps of Engineers (USACE). Because the Dale Hollow HP-Burkesville 69-kV Transmission Line is the only source of power to the 69-kV Burkesville Substation, any failures to this line will result in outages to the substation and loss of service to the area. Both the substation and the transmission line that serve the substation were constructed in 1953 and are becoming inadequate to capably continue to serve the area.

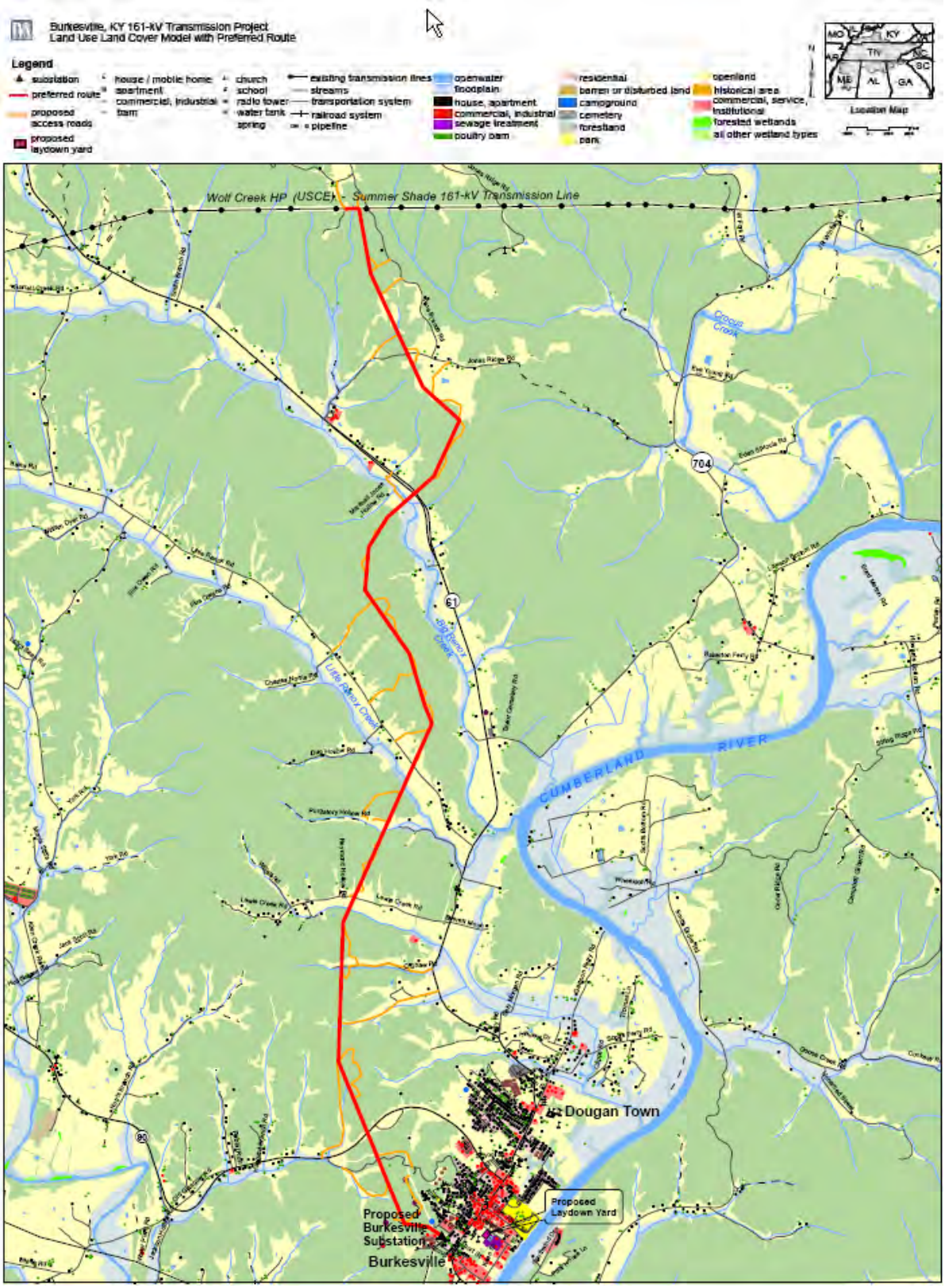

Figure 1-1. Proposed Burkesville 161-kV Transmission Line in Cumberland County, Kentucky

Due to the age and long length of this transmission line, the voltage at the Burkesville Substation falls below acceptable TVA criteria during the winter months when the power demand (or "load") is at its peak. Additionally, because electrical loads in the last few years have exceeded the winter capacity of the substation, reliability of the Burkesville 69-kV Substation is considered poor. Consequently, due to the age and poor condition of the substation and transmission line, both need to be rebuilt in the near future.

To ensure that the Burkesville area has a continuous, reliable source of electric power, TVA needs to provide additional electric service to the area. The construction of a new transmission line would meet this need by addressing the voltage problems and improving reliability in TCEMC's Burkesville service area, thereby allowing TVA to meet NESC and NERC reliability criteria.

Additionally, the proposed project would allow TVA to ensure that the area is provided with a strong, affordable source of power for continued economic health and residential and commercial growth in the area.

1.3. The Decision

The primary decision before TVA is whether to provide additional electric power to TCEMC's service area by constructing a new 161-kV transmission line. If the proposed transmission line is to be built, other secondary decisions are involved. These include the following considerations:

- The timing of the proposed improvements;
- The most suitable route for the proposed transmission line;
- The most suitable location for the proposed tap point;
- The determination of any necessary mitigation and/or monitoring necessary to meet TVA standards and to minimize the potential for damage to environmental resources.

A detailed description of the alternatives is provided in Section 2.1.

1.4. Other Pertinent Environmental Reviews or Documentation

In 2011, TVA completed *Integrated Resource Plan: TVA's Environmental & Energy Future* (TVA 2011a) to determine how it will meet the electric power demands of its customers over the next 20 years while fulfilling TVA's mission of providing low-cost, reliable power, environmental stewardship, and economic development. TVA released the accompanying *Environmental Impact Statement for TVA's Integrated Resource Plan: TVA's Environmental & Energy Future* in March 2011 (TVA 2011b).

1.5. The Scoping Process and Public Involvement

TVA contacted the following federal and state officials, as well as federally recognized Native American tribes, concerning the proposed project. TVA also conducted an internal review by a network of designated environmental specialists.

- Absentee Shawnee Tribe of Oklahoma
- Alabama-Quassarte Tribal Town
- The Cherokee Nation
- Eastern Band of Cherokee Indians
- Eastern Shawnee Tribe of Oklahoma
- Kentucky State Nature Preserves Commission
- Kialegee Tribal Town
- Kentucky State Historic Preservation Officer (KYSHPO)
- The Muscogee (Creek) Nation
- Seminole Tribe of Florida
- The Shawnee Tribe
- Thlopthlocco Tribal Town
- United Keetoowah Band of Cherokee Indians in Oklahoma
- United States Fish and Wildlife Service (USFWS)

This proposal was reviewed in accordance with Executive Order (EO) 11988 (Floodplain Management), EO 11990 (Protection of Wetlands), the Farmland Protection Policy Act, the National Historic Preservation Act (NHPA), the Endangered Species Act (ESA), Section 404 of the Clean Water Act, and EO 12372 (Intergovernmental Review). Correspondence received related to this coordination is contained in Appendix A.

TVA developed a public communication plan that included a Web site with information about the project, a map of the alternative routes, and feedback mechanisms. Public officials were briefed on the project. The 112 property owners who could potentially be affected by any of the route alternatives, along with seven public officials, were invited to a project open house. TVA used local news outlets and notices placed in the local newspapers to notify other interested members of the public of the open house. TVA held the open house on August 26, 2010, at Cumberland County High School in Burkesville, Kentucky, and 51 people attended.

At the open house, TVA presented a network of 10 alternative transmission line routes comprised of 13 different line segments and three tap points (see Figure 1-2) to the public for comment. These segments are described in Section 2.3.4. The primary concern expressed by the public was the impact of the proposed transmission line to residential development and farmland in the area. Owners also voiced concerns relative to health issues, property value, and impacts of the proposed line on visual quality and natural, historical, and cultural resources.

A 30-day public review and comment period was held, following the open house, where TVA accepted public comments on the alternative transmission line routes, tap point locations, and other issues. A toll-free phone number and facsimile number were made available to facilitate comments. During the comment period, numerous landowners contacted TVA to express their concerns, most of which were similar to those voiced at the open house.

At the conclusion of the comment period, TVA made slight adjustments to the segments in response to the comments received.

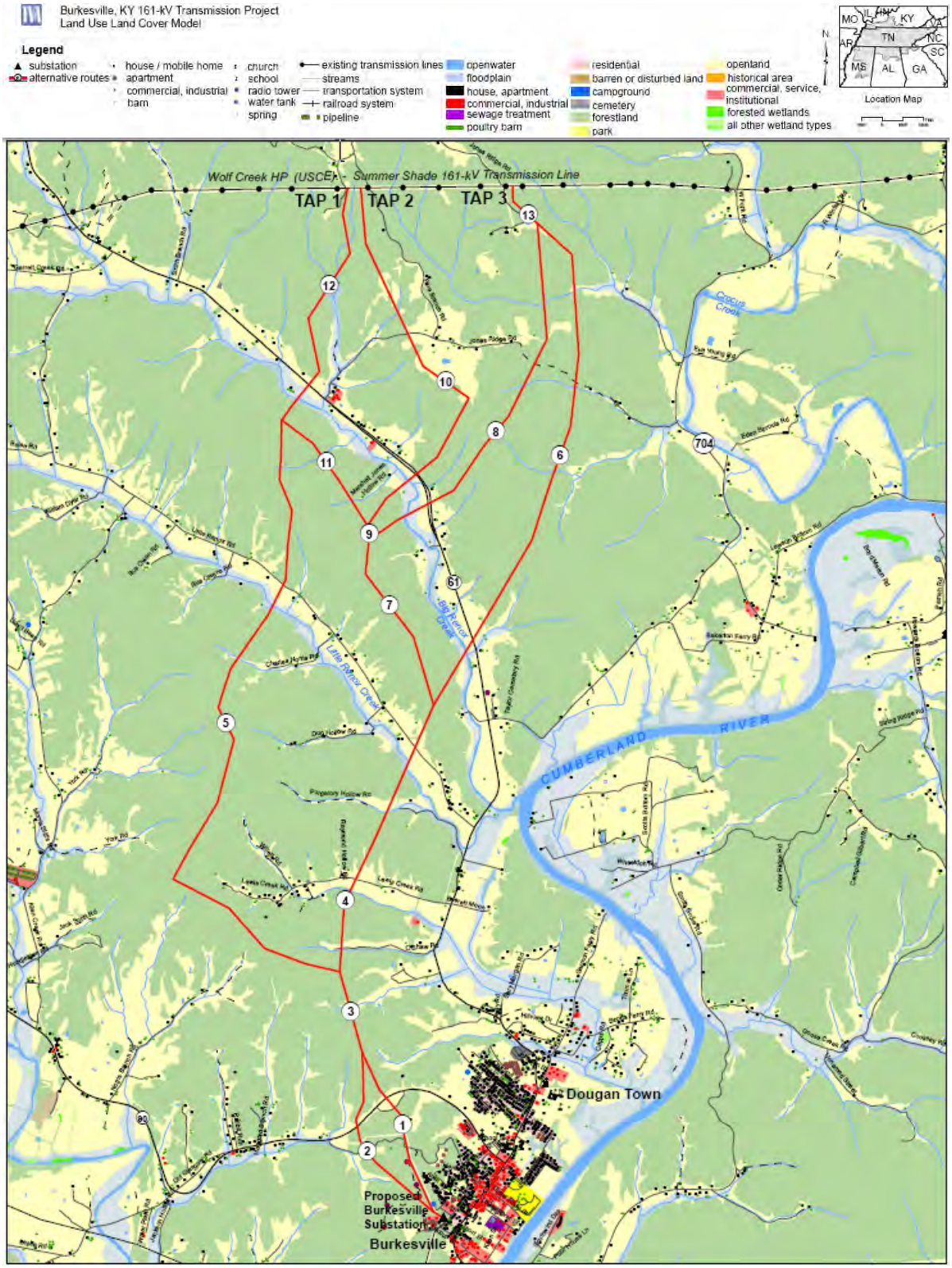

Figure 1-2 Proposed Alternative Route Segments for the Burkesville 161-kV Transmission Line in Cumberland County, Kentucky, Issues to be Addressed

TVA identified resources that could potentially be affected by the construction and operation of the proposed transmission line through an early internal scoping process. This list of resource issues was refined based on comments received during the public review process. Potential impacts to the following environmental resources are addressed in this environmental assessment.

- Land use
- Vegetation
- Wildlife
- Aquatic life
- Endangered and threatened species and their critical habitats
- Water quality for both surface water and groundwater
- Wetlands
- Floodplains
- Archaeological and historic resources
- Aesthetic resources
- Recreation, parks, and natural areas
- Socioeconomics and environmental justice

Potential effects related to air quality, hazardous and nonhazardous wastes, and health and safety were considered. However, because of the nature of the action, any potential effects to these resources would be minor and insignificant. Thus, potential effects to these resources are not analyzed in detail.

1.6. Necessary Federal Permits or Licenses

A permit would be required from the State of Kentucky for the discharge of construction site storm water associated with the construction of the transmission line. TVA would prepare the required erosion and sedimentation control plans and coordinate them with the appropriate state and local authorities. A permit may also be required for burning trees and other combustible materials removed during transmission line construction. A permit would be required from the Kentucky Department of Transportation for crossing state highways during transmission line construction.

CHAPTER 2

2.0 ALTERNATIVES INCLUDING THE PROPOSED ACTION

As described in Chapter 1, TVA proposes to connect TCEMC's planned Burkesville 161-kV Substation to TVA's existing Wolf Creek HP-Summer Shade 161-kV Transmission Line. The connection would be accomplished by constructing and operating approximately 8.5 miles of new 161-kV transmission line. Additionally, TVA would install three switches (two in the source line and one in the new tap line ROW) and provide metering equipment for the distributor to install in the new substation. TCEMC would retire the existing 13-kV capacitor banks and metering package at their existing 69-kV substation and TVA would handle the disposal of this equipment.

This chapter contains the following six major sections:

- Description of Alternatives;
- Description of Construction, Operation, and Maintenance of the Proposed Transmission Line;
- Explanation of the Siting Process;
- Comparison of the Alternative Transmission Line Routes;
- Comparison of Environmental Impact Analysis for the Alternatives;
- Identification of the Preferred Alternative.

This chapter also provides additional background information about the transmission line construction, operation, and maintenance.

2.1. Alternatives

Two alternatives (i.e., the No Action Alternative and the Action Alternative) are addressed in this environmental assessment. Under the No Action Alternative, TVA would not undertake the proposed action. The Action Alternative involves the construction of the proposed transmission line.

2.1.1. Alternative 1 – Do Not Construct a Transmission Line (the No Action Alternative)

Under the No Action Alternative, TVA would not construct the proposed transmission line to serve TCEMC's planned Burkesville 161-kV Substation. However, TCEMC could decide to build a new transmission line to serve its new substation. The distributor could use the route identified by TVA or select another route. If TCEMC were to independently provide transmission service and construct a new transmission line, the potential environmental effects resulting from the implementation of the No Action Alternative would likely be comparable to those resulting from the adoption of the Action Alternative, depending on the route chosen and the construction methods used by TCEMC.

If TCEMC chose not to construct a new substation and transmission line, the transmission system in the Burkesville area would continue to operate with a high risk of interruptions in certain situations, especially during periods of high electricity use. Because ongoing and future development will result in increased demands for electric power, the risk of interruptions is projected to increase over time.

Without the distributor's construction of a new 161-kV substation and a new TVA 161-kV transmission line to supply power to it, these increasing power loads could cause overloaded transformers and other electrical equipment to be damaged or to fail completely, which would affect TVA assets. This could happen as early as winter 2013. The amount of damage depends on how heavily the equipment is overloaded. If a transformer and/or transmission line fails, the result is a power outage. Overloading of a transmission line can cause alternating heating and cooling of the conductor material, which weakens the transmission line over time. Overloading can also cause a transmission line to sag in excess of design criteria, resulting in inadequate clearance between the transmission line and the ground.

2.1.2. Alternative 2 – Construct and Operate a New 161-kV Transmission Line (the Action Alternative)

Under the Action Alternative, TVA would serve TCEMC's planned Burkesville 161-kV Substation by building an 8.5-mile long 161-kV transmission line connecting the planned substation to TVA's existing Wolf Creek HP-Summer Shade 161-kV Transmission Line (see Figure 1-1). TVA would install three switch structures. One would be installed on each side of the tap point in the Wolf Creek HP-Summer Shade 161-kV Transmission Line and a third switch structure would be installed within the new tap line ROW.

The new transmission line would be located on new 100-foot-wide ROW. For construction and maintenance of the proposed transmission line, 25 access roads (see Figure 1-1) would be required.

TVA would provide metering equipment to the distributor for installation at the new Burkesville Substation. TCEMC would retire the existing 13-kV capacitor banks and metering package at their existing 69-kV substation and TVA would handle the disposal of this equipment. This equipment would be disposed of according to TVA's Environmental Protection Procedures. TVA system's map board display at TVA's System Operations Center and Regional Operations Center in Chattanooga would be modified to include indicators of the operational status of the new facilities.

Additional information detailing the implementation of the Action Alternative, as well as how the most suitable transmission line route and tap point were determined, is provided in the following sections:

- Section 2.2 - Construction, Operation, and Management of the Proposed Transmission Line.
- Section 2.3 - The Siting Process.
- Section 2.4 - Comparison of Alternative Routes.

Implementation of this alternative would provide service to TCEMC's planned substation, would help meet the growing electric power needs in the Burkesville area, would improve the reliability of the Burkesville power supply by providing a delivery point, and would prevent overloading and possible damage of existing equipment.

2.1.3. Other Alternatives Considered But Eliminated

During the development of this proposal, other alternatives were considered. These involved the distributor upgrading existing facilities and constructing new transmission lines in nearby areas. However, upon further study it was determined that these other

alternatives would not meet project needs. These alternatives, which were considered but not selected for further consideration, are described briefly below.

2.1.3.1. Distributor to Upgrade the Existing 69-kV Substation Equipment or Construct a New North Burkesville 69-kV Substation

Under this alternative, TCEMC would continue to supply the area using a 69-kV system by either increasing the capacity in their existing Burkesville 69-kV Substation or building a new North Burkesville 69-kV Substation at a different location. To upgrade the existing substation, the distributor would replace their existing 69-kV transformers and build approximately one mile of new 69-kV transmission line to connect to East Kentucky Power Cooperative. Under this scenario, TVA would continue to operate the system as it exists (i.e., do nothing) because TVA has existing metering equipment in this substation.

Should the distributor construct a new North Burkesville Substation, TCEMC would also build approximately 2.5 miles of new 69-kV transmission line. TVA's involvement would be limited to the installation of metering equipment in the new North Burkesville Substation.

Although implementing this alternative would address the aging equipment problems of the existing Burkesville Substation, as identified in Section 1.2, this option would not address the reliability or voltage problems caused by the single-source feed Dale Hollow HP-Burkesville 69-kV Transmission Line. Additionally, this alternative does not address future load growth in the area as well as the Action Alternative does. For these reasons, this alternative was eliminated from further consideration.

2.1.3.2. Underground Utility Lines

A frequent objection to the construction of new transmission lines is their adverse visual effects. Thus, a frequently suggested alternative is the installation of buried transmission lines.

Power lines can be buried. However, most buried lines tend to be low-voltage distribution lines (i.e., lines that are 13-kV or less) rather than high-voltage transmission lines, which tend to be 69-kV and above. Although low-voltage distribution lines can be laid into trenches and buried without the need for special conduits, some lines require armor casings for safety reasons. Burying higher voltage lines in the 69-kV, 161-kV, and 500-kV range requires extensive excavation, and these lines must be encased in special conduits or tunnels. Additionally, measures to ensure proper cooling and to provide adequate access are required. Usually, a road along or within the ROW for buried lines must be maintained for routine inspection and maintenance.

Although buried lines are much less susceptible to catastrophic storm damage, especially wind damage, they tend to be very expensive to install and maintain. Conduit systems require ventilation systems to provide adequate cooling for the conductors. Similarly, they must be protected from flooding, which could cause an outage. Repairs of buried lines may require excavation, and the precise location of problem areas can be difficult to determine.

Burying the proposed 161-kV line is not a feasible option for these and other reasons. Expense would be prohibitive. The potential adverse environmental effects of constructing and operating a buried high-voltage line would likely be greater overall than those associated with a traditional aboveground line. For these reasons, this alternative was eliminated from further consideration.

2.2. Construction, Operation, and Management of the Proposed Transmission Line

2.2.1. Transmission Line Construction

2.2.1.1. Right-of-Way Acquisition and Clearing

The transmission line would be constructed within a new 100-foot-wide ROW. TVA would purchase easements from landowners for the new ROW. These easements would give TVA the right to construct, operate, and maintain the transmission line, as well as remove "danger trees" adjacent to the ROW. Danger trees include any trees that are located beyond the cleared ROW, but that are tall enough to pass within 5 feet of a conductor or strike a structure should it fall toward the transmission line. The fee simple ownership of the land within the ROW would remain with the landowner, and many activities and land uses could continue to occur on the property. However, the terms of the easement agreement prohibit certain activities, such as construction of buildings and any other activities within the ROW that could interfere with the transmission line or create a hazardous situation.

Because of the need to maintain adequate clearance between tall vegetation and transmission line conductors, as well as to provide access for construction equipment, most trees and shrubs would initially be removed from the entire 100-foot width of the new ROW. Equipment used during this ROW clearing would include chain saws, skidders, bulldozers, tractors, and/or low ground-pressure feller-bunchers. Marketable timber would be salvaged where feasible; otherwise, woody debris and other vegetation would be piled and burned, chipped, or taken off site. In some instances, vegetation may be windrowed along the edge of the ROW to serve as sediment barriers. Vegetation removal in streamside management zones (SMZs) and wetlands would be restricted to trees tall enough, or with the potential to soon grow tall enough, to interfere with conductors. Clearing in SMZs would be accomplished using hand-held equipment or remote-handling equipment, such as a feller-buncher, in order to limit ground disturbance. TVA ROW Clearing Specifications, Environmental Quality Protection Specifications for Transmission Line Construction, Transmission Construction Guidelines Near Streams (Appendices B, C, D), and Best Management Practices for Tennessee Valley Authority Transmission Construction and Maintenance Activities (Muncy 1999) would be followed in clearing and construction activities.

Following clearing and construction, vegetative cover on the ROW would be restored to its state as much as possible prior to construction. Pasture areas would be reseeded with suitable grasses. Wooded areas would be restored using native grasses and other low-growing noninvasive species. Erosion controls would remain in place until the plant communities become fully established. Streamside areas would be revegetated as described in Appendices B, C, and D, and in Muncy (1999).

2.2.1.2. Access Roads

Both permanent and temporary access roads would be needed to allow vehicular access to each structure and other points along the ROW. Typically, new permanent or temporary access roads used for transmission lines are located on the ROW wherever possible and are designed to avoid severe slope conditions and to minimize stream crossings. Access roads are typically about 20 feet wide and are surfaced with dirt or gravel.

Culverts and other drainage devices, fences, and gates would be installed as necessary. Culverts installed in any permanent streams would be removed following construction. However, in wet-weather conveyances (i.e., streams that run only following a rainfall), they would be left or removed, depending on the wishes of the landowner or on any permit conditions that might apply. If desired by the property owner, TVA would restore new temporary access roads to previous conditions. Additional applicable ROW clearing and environmental quality protection specifications are listed in Appendices B and C.

2.2.1.3. Construction Assembly Areas

A construction assembly area (laydown area) would be required for worker assembly, vehicle parking, and material storage. The site identified for this project is approximately five acres in size and is located at 414 South Main Street in Burkesville. TVA would lease the site from the landowner for the duration of the construction period. The property would be leased by TVA about one month before construction begins. The laydown area consists primarily of a gravel lot that is adjacent to two existing paved roads (South Main Street and Lower River Street) near the proposed transmission line. TVA would install a barbed wire fence around the property and add crushed stone to the site as needed. A gate entrance would be be added if necessary. .Trailers used for material storage and office space would be parked on the site. Following completion of construction activities, all trailers, unused materials, and construction debris would be removed from the site. The gravel and fencing installed by TVA would remain on the property.

2.2.1.4. Structures and Conductors

The proposed 161-kV transmission line would utilize both double and triple steel-pole structures, as shown in Figure 2-1. Structure heights would vary according to the terrain and would range between 50 and 140 feet.

Three conductors (the cables that carry the electrical current) are required to make up a circuit in alternating-current transmission lines. For 161-kV transmission lines, each single-cable conductor is attached to fiberglass or ceramic insulators suspended from the structure cross arms. A smaller overhead ground wire or wires are attached to the top of the structures. This ground wire may contain fiber optic communication cables.

Poles at angles (i.e., angle points) in the transmission line may require supporting screw-and-rock-anchored guys. Some structures for larger angles could require two or three poles. Most poles would be directly imbedded in holes augured into the ground to a depth equal to 10 percent of the pole's length plus an additional 2 feet. Normally, the holes would be backfilled with the excavated material, but, in some cases, gravel or a cement-and-gravel mixture would be used.

Equipment used during the construction phase would include trucks, truck-mounted augers, and drills, as well as tracked cranes and bulldozers. Low ground-pressure-type equipment would be used in specified locations (e.g., areas with soft ground) to reduce the potential for environmental impacts.

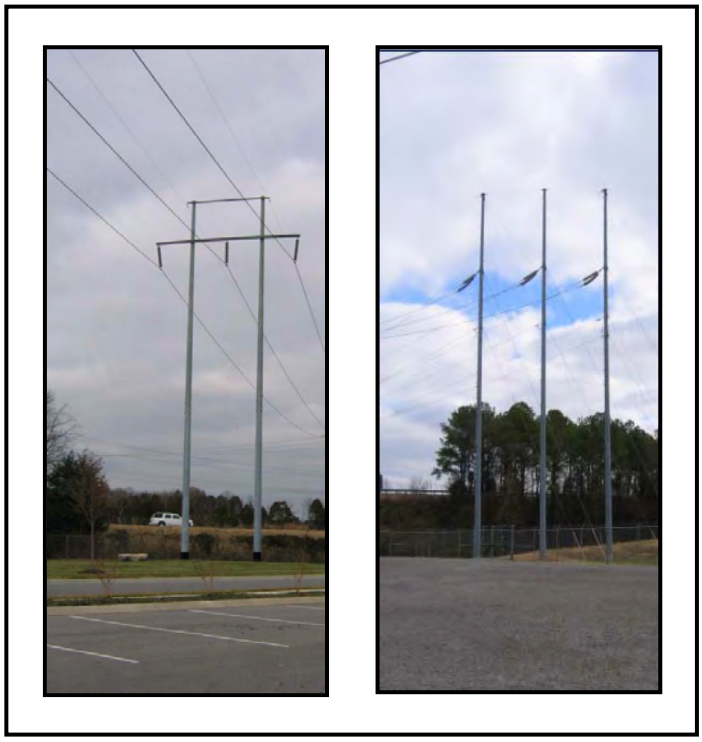

Figure 2-1. Examples of a Double and Triple Steel-pole 161-kV Transmission Structures

2.2.1.5. Conductor and Ground Wire Installation

Reels of conductor and ground wire would be delivered to various staging areas along the ROW, and temporary clearance poles would be installed at road crossings to reduce interference with traffic. A small rope would be pulled from structure to structure. It would be connected to the conductor and ground wire and used to pull them down the line through pulleys suspended from the insulators. A bulldozer and specialized tensioning equipment would be used to pull conductors and ground wires to the proper tension. Crews would then clamp the wires to the insulators and remove the pulleys.

2.2.2. Operation and Maintenance

2.2.2.1. Inspection

Periodic inspections of 161-kV transmission lines are performed by helicopter aerial surveillance twice a year after operation begins. Foot patrols or climbing inspections are performed every four years, except on certain critical segments, on which the inspections are performed on two-year intervals. The inspections are conducted in order to locate damaged conductors, insulators, or structures, and to discover any abnormal conditions that might hamper the normal operation of the line or adversely affect the surrounding area. During these inspections, the condition of vegetation within the ROW, as well as immediately adjoining the ROW, is noted. These observations are then used to plan corrective maintenance and routine vegetation management.

2.2.2.2. Vegetation Management

Management of vegetation along the ROW is necessary to ensure access to structures and to maintain an adequate distance between transmission line conductors and vegetation. For a 161-kV transmission line, NESC standards require a minimum vegetation clearance of 24 feet. Vegetation management along the ROW would consist of two different activities: felling of danger trees adjacent to the cleared ROW, as described in Section 2.2.1.1, and vegetation control within the cleared ROW. These activities occur on approximately three- to five-year cycles.

Management of vegetation within the cleared ROW would include an integrated vegetation management approach designed to encourage the low-growing plant species and discourage tall-growing plant species. A vegetation-reclearing plan would be developed for each transmission line segment based on the results of the periodic inspections described above. The two principal management techniques are mechanical mowing (using tractor-mounted rotary mowers) and herbicide application. Herbicides are normally applied in areas where heavy growth of woody vegetation is occurring on the ROW and mechanical mowing is not practical. Herbicides would be applied selectively by helicopter or from the ground with backpack sprayers or vehicle-mounted sprayers.

Any herbicides used are applied in accordance with applicable state and federal laws and regulations. Only herbicides registered with the United States Environmental Protection Agency (USEPA) are used. A list of the herbicides currently used by TVA in ROW management is presented in Appendix E. This list may change over time as new herbicides are developed or new information on presently approved herbicides becomes available.

2.2.2.3. Structure Replacement

Other than vegetation management, little maintenance work is generally required. The transmission line structures and other components typically last several decades. In the event that a structure needs to be replaced, the structure would normally be lifted out of the ground by crane-like equipment, and the replacement structure would be inserted into the same hole or an immediately adjacent hole. Access to the structures would be on existing roads where possible. Replacement of structures may require leveling the area surrounding the replaced structures, but additional area disturbance would be minor compared to the initial installation of the structure.

2.3. The Siting Process

The process of siting the proposed transmission line followed the basic steps used by TVA to determine a transmission line route. These include the following:

- Determine potential existing power sources to supply the transmission line,
- Define the study area,
- Collect data to minimize potential impacts to cultural and natural features,
- Develop potential tap points,
- Develop general route options and potential routes,
- Gather public input,
- Incorporate public input into the final identification of the transmission line route.

2.3.1. Definition of the Study Area

The first task in defining the study area was to identify the power sources that could supply the planned substation. TVA's existing Wolf Creek HP-Summer Shade 161-kV Transmission Line was the most practical source because it is the closest 161-kV transmission line, and it would serve as the most reliable power source to the new substation.

The study area boundaries were chosen to allow for the establishment of two or more corridors between the selected power source and the planned Burkesville Substation. These corridors would eventually yield a preferred transmission line route on which to construct the transmission line. The study area is shown in Figure 1-2. The northern boundary of the study area is the Wolf Creek HP-Summer Shade 161-kV Transmission Line. The southern boundary is the town of Burkesville, site of the distributor's proposed upgraded substation. The Cumberland River is the natural eastern/southeastern boundary of the study area. In order to minimize the length of transmission line needed to connect to the proposed new substation, the western boundary of the study area is the intersection of State Route (SR) 61 and the source transmission line. Expanding the study area would result in longer route alternatives, which would cause greater land use and environmental impacts, as well as higher costs associated with designing and building the transmission line. Following is a brief description of the study area.

2.3.1.1. Natural and Cultural Features

The northern and middle portion of the study area is within the Eastern Highland Rim Ecoregion, which contains undulating plains, hills, and karst. The southern portion of the study area near Burkesville falls within the Outer Nashville Basin Ecoregion, which is characterized by steep ridges and bluffs and cultivated terraces and floodplains along the Cumberland River. The study area drains to the Cumberland River and its tributaries Lewis Creek and Big Renox Creek (and its tributaries Strange Branch and Little Renox Creek). Near the Cumberland River, steep bluffs, springs, cascades, and wide bottomlands occur. There are various churches and cemeteries within the study area.

2.3.1.2. Land Use

The most concentrated residential, commercial, and industrial development is located in the southern portion of the study area, along SR 61 in Burkesville. The majority of the land within the study area consists of steep forested slopes, but the valleys provide some opportunities for agricultural and residential use. The Wolf Creek HP-Summer Shade 161-kV Transmission Line runs east and west in Amandaville, north of SR 61.

2.3.1.3. Transportation

There are two major transportation features, both state highways, in the study area. SR 61 runs northwest-to-southeast through the study area, and SR 90 runs east-to-west through the western portion of the study area. Other roads include Pine Branch Road near the tap point; High Street near the proposed new substation; SR 704 (also known as Crocus Creek Road) along the eastern portion of the study area; Jones Ridge Road; Little Renox Road; and Lewis Creek Road. There are no airports or railroads in the study area.

2.3.2. Data Collection

TVA first collected geographic data such as topography, land use, transportation, environmental features, cultural resources, near-term future development, and land conservation information for the study area. Information sources used in the transmission

line study included design drawings for area transmission lines, data collected into a geographic information system (GIS), including United States Geological Survey digital line graphs, and Cumberland County tax maps. Various proprietary data maintained by TVA in a corporate geo-referenced database, including Heritage file data on sensitive plants and animals, as well as on archaeological and historical resources, were also used.

Additionally, during April 2010, TVA took new aerial color orthophotography of the study area. These images were geo-referenced to produce an accurate image of the Earth by removing the distortions caused by camera tilt and topographic relief displacements, and then digitized for use in the GIS. This aerial photography was then interpreted to obtain land use and land cover data, such as forests, agriculture, wetlands, houses, barns, commercial and industrial buildings, churches, and cemeteries.

Data were then analyzed both manually and with GIS. The use of GIS allows substantial flexibility in examining various types of spatially superimposed information. This system allowed the multitude of study area factors to be examined simultaneously to develop and evaluate numerous options and scenarios to determine the route or routes that would best meet project needs, including avoiding or reducing potential environmental impacts.

Manual calculations from aerial photographs, tax maps, and other sources included the number of road crossings, stream crossings, and property parcels. Finally, the aerial photography, GIS-based map, and other maps and drawings were supplemented by reconnaissance throughout the study area by TVA staff, including a siting engineer and environmental engineer.

2.3.3. Establishment and Application of Siting Criteria

TVA uses a set of evaluation criteria that represent opportunities and constraints for development of transmission line routes. These criteria include factors such as existing land use, ownership patterns, environmental features, cultural resources, and visual quality. Cost is also an important factor, with engineering considerations and ROW acquisition costs being the most important elements. Application of these constraints is flexible, and TVA can, and does, deviate from them. Identifying feasible transmission line routes involves weighing and balancing these criteria and making adjustments to them as specific conditions dictate.

Each of the transmission line route options was evaluated according to criteria related to engineering, environmental, land use, and cultural concerns. Specific criteria are described below. For each feature identified as occurring along a proposed route option, specific considerations related to these features were identified and scored. In the evaluation, a higher score means a bigger constraint or obstacle for locating a transmission line. For example, a greater number of streams crossed, a longer transmission line route length, or a greater number of historic resources affected would give a transmission line route option a higher score, and thus, a worse score.

- **Engineering Criteria** include considerations such as terrain (steeper slopes can present major challenges for design and construction), total length of the transmission route, width of new ROW, number of primary and secondary road crossings, the presence of pipeline and transmission line crossings, and total line cost.

- **Environmental Criteria** include the presence of slopes greater than 30 percent (steeper slopes have more potential for erosion and potentially greater water quality impacts), consideration of visual aesthetics, the number of forested acres within the proposed ROW, the number of open water crossings, presence of sensitive (i.e., those supporting endangered or threatened species) stream crossings, the number of perennial and intermittent stream crossings, presence of wetlands or rare species habitat, the number of natural area crossings, and proximity to wildlife management areas.

- **Land Use Criteria** include the number of fragmented property parcels and proximity to schools, houses, commercial or industrial buildings, and barns.

- **Cultural Criteria** include the presence of archaeological and historic sites, churches, and cemeteries. (Broadly speaking, these are also environmental criteria).

A tally of the number of occurrences for each of the individual criteria were calculated for each potential alternative route. Next, a normalized ranking of alternative routes was calculated for each individual feature based on each route's value as it related to the other alternative routes. Weights reflecting the severity of potential effects (i.e., the relative degree of constraint) were then developed for each individual criterion. These criterion-specific weights were then multiplied by the individual alternative rankings to create a table of weighted rankings. The weighted rankings for each alternative were then added to develop overall scores of each alternative route by engineering, environmental, land use, cultural and overall total. For each of these categories, a ranking of each alternative route was calculated based on the relationship of various route's scores to one another.

These rankings made it possible to recognize which routes would have the lowest and the highest impacts on engineering, environmental, land use, and cultural resources, based on the data available at this stage in the siting process. Finally, the scores from each category were combined into an overall score. The alternative route options were then rank ordered by their overall scores.

2.3.4. Development of General Route Options and Potential Transmission Line Routes

The straight-line distance from the TVA source transmission line to the planned TCEMC substation site is about 7.5 miles. That distance, along with the steep terrain, limited the number of possible alternative corridors that could be identified and studied for the project. Using information gathered during the system's studies and data development phases, several potential tap point locations were identified that could be utilized on the existing Wolf Creek HP-Summer Shade 161-kV Transmission Line. Electric system reliability concerns require disconnect switches on each sides of the proposed tap structure in the existing source line and a disconnect switch in the tap line itself near the tap point. These switch locations must meet line engineering requirements and be accessible by road in all weather conditions, including high water. Three potential tap point locations were identified that would meet these requirements.

Thirteen route segments, as shown in Figure 1-2, were developed using the identified tap point locations, TCEMC's planned substation location, and the GIS-based land use/land cover model and other data layers, such as property boundaries, digital elevation model results (which were used to identify steepness and terrain characteristics), and

transportation. The GIS was used to locate segments that would best meet project needs by avoiding or reducing conflict with constraints (including sensitive environmental resources) and by using identified opportunities.

All of the alternative tap point locations are currently undeveloped. Tap Point 1 is located about 400 feet east of structure 57 on the Wolf Creek HP-Summer Shade 161-kV Transmission Line. Tap Point 2 is approximately 250 feet west of structure 56 on the Wolf Creek HP-Summer Shade 161-kV Transmission Line and Pine Branch Road. Tap Point 3 is located about 270 feet east of structure 52 of the Wolf Creek HP-Summer Shade 161-kV Transmission Line and Jones Ridge Road.

Segment 1 (see Figure 1-2) originates at the planned Burkesville Substation and proceeds north-northwest, parallel to TCEMC's 13-kV distribution line, for approximately 3500 feet before crossing SR 90 and terminating into Segment 3. Segment 1 contains very steep terrain and is approximately 1.33 miles long.

Segment 2 begins at the planned Burkesville Substation and proceeds in a northwesterly direction over steep terrain. This segment crosses TCEMC's distribution line and SR 90 before ending at Segment 3. Segment 2 is approximately 1.44 miles long.

Segment 3 begins at the end of Segments 1 and 2 and continues northwest across a stream over steep terrain before terminating into Segments 4 and 5. Segment 3 is approximately 0.60 mile long.

Segment 4 begins at the termination of Segment 3 and heads north for a little less than half a mile, crossing one stream. This segment then turns northeast and continues for approximately 1.5 miles over mountainous terrain, crossing three streams, Lewis Creek Road, and Little Renox Road before terminating into Segments 6 and 7. Segment 4 is approximately 2.03 miles long.

Segment 5 begins at the end of Segment 3. The segment heads west/northwest for about 1.4 miles over steep terrain. Segment 5 then turns north and continues for about 3.5 miles over steep terrain, crossing Little Renox Creek and Little Renox Road before terminating into Segment 12. Segment 5 is approximately 4.91 miles long.

Segment 6 begins at the end of Segment 4 and continues in a northeasterly direction over steep terrain. This segment crosses SR 61 and four streams (including Big Renox Creek) before ending at Segment 13. Segment 6 is approximately 3.77 miles long.

Segment 7 begins at the end of Segment 4 and heads northwest, then north, over steep terrain. This segment terminates at Segments 8 and 9 and is approximately 1.31 miles long.

Segment 8 begins at the end of Segment 7 and heads northeast across three streams (including Big Renox Creek), SR 61, and Jones Ridge Road before terminating at Segment 13. This segment is approximately 2.79 miles long.

Segment 9 begins at the end of Segment 7 and heads a short distance northwest over mountainous terrain before terminating into Segments 10 and 11. Segment 9 is approximately 0.11 mile long.

Segment 10 begins at the end of Segment 9 and heads northeast for about 1.17 miles, crossing one stream and SR 61. This segment then turns northwest for approximately 1.75 miles, crossing Jones Ridge Road before terminating at Tap Point 2. Segment 10 is approximately 2.92 miles long.

Segment 11 begins at the end of Segment 9 and heads northwest through forested, steep terrain, crossing two streams. This segment terminates at Segment 12 and is approximately 0.97 mile long.

Segment 12 begins at the end of Segments 5 and 11. This segment heads north across Big Renox Creek and SR 61, then making three more stream crossings before terminating at Tap Point 1. Segment 12 is approximately 1.84 miles long.

Segment 13 begins at the end of Segments 6 and 8, and heads northwest along the east side of Jones Ridge Road before terminating at Tap Point 3. This segment is approximately 0.34 mile long.

Ten alternate transmission line routes consisting of a combination of these 13 constituent segments (see Figure 1-2 and Table 2-1) were then developed. These routes were evaluated as described below.

Table 2-1. Alternative Route Corridors

Alternative Route	Constituent Segments	Tap Point
1	1, 3, 4, 6, 13	3
2	1, 3, 4, 7, 8, 13	3
3	1, 3, 4, 7, 9, 10	2
4	1, 3, 4, 7, 9, 11, 12	1
5	1, 3, 5, 12	1
6	2, 3, 4, 6, 13	3
7	2, 3, 4, 7, 8, 13	3
8	2, 3, 4, 7, 9, 10	2
9	2, 3, 4, 7, 9, 11, 12	1
10	2, 3, 5, 12	1

2.3.5. Route Evaluation and Identification

Each of the ten alternative routes offered different opportunities and constraints. Opportunities include characteristics such as open land, areas less suitable for development, and lack of sensitive environmental areas and land use conflicts. The assessment of the opportunities and constraints for these alternative routes are summarized below by engineering, environmental, land use, and cultural criteria.

Engineering

The absence of interstate road, pipeline, and railroad crossings resulted in fewer than normal engineering constraints along any of the alternative routes. The steep terrain throughout the study area presented a major challenge for route selection because of its potential affect to construction and design. The difficulty is compounded by the requirement that any points where the direction of the route changes (angle points called point of intersection (PI)) must be on a flat or elevated portion of the land, and

must have room for the required structure guys. It is not desirable to route transmission lines on terrain with a slope greater than 30 percent (which is prevalent throughout the study area) due to the increased construction difficulty, safety concerns, and the increased potential for erosion on the cleared ROW. Route 3 contains the least amount of terrain with slope greater than 30 percent, while Routes 5 and 10, which utilize Segment 5 along the western portion of the study area, have the greatest amount of steep terrain. Each of the proposed routes cross two state highways, SR 90 and SR 61. Additionally, each route must cross or parallel TCEMC's existing 13-kV distribution line. This line presents a challenge from an engineering standpoint because of the need to provide and maintain electrical clearance over the lower voltage transmission line and the requirement to coordinate design and construction with the distributor. The length of the alternative routes ranged from 8.06 to 8.78 miles, with Alternative Route 10 being the longest.

Environmental

The initial environmental review (GIS analysis) identified no sensitive streams or wetlands along any of the alternative routes. All of the alternative routes cross several small streams as well as Big Renox Creek and Little Renox Creek. Because the entire study area is in Cumberland County, and therefore contains potential Indiana bat habitat, the amount of forested acreage was an important environmental consideration. Route 3 would affect the fewest forested acres, while the most forested acreage would be cleared for Route 10.

Land Use

As mentioned in Section 2.3.1.2, most of the development in the study area is located in Burkesville along SR 61, near Segments 1 and 2, and the proposed Burkesville Substation. Segment 1 initially runs parallel to the distributor's existing 13-kV transmission line ROW for about 3,500 feet. There are several homes and cellular/radio towers within 300 feet of the existing ROW. Additionally, a water tank is located within 300 feet of Segments 1 and 2. Finally, numerous commercial properties are located within 300 feet of Segments 1 and 2. Although these constraints received little opposition, they present engineering challenges. Because all of the routes required the use of either Segment 1 or 2 in order to exit the planned Burkesville Substation, the scores based on land use criteria were similar for all routes.

Cultural

Cultural resources include, but are not limited to, prehistoric and historic archaeological sites, districts, buildings, structures, and objects; and locations of important historic events that lack material evidence of those events. Cultural resources include features such as archaeological sites, cemeteries, historical sites, historic structures, churches, and recreational areas. The GIS analysis identified no known archaeological or historical sites within any of the alternative routes. None of the alternative routes is within the buffer zones for churches, cemeteries, or recreational areas. The analysis showed that all but two of the alternative routes (3 and 8) could result in minor visual impacts.

Upon completion of the analysis described in Section 2.3.3.1, there was a logical spread in the overall scores of the alternative routes (Table 2-2). Two alternative routes (3 and 8) had lower overall scores than the other eight routes because they scored well in engineering, environmental, and cultural. The overall scores were very close for the next six alternatives. Routes 7 and 10 were the worst scoring alternatives, primarily due to high scores for engineering and environmental.

The numerical scores ranking the alternative routes ranged from 16.69 for Alternative Route 3 (route ranked best) to 26.10 for Alternative Route 7 (the route ranked worst).

Table 2-2. Alternative Route Option Ranks

Route Rankings	Total Score Based on Criteria Analysis	Alternative Route	Constituent Segments
1	16.69	3	1, 3, 4, 7, 9, 10
2	18.27	8	2, 3, 4, 7, 9, 10
3	20.76	4	1, 3, 4, 7, 9, 11, 12
4	22.09	1	1, 3, 4, 6, 13
5	22.34	9	2, 3, 4, 7, 9, 11, 12
6	23.67	6	2, 3, 4, 6, 13
7	23.76	5	1, 3, 5, 12
8	24.49	2	1, 3, 4, 7, 8, 13
9	25.34	10	2, 3, 5, 12
10	26.10	7	2, 3, 4, 7, 8, 13

2.4. Comparison of Alternative Transmission Line Routes

From three alternative tap points, and based on 13 possible alternative transmission line segments as shown in Figure 1-2, TVA established and considered ten alternative routes that ranged between 8.06 and 8.78 miles in length. This section provides analysis of the route segments and their relation to alternative routes.

2.4.1. Alternative Transmission Line Routes

All of the proposed routes to connect TCEMC's planned Burkesville 161-kV Substation to TVA's existing Wolf Creek HP-Summer Shade 161-kV Transmission Line are primarily oriented in a north-south alignment.

The steep terrain throughout the study area presented challenges in finding feasible route corridors and tap points. The terrain along the Wolf Creek HP-Summer Shade 161-kV Transmission Line provided very few opportunities for a connection point. Tap Points 1 and 2 are located in close proximity to each other, between structures 56 and 57 of the source transmission line; both of these tap points could provide connections for the central and western alternative corridors. Tap Point 3 is located several spans east of Tap Points 1 and 2, between Structures 51 and 52, and would provide a connection point for the eastern alternative corridors.

While all three alternative locations are feasible, Tap Point 2 was the most favorable location due to its level terrain, which would allow for optimal switch locations (i.e., as close as possible to the tap structure), and close proximity to an existing road (Pine Branch Road), which would eliminate the need for new road construction to access the switches. Tap Points 1 and 3 would require new access road construction and would result in a much greater distance between the tap point and switches.

Prior to the final route selection, a cemetery was identified within the proposed new ROW just south of Tap Point 2. Because a switch would have been required in this area, Tap Point 2 was then eliminated from consideration and Routes 3 and 8, which originally would have connected to Tap Point 2, would now connect to Tap Point 1.

In the immediate vicinity of the planned Burkesville Substation, opportunities for route segments were limited by existing utilities and residential and commercial development. As a result, only two practical paths leaving the substation (Segments 1 and 2) were developed. Segment 1 runs parallel to TCEMC's 13-kV distribution line, and Segment 2 heads slightly west. Routes 1 through 5 utilize Segment 1 and Routes 6 through 10 use Segment 2.

Routes 1 and 6, the easternmost routes, are identical except for their path out of the Burkesville Substation. These routes are also the shortest and are the only routes that utilize Segment 6. However, Segment 6 crosses more steep terrain than some alternatives, and connects to Tap Point 3, which is the least favorable connection point. These factors contributed to Alternative Route 1, which is 8.06 miles long, ranking fourth in the analysis of possible routes with a score of 22.09. Route 6, which is 8.17 miles long, scored 23.67 and ranked sixth overall.

Routes 2 and 7 are identical except for their path out of the Burkesville Substation. These routes follow the same general path as Routes 1 and 6 until crossing Little Renox Creek, where they turn northwest along Segment 7. Once reaching the end of Segment 7, Routes 2 and 7 turn back to the northeast along Segments 8 and 13 to connect to Tap Point 3. Routes 2 and 7 scored in the bottom half of the rankings primarily due to poor engineering and environmental scores. These routes connect to Tap Point 3, which is not an ideal connection point for the reasons mentioned previously. Route 2 is about 8.38 miles long and ranked eighth in the analysis with a score of 24.49. Route 7, which is approximately 8.5 miles long, scored last in the analysis with a score of 26.10.

Routes 3 and 8 are the same except for the initial path out of the Burkesville Substation. These routes are the most central routes and follow the same path as Routes 2 and 7 until reaching the end of Segment 7, when they turn slightly northeast and then north along Segment 10 to connect to Tap Point 1 (originally Tap Point 2). Both of these routes scored very well in the analysis due to low (better) engineering and environmental scores. These routes cross the fewest acres of slope greater than 30 percent and thus would be more favorable to design and build than the other alternative routes. Further, Route 3 crosses the fewest forested acres and would therefore affect the least amount of potential Indiana bat habitat. Route 3 is approximately 8.29 miles long and ranked first in the analysis with a score of 16.69. Route 8, which is 8.40 miles long, scored 18.27 and ranked second overall.

Routes 4 and 9 are identical except for their path out of the Burkesville Substation. These routes follow the same general path as Routes 3 and 8 until reaching the end of Segment 7, where they turn northwest along Segment 11. Once reaching the end of Segment 11, Routes 4 and 9 turn northeast along Segment 12 to connect to Tap Point 1. Routes 4 and 9 scored in the top half of the rankings primarily due to very good engineering scores. They scored slightly worse than the top two routes because Segments 11 and 12 cross slightly steeper and more heavily forested terrain than Segment 10. Route 4 is about 8.18 miles long and ranked third in the analysis with a score of 20.76. Route 9, which is approximately 8.29 miles long, scored fifth in the analysis with a score of 22.34.

Routes 5 and 10 are the same except for their path out of the Burkesville Substation and they are the westernmost routes. They are also the two longest routes and are the only routes that utilize Segment 5. Routes 5 and 10 scored in the bottom half of analysis, primarily because they had the worst engineering scores due to the mountainous terrain in the western portion of the study area along Segment 5. Additionally, these routes affected the most forested acres, which could result in the greatest impact to potential Indiana bat habitat. These factors resulted in Alternative Route 5, which is 8.67 miles long, ranking seventh in the analysis of possible routes with a score of 23.76. Route 10, which is 8.78 miles long, scored 25.34 and ranked ninth overall.

The scores for the top two routes (3 and 8) were relatively close. These routes would be the easiest to design and construct because of the terrain. Additionally, Routes 3 and 8 would minimize environmental impacts for several reasons: fewer forested acres (i.e., potential Indiana bat habitat) would be cleared than for the other alternatives; the terrain would result in less potential for erosion; and these routes cross the fewest streams (along with Routes 5 and 10). Route 3 scored slightly better than Route 8 because it requires less forested clearing, the overall terrain is not as steep, and it is slightly shorter than Route 8. For these reasons, Alternative Route 3 was selected as the preferred route option.

2.4.2. Identification of the Preferred Transmission Line Route

The preferred transmission line route for the Action Alternative is Alternative Route Option 3, consisting of Alternative Segments 1, 3, 4, 7, 9, and 10, with the use of Alternative Tap Point 1 (see Figure 1-1).

After the preferred transmission line route was identified, affected property owners were mailed information showing the location of the preferred route on their property. Additional comments received from property owners were reviewed and, where practical, changes were made to the preferred route selections prior to and during engineering and environmental field surveys. The route segments were adjusted based on public and property owner input, as well as environmental data, to lessen overall impacts. Examples include following parcel boundaries to lessen the impact on future uses of the property and to reduce the proximity to sensitive areas and species, as well as cultural/historical features.

During field surveys, an adjustment was made to the transmission line route near the planned Burkesville Substation. During surveys, guy wires from a cell tower near TCEMC's distribution line were discovered to be located too close to the proposed path of Segment 1. In addition, a gas main/meter and junkyard were identified on the property north of the cell tower along Segment 1. To avoid these obstacles, TVA shifted the route to the west and eliminated two angle structures, modifying the locations of Segments 1 and 3.

2.5. Comparison of Environmental Impact Analysis for the Alternatives

Table 2-3 compares the environmental impacts of the two proposed alternatives derived from the information and analysis provided in Chapter 3, Affected Environment and Chapter 4, Environmental Consequences.

2.6. The Preferred Alternative

The Action Alternative, i.e., Construct and Operate a 161-kV Transmission Line, is TVA's Preferred Alternative for this proposed project. TVA would build a 161-kV transmission line from TCEMC's planned Burkesville Substation to a tap point in TVA's existing Wolf Creek

HP-Summer Shade 161-kV Transmission Line. The preferred route for the Action Alternative is Alternative Route Option 3, which would consist of Alternative Route Segments 1, 3, 4, 7, 9, and 10, and would terminate into Tap Point 1, as shown in Figure 1-1. The transmission line route would be approximately 8.5 miles in length.

Table 2-3. Environmental Impact Analysis Comparison of the Alternatives

RESOURCE AREA	ALTERNATIVE 1 THE NO ACTION ALTERNATIVE	ALTERNATIVE 2 THE PREFERRED ACTION ALTERNATIVE
Number of Right-of-Way Miles	0	8.5
Land Use	None	Most of the ROW for the proposed transmission line is either agricultural or forest. Agricultural operations are consistent with transmission line operations. Approximately 85 acres of forested land within the proposed ROW would be cleared. The proposed route tends to avoid residences and commercial areas, and most houses are 300 to 500 feet from the ROW. Because of this distance, no significant effects to residential land use are expected. Thus, no noticeable changes in land use or restrictions on uses of adjacent properties would occur.
Vegetation	None	Implementation of Alternative 2 would result in the long-term conversion of 85 acres of forested areas to early successional habitats. The cumulative project-related effects to forest resources would be negligible when considered in the context of the total forest land occurring in the region. No significant changes would occur to the terrestrial ecology of the region.
Wildlife	None	Potential impacts to wildlife would result from the long-term conversion of forest to early successional habitats and from the creation of forest-edge habitat. However, most species that would be affected by these changes are common locally and regionally and the effects on wildlife would be minor.
Aquatic Ecology	None	A total of 91 watercourses (nine perennial and 13 intermittent streams, 66 wet-weather conveyances, and three ponds) could be affected. Impacts to aquatic ecology with implementation of best management practices (BMPs) and protective measures are expected to be insignificant.
Endangered and Threatened Species	None	No effects on state-listed aquatic or terrestrial animal species are anticipated with the implementation of BMPs, SMZs, and mitigation measures. Two state-listed plant species, a butternut tree and a small population of Carolina anglepod, would be negatively affected. Effects on the federally listed Indiana bat would not be adverse with the implementation of BMPs, SMZs, and mitigation measures including those outlined in a Memorandum of Agreement (MOA) with the USFWS.
Surface Water	None	Potential impacts would be minimized by avoiding stream crossings where possible and implementation of BMPs. Impacts to surface waters are expected to be insignificant.
Groundwater	None	With the use of BMPs and control measures normally applied by TVA, potential effects to groundwater quality would be insignificant.
Floodplains	None	Portions of the proposed transmission lines and access roads would be in floodplains, but would not adversely affect flooding or floodplain values.

RESOURCE AREA	ALTERNATIVE 1 THE NO ACTION ALTERNATIVE	ALTERNATIVE 2 THE PREFERRED ACTION ALTERNATIVE
Wetlands	None	The proposed transmission lines would span five wetlands comprising 0.34 acres and convert 0.08 acres from forested to nonforested wetlands. Wetland areas along the ROW would be maintained by standard practices including implementing BMPs. Overall wetland impacts are considered insignificant.
Archaeological and Historic Resources	None	The proposed transmission line would have a visual effect on seven structures that are eligible for inclusion on the National Register of Historic Places (NRHP). However, no adverse effects are anticipated on any historic properties.
Aesthetic Resources	None	Visual impacts as a result of the transmission line would be minimal because the vegetation and topography would obscure most views. In areas near the tap point and the planned Burkesville Substation, the proposed transmission lines would be visually similar to poles, towers, lines, and other industrial features seen in the landscape now. Visual impacts are anticipated to be minor and insignificant as a result of this alternative. Noises and odors associated with construction activities would be temporary and the impacts would be insignificant.
Recreation, Parks, and Natural Areas	None	The proposed transmission lines would be located within 0.3 mile of the Cumberland River, listed on the Nationwide Rivers Inventory (NRI). This NRI-listed stream would not be affected because of the distance and implementation of BMPs. No natural areas or Wild and Scenic Rivers would be affected. There are no developed public recreation facilities near the proposed transmission line route. Recreation in the area is informal, dispersed, and on private land. Implementation of the Action Alternative would result in insignificant effects on public recreation activities and resources.
Socioeconomics and Environmental Justice	TVA would not be able to ensure continued service reliability and reduce the risk of disruptions. Over the long term, this could have adverse economic effects to the region through the loss of electric service. Any such impacts would affect all populations in the region negatively.	Continued stability of service would provide positive impacts to the area by helping to maintain economic stability and growth in the area. Any negative social, economic, or environmental justice impacts that might occur under the action alternative would be small, tending to diminish over time, and would be much smaller than negative impacts under the no action alternative.

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CHAPTER 3

3.0 AFFECTED ENVIRONMENT

The existing condition of environmental resources that could be affected by the proposed actions are described in this chapter. The descriptions below of the potentially affected environment are based on field surveys conducted in 2011, on published and unpublished reports, and on personal communications with resource experts. This information establishes the baseline conditions against which TVA decision makers and the public can compare the potential effects of implementing the alternatives under consideration.

The scope of the environmental review includes portions of Cumberland County, Kentucky. The proposed 8.5 miles of transmission line would require a cleared 100-foot-wide ROW and would occupy an area of approximately 103 acres. Thus, the “project area” as used below refers primarily to that area within the route of the proposed ROW and access roads, unless otherwise stated. The analysis of potential effects to endangered and threatened species and their habitats included records of occurrence within a 3-mile radius for terrestrial animals, a 5-mile radius for plants, and a 10-mile radius for aquatic animals. The analysis area for aquatic resources included the watershed of the project area.

Potential effects related to air quality, hazardous and nonhazardous wastes, and health and safety were considered. Potential effects to these resources were found to be minimal or absent because of the nature of the action. The current conditions of other resources that could be affected by the proposed project construction, operation, and maintenance of the proposed transmission line project are described in this chapter.

3.1. Land Use

Concerns regarding potential effects to land use, particularly restrictions on uses within the proposed ROW are frequently raised by the public. TVA typically purchases an easement with landowners for the ROW. This easement agreement provides TVA the right to construct and maintain the transmission line on private land while the property owner retains fee simple ownership. The easement agreement prohibits the construction of permanent structures, especially habitable structures, within the ROW. As a result of an extensive routing process (see Section 2.3), most of the proposed transmission line route would cross agricultural or forested areas, and the route would not intersect any major commercial, industrial, or residential areas.

3.2. Vegetation

Vegetation along the proposed transmission line ROW and access roads is characterized by two main types — forested vegetation (85 percent) and herbaceous vegetation (15 percent). No forested areas in the proposed project area had structural characteristics indicative of old growth forest (Leverett 1996). All plant communities observed in the project area are common and well represented throughout the region.

All forest in the project area is deciduous in composition. Deciduous forest is characterized by trees with overlapping crowns where deciduous species account for more than 75 percent of the canopy cover. Throughout the project area, species composition varies with factors such as landscape position and previous land use, but common overstory species observed included America beech, blackgum, chestnut oak, pignut, hickory, red

maple, sugar maple, white oak, and yellow-poplar. Some of the forests within the proposed ROW were heavily impacted by previous logging or grazing, but more than half the forest in the project area is comprised of mature hardwoods with diameters at breast height commonly reaching 18 to 24 inches. The herbaceous layer of ridge-top forests was typically stunted because of the drier conditions on those sites, but numerous herbaceous species inhabited areas rich, mid to lower slopes. Common species in these habitats included Allegheny brook saxifrage, American columbo, Carolina angelpod, dwarf crested iris, great yellow wood sorrel, greater tickseed, Guyandotte beauty, maidenhair fern, shooting star, spiderwort, tuberous stoneseed, and wild ginger. Riparian forests associated with creeks were generally heavily disturbed by previous clearing and were populated primarily with small diameter black walnut, boxelder, green ash, and sycamore along with an assortment of weedy herbaceous species.

Herbaceous vegetation is characterized by greater than 75 percent cover of forbs and grasses and less than 25 percent cover of other types of vegetation. Early successional fields, existing transmission line ROW, and agricultural fields are the most common types of herbaceous vegetation found along the proposed transmission line corridor. These areas are heavily disturbed by previous and/or present land use and contain plant species indicative of early successional habitats. Common species observed in the herbaceous vegetation type include broomsedge, goldenrod, Japanese honeysuckle, Johnsongrass, orchard grass, rabbit tobacco, red clover, sericea lespedeza, tall fescue, and white clover.

EO 13112 (Invasive Species) was issued in 1999 to enhance federal coordination and response to the complex and accelerating problem of invasive species and serves to prevent their introduction to minimize the economic, ecological, and human health impacts. Invasive plant species are nonnative species that invade natural areas and displace native species, generally by out competing native species or by altering ecological communities or ecosystem processes (Miller 2003; Vitousek et al. 1996). No federal-noxious weeds were observed, but several species identified by the Kentucky Exotic Plant Pest Council as high priority invasive plants were observed in the project area (Table 3.1).

During field surveys, invasive plants, shown in Table 3-1, were observed in both forest and herbaceous vegetation areas. However, herbaceous areas generally contained both greater numbers and cover of invasive plant species. Disturbances for mowing, grazing, and ROW maintenance prevent tree species from becoming established, but can also encourage invasion and establishment of weedy species.

Table 3-1. Invasive Plant Species Observed in the Proposed Right-of-Way for the Burkesville, KY 161-kV Transmission Line

Common Name	Scientific Name
Tree-of-heaven	*Ailanthus altissima*
Tall Fescue	*Festuca arundinacea*
Chinese Lespedeza	*Lespedeza cuneata*
Japanese Honeysuckle	*Lonicera japonica*
Japanese Stiltgrass	*Microstegium vimineum*
Princess Tree	*Paulownia tomentosa*

3.3. Wildlife

Wildlife habitat assessments along the proposed transmission line corridor and access roads were conducted in May and June 2011, and along the associated proposed access roads in November 2011. Terrestrial habitat observed along the proposed transmission line route and associated access roads is characterized by two main types—herbaceous vegetation and forest. Overall, the proposed area is dominated by steep forested slopes and ridges that are bisected by herbaceous valleys previously cleared for agricultural or residential use or for transportation (roadways). Some aquatic features (herbaceous wetland, herbaceous and forested streams, and intermittent streams and wet-weather conveyances) also occur within the project area.

Herbaceous wildlife habitat included cattle pasture, residential lawns, fields, and roadside edges. Pastures and other areas composed primarily of herbaceous vegetation provide habitat for early successional bird species such as Carolina wren, eastern bluebird, American robin, brown thrasher, white-eyed vireo, yellow-breasted chat, prairie warbler, indigo bunting, northern cardinal, blue grosbeak, field sparrow, song sparrow, and orchard oriole. Birds found in early successional habitats with a dominant grass component include dickcissel, grasshopper sparrow, savannah sparrow, northern bobwhite, eastern meadowlark, and white-throated sparrow. Small mammals such as eastern mole, white-footed mouse, and prairie vole, and larger mammals such as eastern cottontail, woodchuck, common raccoon, and white-tailed deer can be abundant in early successional habitats. Predators that hunt small mammals in these areas include red fox, coyote, snakes, and raptors such as American kestrel and red-tailed hawk. Reptiles often found in early successional habitats include black racer, black rat snake, milksnake, and common garter snake. Wetlands and streams occurring within areas dominated by herbaceous vegetation provide habitat for amphibians including American and Fowler's toads, green frog, northern cricket frog, southeastern chorus frog, and red-spotted newts.

Forested wildlife habitat included deciduous forest and mixed evergreen-deciduous forest. These forested areas provide habitat for wild turkey, downy woodpecker, pileated woodpecker, white-breasted nuthatch, and American crow, as well as numerous Neotropical migrant birds such as wood thrush, red-eyed vireo, ovenbird, hooded warbler, black-and-white warbler, and Acadian flycatcher. Common reptiles include ring-necked snake, black rat snake, and copperhead. Wetlands and streams within deciduous woodlands provide habitat for amphibians such as American and Fowler's toads, northern cricket frog, spotted salamanders, red salamanders, and red-spotted newts. Three-toed box turtle is a common reptile in forested areas and white-tailed deer and eastern gray squirrel are mammals frequently found in deciduous forests.

No caves have been documented within three miles of the project area and no caves were found during field observations.

3.4. Aquatic Ecology

The proposed 161-kV transmission line crosses the Eastern Highland Rim and Outer Nashville Basin ecoregions within drainages of the Cumberland River and its tributaries Lewis Creek and Big Renox Creek (see Section 3.6). Overall, 91 watercourses including nine perennial, 13 intermittent, 66 wet-weather conveyances, and 3 ponds occur along the proposed transmission line route. The location of each of these watercourses was recorded using a global positioning system, and a habitat assessment form was completed for each during the May and November 2011 field survey. A listing of stream crossings in

the project area, excluding wet-weather conveyances, as well as observed stream substrate conditions is provided in Appendix F. Additional information regarding watercourses in the vicinity of the project area can be found in Section 3.6.

Because transmission line construction and maintenance activities may affect riparian conditions and in-stream habitat, TVA evaluated the condition of both of these at each stream crossing along the proposed route. Streams crossed by the proposed Burkesville, KY 161-kV Transmission Line route include Big Renox Creek, Little Renox Creek, Lewis Creek, and Haggard Branch, as well as several of their unnamed tributaries. Two unnamed tributaries to Strange Branch are also crossed by the proposed route. Observed in-stream habitat crossed by the proposed route varied from headwater streams to medium/large creeks with substrate composition predominately bedrock with cobble/gravel.

Three classes were used to indicate the current condition of streamside vegetation across the length of the proposed transmission line (Table 3-2):

- Forested - Riparian area is fully vegetated with trees, shrubs, and herbaceous plants. Vegetative disruption from mowing or grazing is minimal or not evident. Riparian width extends more than 60 feet on either side of the stream.

- Partially forested – Although the riparian area is not forested, sparse trees and/or scrub-shrub vegetation is present within a wider band of riparian vegetation (20 to 60 feet). Disturbance of the riparian zone is apparent.

- Nonforested - No trees or only a few trees are present within the riparian zone. Significant clearing has occurred, usually associated with pasture or cropland.

Table 3-2. Riparian Condition of Streams Located Within the Proposed Burkesville, KY 161-kV Transmission Line Right-of-Way and Access Roads

Riparian Condition	Number of Perennial Streams	Number of Intermittent Streams	Total
Forested	3	9	12
Partially forested	3	2	5
Nonforested	3	2	5
Total	**9**	**13**	**22**

TVA then assigns appropriate SMZs and BMPs based upon these evaluations and other considerations (such as State 303(d) listing and presence of endangered or threatened aquatic species). Appropriate application of these BMPs minimizes the potential for impacts to water quality and in-stream habitat for aquatic organisms.

3.5. Endangered and Threatened Species

Species listed at the federal level as endangered or threatened are protected under the ESA, which is administered by the USFWS. Section 7 of this act requires federal agencies to conserve these species and to consult with USFWS in situations where a federal action may affect these species or their habitats. The state of Kentucky also list species as endangered, threatened, or of other conservation concern.

3.5.1. Plants

No federally listed plant species are known to occur in Cumberland County, Kentucky, or within a five-mile vicinity of the project area. Two state-listed plant species were previously known from within a five-mile vicinity of the project area, and a third state-listed plant, butternut, was found during field surveys. No scentless mock orange was identified during field surveys of the proposed transmission line ROW. However, thirteen occurrences of the other two state-listed plant species were observed (Table 3-3). No designated critical habitat for plant species occurs in the project area.

Single butternut trees were observed at two locations in the project area. Both individual trees were located in rich forests situated on mid to lower slopes and exhibited symptoms of butternut canker, a fungal infection that is killing butternut trees across the species range (Michler et al. 2005)

Carolina angelpod was observed at eleven distinct locations throughout the project area. At each location, the number of plants observed varied from a few to about 100 individual plants; but the majority of locations supported between 25 and 75 plants. The species was observed in rocky forests with a relatively open understory, as well as disturbed areas where the forest canopy had been partially removed by logging and construction of small forest roads and transmission line ROW. Sites where Carolina angelpod was observed did not possess characteristics that would suggest that the species has strict habitat preferences, other than increased light levels resulting from openings in the forest canopy. Occurrences of Carolina angelpod observed in the proposed ROW were more or less evenly distributed across the project area.

Table 3-3. State-Listed Plant Species Previously Reported From Within a Five-Mile Vicinity of the Burkesville, KY 161-kV Delivery Point Project Area

Common Name	Scientific Name	Status[1]	
		Federal	State (Rank[2])
Butternut[3]	*Juglans cinerea*	-	T (S3)
Carolina Anglepod[3]	*Matelea carolinensis*	-	E (S1?)
Scentless Mock Orange	*Philadelphus inodorus*	-	T (S1S2)

Source: TVA Natural Heritage Database, June 2010.
[1]Status Codes: E = Endangered; T = Threatened.
[2]State Ranks: S1 = Critically imperiled; S2 = Imperiled; S3 = Vulnerable ; S#S# = A numeric range rank (e.g., S2S3) is used to indicate any range of uncertainty about the status of the species or community; ? = Denotes inexact or uncertain numeric rank.
[3]State-listed plant species located during botanical surveys of the project area.

3.5.2. Terrestrial Animals

One federally listed and four state-listed terrestrial animal species are known from within three miles of the project area in Cumberland County, Kentucky (Table 3-4). Additionally, Bewick's wren, a state-listed species previously undocumented in the county, was observed during the November field investigations. The federally listed endangered Indiana bat has been considered in the project review due to guidance from the Kentucky Ecological Services office of the USFWS.

Table 3-4. Federally and State-Listed Species of Terrestrial Animals Known From Within a Three-Mile radius of the Proposed Project Area

Common Name	Scientific Name	Status[1]	
		Federal	State (Rank[2])
Birds			
Bewick's wren	*Thryomanes bewickii*	-	S (S3)
Mammals			
Eastern small-footed bat	*Myotis leibii*	-	T (S2)
Evening bat	*Nycticeius humeralis*	-	S (S3)
Indiana bat	*Myotis sodalis*	LE	E (S1S2)
Gray bat	*Myotis grisescens*	LE	T (S2)
Invertebrates			
Karst snowfly	*Allocapnia cunninghami*	-	T (S1S2)

Source: Kentucky Natural Heritage Program, May and November 2011.
[1]Status Codes: E = Endangered; LE = Listed endangered; T = Threatened; S = Special concern.
[2]State Ranks: S1 = Critically imperiled; S2 = Imperiled; S3 = Vulnerable.

Karst snowfly inhabits spring-fed streams in karst habitats (Kentucky State Nature Preserves Commission (KSNPC) 2011). Historical records occur for this species in Cumberland County. Suitable habitat for this species was not observed along the proposed transmission line route.

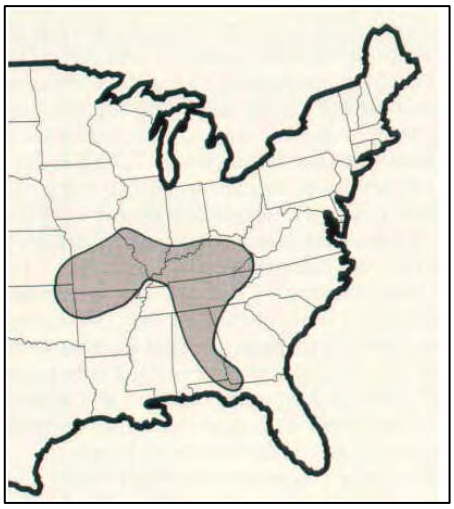
Bewick's wren was observed during November field investigations. This observation is the first record of an occurrence for this species in Cumberland County, Kentucky. Although historically the species is reported to overwinter in Kentucky, it is currently rarely reported outside of the breeding season. Bewick's wren has been documented in a variety of semi-open habitats. Although information suggests it historically inhabited natural forest openings, this species currently is more closely associated with human altered habitats. Bewick's wren is more commonly encountered in rural farmland and residential settings, but occurrences in suburban yards, brushy forest margins, and forest clearings also have been documented (Palmer-Ball 1996). The Bewick's wren observed was found in an open and overgrown cedar glade/early successional area with scattered patches of tall grass and shrubbery that has grown up in what appears to be an old clear cut. Cedar trees were small to mid-sized and relatively far apart with some areas of bare shale. The existing road was a bare dirt/gravel bed.

Habitat for eastern small-footed bats is comprised primarily of hilly or mountainous areas, in or near deciduous or evergreen forest, and sometimes in open farmland. Warm-season roosts include buildings, towers, hollow trees, spaces beneath the loose bark of trees, cliff crevices, and bridges over rivers (in expansion joints). Hibernation occurs in solution and fissure caves and mine tunnels (including coal, iron, copper, and talc mines). Situations near the entrance, where the air is relatively cold and dry, seem to be preferred. These bats are usually found singly or occasionally in small clusters, but many may be packed in a crevice; often they hang among other species (NatureServe 2010). Data provided by the KSNPC indicated that foraging and/or traveling eastern small-footed bats have been documented in Cumberland County via 2007 summer mist net captures over Haggard Branch and nearby areas. Haggard Branch is located near the southern end and to the west of the proposed transmission line route. Suitable habitat for eastern small-footed bats in the form of hollow trees and loose bark is available in the project area.

Evening bat inhabits deciduous and mixed forest interspersed with cultivated areas. This species is commonly found along waterways. Summer roosts include attics of buildings, tree cavities, and spaces behind loose tree bark. Evening bats also may use Spanish moss for summer roosting, and the entrances of caves in the fall. Hibernation sites have not been documented. Maternity colonies may be found under loose bark, in tree cavities, in Spanish moss, or in buildings. This species preys on flying insects. Data provided by the KSNPC indicated that foraging and/or traveling evening bats have also been documented in Cumberland County via the 2007 summer mist net captures over Haggard Branch and nearby areas.

Gray Bat

The gray bat was listed as endangered by the USFWS in 1976. The species' primary range is concentrated in the cave regions of Alabama, Arkansas, Kentucky, Missouri and Tennessee (see Figure 3-1), with smaller populations found in adjacent states. Gray bats occupy cold caves or mines in the winter, during the hibernation season, and warmer caves during the summer. Gray bats primarily forage over open water of rivers, streams, lakes or reservoirs as far as 20 miles away from their caves. Maternity colonies are typically found in caves between 0.5 to 2.5 miles from foraging areas. Although this species has recovered in many areas, human disturbance of unprotected caves continues to be the primary cause of continued decline in some populations of the gray bat. Although not yet documented in gray bats, white-nose syndrome has affected six (6) other species of cave-dwelling bats to date. Since the fungus is not species-specific, it is considered a new threat to the gray bat (USFWS 2009a).



(a) Approximate Gray Bat Range

(b) Gray Bat

Photo by Merlin Tuttle, Bat Conservation International

Figure 3-1. Gray Bat Approximate Range Map and Image

No caves have been documented within three (3) miles of the proposed route and none were identified during field investigations.

Data provided by the KSNPC indicated that foraging gray bats have been documented in Cumberland County via the 2007 summer mist net captures over Big Renox Creek and Smith Branch, a tributary of Big Renox Creek. Big Renox Creek approaches the northern end of the proposed route from the west, intersects the route approximately one-third of the way south and then roughly parallels the route along the east side for the remainder of the line. Suitable foraging habitat for the gray bat is available in the project area where the route crosses Big Renox Creek between PI 4 and 5. Marginally suitable foraging habitat may be available along some of the other streams along the route; however, because most of these streams are small and/or intermittent, these are not necessarily reliable foraging/drinking sources in comparison to Big Renox Creek.

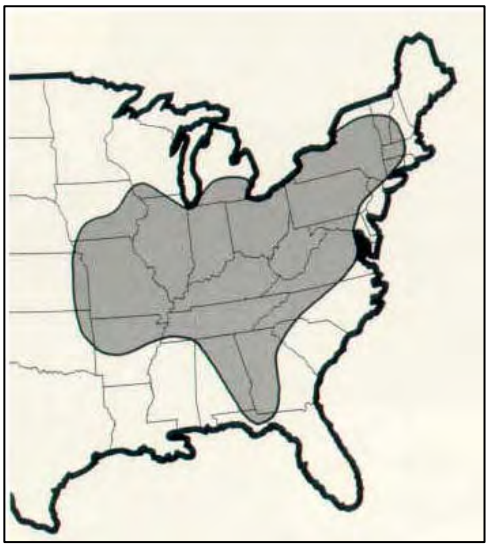
Indiana Bat

The Indiana bat was originally listed as in danger of extinction in 1966, under the Endangered Species Preservation Act, and is currently listed as endangered under the ESA of 1973, as amended. Listing was due to large numbers of Indiana bat deaths caused by human disturbance during hibernation (USFWS 2007). A recovery plan was completed and approved in 1983. In 2007, a new draft revised recovery plan was released, reflecting knowledge of 281 hibernacula in 19 states and 269 colonies in 16 states (ibid). The USFWS completed a 5-year review of the status of the Indiana bat in 2009 (USFWS 2009b). The current recovery priority for the Indiana bat is 8, which indicates that this species has a moderate degree of threat and high recovery potential.

The Indiana bat is an insectivorous, migratory bat that hibernates in caves and mines during the winter throughout the eastern United States (see Figure 3-2). In the spring, reproductive females migrate to wooded areas where they form maternity colonies. Males and non-reproductive females also migrate and roost in wooded areas, but tend to stay closer to hibernacula and not roost in colonies. Summer roosts of both maternity colonies and other adults are typically behind exfoliating bark of large, primarily dead, trees. Maternity colonies tend to occupy dead trees with large pieces of exfoliating bark that receive direct sunlight for more than half the day. Maternity colonies occur in riparian areas, bottomland and floodplain habitats, wooded wetlands, and upland communities. Indiana bats typically forage in semi-open to closed forested habitats, forest edges, and riparian areas. Indiana bats return to hibernacula in late summer or early fall to mate and then enter into hibernation (USFWS 2007; Kurta and Kennedy 2002; USFWS 2008).

Biologically critical needs of this species include limiting use of fat during hibernation, obligate colonial roosting, high energy demands of pregnant and nursing females, and development and weaning of young. Threats to these needs that may make Indiana bats increasingly vulnerable include significant disruption to roosting areas (both hibernacula and maternity colonies), availability of hibernacula, and connectivity and conservation of roosting-foraging and migration corridors (USFWS 2007).

Although the Indiana bat has not been documented in Cumberland County, the Kentucky USFWS has identified all forested areas of the state where the Indiana bat has not been documented as potentially suitable summer roosting habitat for this species until determined otherwise. The closest summer record of Indiana bat is a non-maternity record approximately 15 miles away in Clinton County, Kentucky (USFWS 2010).



(a) Approximate Indiana Bat Range

(b) Indiana Bat

Photo by Merlin Tuttle, Bat Conservation International

Figure 3-2. Indiana Bat Approximate Range Map and Image

TVA biologists conducted field surveys along the proposed ROW in late May and early June 2011. Additional surveys were conducted in mid-November 2011 along the proposed access roads. A total of 69 acres (60 acres within the ROW and 9 acres along access roads) was identified as potentially suitable forested habitat for the Indiana bat across sections of the proposed project area (Figure 3-3). TVA initially informed the Kentucky USFWS of their findings in July 2011, with follow-up correspondence in November 2011 and January 2012 (Appendix A). Potentially suitable summer roosting and foraging habitat for the Indiana bat was identified within some of the forested areas and hillsides. These forests are composed of mature trees, including species that have shaggy bark suitable for summer roosts, as well as some snags with exfoliating bark.

3.5.3. Aquatic Animals

Nine federally listed endangered species, one proposed federally listed endangered species, and eight state-listed aquatic species are known to occur in Cumberland County (Table 3-5) and within a 10-mile radius of the proposed transmission line route. With the exception of the ring pink, purple lilliput, and the elusive clubtail, these species are known only from historical records and are likely no longer present due to general habitat loss or other degradation of the environment. Clubshell, fluted kidneyshell, and little-wing pearlymussel are not known from the area, but based on USFWS records could potentially occur in the project area and are included in Table 3-5. However, habitat for the ring pink, clubshell, fluted kidneyshell, and little-wing pearlymussel is only found in the Cumberland River within the project area. Potentially suitable habitat for the adult stage of the elusive clubtail and habitat for the state-listed purple lilliput was observed along the proposed transmission line route.

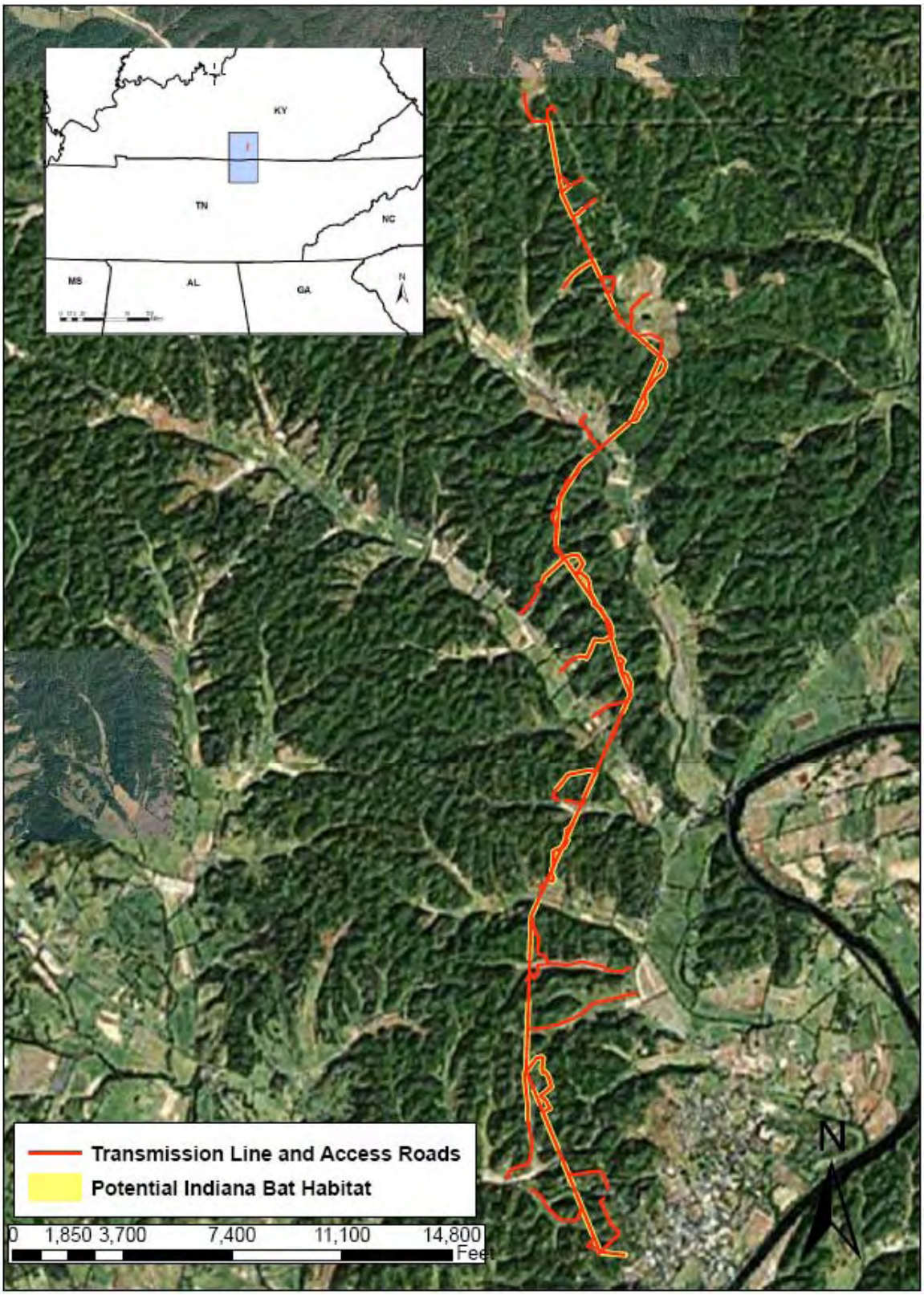


Figure 3-3. Potential Indiana Bat Habitat Along the Proposed Burkesville, KY 161-kV Transmission Line Route

Table 3-5. Federally and State-Listed Aquatic Species Known From Cumberland County and/or Within a 10-Mile Radius of the Proposed Project Area

Common Name	Scientific Name	Status[1]	
		Federal	State (Rank[2])
Fish			
Blotched Chub[3]	*Erimystax insignis*		E (S1)-
Palezone Shiner[3]	*Notropis albizonatus*	LE	E (S1)
Stargazing Minnow[3]	*Phenacobius uranops*		S (S2S3)-
Macroinvertebrate			
Elusive Clubtail	*Stylurus notatus*	-	E (S1)
Mussels			
Armored Rocksnail[3]	*Lithasia armigera*		S (S3S4)
Clubshell	*Pleurobema clava*	LE	E (S1)
Cracking Pearlymussel[3]	*Hemistena lata*	LE	X (SX)
Cumberland Bean[3]	*Villosa trabalis*	LE	E (S1)
Cumberlandian Combshell[4]	*Epioblasma brevidens*	LE	E (S1)
Dromedary Pearlymussel[3]	*Cromus dromas*	LE	X (SX)
Fanshell[3]	*Cyprogenia stegaria*	LE	E (S1)
Fluted Kidneyshell	*Ptychobranchus subtentum*	C	E (S1)
Little-wing Pearlymussel	*Pegias fabula*	LE	E (S1)
Orange-foot Pimpleback[3]	*Plethobases cooperianus*	LE	E (S1)
Oyster Mussel[4]	*Epioblasma capsioformis*	LE	E (S1)
Pink Mucket[3]	*Lampsilis abrupta*	LE	E (S1)
Pocketbook[3]	*Lampsilis ovata*	-	E (S1)
Purple Catspaw Pearlymussel[4]	*Epioblasma obliquata obliquata*	LE	E (S1)
Purple Lilliput	*Toxolasma lividus*	-	E (S1)
Pyramid Pigtoe[3]	*Pleurobema rubrum*	-	E (S1)
Ring Pink	*Obovaria retusa*	LE	E (S1)
Rough Pigtoe[3]	*Pleurobema plenum*	LE	E (S1)
Sheepnose[4]	*Plethobasus cyphyus*	PE	E (S1)
Snuffbox[3]	*Epioblasma triquetra*	-	E (S1)
Spectaclecase[3]	*Cumberlandia monodanta*	PE	E (S1)

Source: TVA data, January 2012.
[1]*Status Codes*: C = Candidate; E = Endangered; X **=** Extirpated; LE = Listed Endangered; S = Special concern; PE = Proposed endangered.
[2]*State Ranks*: S1 = Critically imperiled; S2 = Imperiled; S3 = Vulnerable; S4 = Apparently Secure; X = Presumed extirpated.
[3]**Historical** = Element occurrence is greater than 25 years old.
[4]**Extirpated** = Historically known from the area but believed to be extirpated.

The following provides a brief description of species potentially occuring within the project area.

The blotched chub prefers riffle areas in medium-sized creeks to small rivers with coarse substrate. Spawning occurs between April and May (Etnier and Starnes 1993).

The palezone shiner is normally encountered in pools and pool runs below riffles of high-gradient, clear streams flowing over bedrock, cobble, and or gravel mixed with clean sand. Spawning is thought to occur in late May through July. Little else is known about the life history of this species (Metee et al. 1996).

The stargazing minnow is common in riffle areas of small to medium rivers. Spawning occurs between April and June (Etnier and Starnes 1993).

The elusive clubtail is a dragonfly that is generally associated with large clear river systems with moderate current. The aquatic larvae are burrowers and prefer substrates of gravel or sand. This species has also been documented in impoundments with silt and gravel substrates. Adults have been reported to live in treetops on the sides of valleys, with males patrolling far out over the water (NatureServe 2011). They presumably feed mostly among or above the trees, but will forage in grassy or brushy places in non-forested areas (KSNPC 2011; NatureServe 2010). An individual of this species was observed during field surveys. Suitable habitat in the form of fields and ridge tops is available within the project area.

Armored rocksnail inhabits partially buried logs, gravel, and submerged rock outcroppings in medium to large rivers (NatureServe 2011).

The cracking pearlymussel prefers shallow water in moderate current over mud, sand, and fine gravel substrate (Parmalee and Bogan 1998).

The Cumberland bean occurs in small rivers and streams, in gravel or sand substrate with fast current in riffle areas (ibid). It is restricted to a very few rivers and streams in the upper Cumberland River and its tributaries in Kentucky.

The dromedary pearlymussel is known to occur in shoals and riffles (ibid).

The fanshell occurs in the Ohio, Cumberland, and Tennessee River systems. All viable populations are restricted to unimpounded stretches of the Clinch River, on substrate of coarse sand and gravel in strong flowing waters (ibid).

The orangefoot pimpleback can be found primarily in big rivers. Individuals have been found at depths of 12 to 18 feet in sand and coarse gravel substrate (ibid).

The pink mucket is typically a big river species, but occasionally individuals become established in small- to medium-sized tributaries of large rivers. It inhabits rocky bottoms with swift current, usually in less than three feet of water (ibid).

The pocketbook is a habitat generalist that has adapted well for both impoundment and riverine situations (ibid).

The purple lilliput has a wide distribution. It prefers mud, sand, and gravel substrate of small to medium-sized rivers. However, it can be found on shallow, rocky gravel points or sandbars in impoundments. Females become gravid in May or June (ibid).

The pyramid pigtoe prefers rivers with strong current and substrate composed of firm sand and gravel (ibid).

The ring pink is typically found in large rivers with gravel bars (ibid).

The snuffbox is typically found in shallow riffles with swift current over sand and gravel substrate (ibid).

The spectaclecase has been documented in various types of substrate, including gravel, sand, and mud, in medium-sized to large rivers (ibid).

3.6. Surface Water

Precipitation in the project area averages about 54 inches per year. The wettest month is March, which averages 5.2 inches of precipitation, and the driest month is October, with 3.4 inches of precipitation on average. The average annual air temperature is 56 degrees Fahrenheit (°F) and ranges from a monthly average of 34°F in January to 77°F in July. Stream flow varies with rainfall and averages about 22 inches of runoff per year, or approximately 1.7 cubic feet per second per square mile of drainage area.

The area around the proposed transmission line drains to the Cumberland River and its tributaries Lewis Creek and Big Renox Creek (and its tributaries Strange Branch and Little Renox Creek). The Cumberland River is classified by the Kentucky Department for Environmental Protection for cold water aquatic habitat, primary contact recreation, secondary contact recreation, and domestic water supply. The remaining streams are classified for warm water aquatic habitat, primary contact recreation, secondary contact recreation, and domestic water supply.

Big Renox Creek is on the State 303(d) list as impaired (i.e., not fully supporting its designated uses) due to cause unknown from source unknown. Lewis Creek is listed due to nutrient/eutrophication biological indicators, sedimentation/siltation, and organic enrichment (sewage) biological indicators from loss of riparian habitat and municipal sources (urbanized high density area).

3.7. Groundwater and Geology

The proposed project is located within the Interior Low Plateaus Physiographic Province and is underlain by the Mississippian Plateau Aquifer. In Cumberland County, water is obtained from consolidated sedimentary rocks of Ordovician, Devonian, and Mississippian age, and from unconsolidated sediments of Quaternary age.

Formations that make up the Mississippian Plateau Aquifer are the Ste. Genevieve Limestone, the St. Louis Limestone, the Warsaw Limestone, and the Fort Payne Formation of Mississippian age, the Chattanooga Shale of Devonian age, and the Cumberland Formation, Leipers Limestone, Catheys Formation of Ordovician age (Lloyd and Lyke 1995). These formations include strata that consist of carbonate units which are characterized by karst terrain. The term “karst” refers to carbonate rocks (limestone and dolostone) in which groundwater flows through solution-enlarged channels and bedding planes within the rock. Karst topography is characterized by sinkholes, springs,

disappearing streams, and caves, as well as by rapid, highly directional groundwater flow in discrete channels or conduits. Because of the connections between surface and underground features, water in karst areas is not distinctly surface water or groundwater.

Karst systems are readily susceptible to contamination, as the waters can travel long distances through conduits with no chance for natural filtering processes of soil or bacterial action to diminish the contamination. “Mature” or well-developed karst is particularly susceptible to contamination, and some karst in the project area is considered mature. In unconfined or poorly confined conditions, karst aquifers have very high flow and contaminant transport rates under rapid recharge conditions such as storm events.

Public drinking water for Cumberland County is supplied by surface water (USEPA 2011). A majority of the population is supplied by the public water system; however, there are a few domestic groundwater wells within the project area.

3.8. Floodplains

A floodplain is the relatively level land area along a stream or river that is subjected to periodic flooding. The area subject to a one-percent chance of flooding in any given year is normally called the 100-year floodplain. The proposed transmission line route would cross several floodplain areas associated with streams mentioned in Section 3.6.

3.9. Wetlands

Wetlands are those areas inundated by surface or by groundwater, such that vegetation adapted to saturated soil conditions are prevalent. Examples include swamps, marshes, bogs, and wet meadows. Wetland fringe areas are also found along the edges of most watercourses and impounded waters (both natural and man-made). Field surveys were conducted in June 2011 to delineate wetland areas within the proposed transmission line ROW, the associated access roads, and the switching station site.

Wetland determinations were performed according to the USACE standards, which require documentation of hydrophytic (i.e., wet-site) vegetation, hydric soil, and wetland hydrology (Environmental Laboratory 1987; Reed 1997; U.S. Department of Defense and USEPA 2003). Broader definitions of wetlands, such as that used by the USFWS (Cowardin et al. 1979), and the TVA Environmental Review Procedures definition (TVA 1983), were also considered in this review. A TVA-developed modification of the Ohio Rapid Assessment Method (Mack 2001) specific to the TVA region (i.e., the Tennessee Valley Authority Rapid Assessment Method or “TVARAM”), was used to categorize wetlands by their functions, sensitivity to disturbance, rarity, and ability to be replaced. The categorization was used to evaluate impacts and to determine the appropriate levels of mitigation for wetland impacts.

TVARAM scores are used to classify wetlands into three categories. Category 1 wetlands are considered “limited quality waters.” They represent degraded aquatic resources having limited potential for restoration with such low functionality that lower standards for avoidance, minimization, and mitigation can be applied. Category 2 includes wetlands of moderate quality and wetlands that are degraded but have reasonable potential for restoration. Avoidance and minimization are the preferred mitigation measures for Category 2 wetlands. Category 3 generally includes wetlands of very high quality or of regional/state-wide concern, such as wetlands that provide habitat for threatened or endangered species.

The proposed transmission line corridor traverses mountainous terrain dominated by upland forest that is crossed by several creek drainages. Five wetland areas, totaling 0.34 acre, were identified within the proposed transmission line ROW (Table 3-6).

Table 3-6. Wetlands Within the Proposed Burkesville, KY 161-kV Transmission Line Right-of-Way

Wetland Identifier	Type[1]	Wetland Acreage	Estimated Forested Wetland Acreage in Proposed Right-of-Way	TVARAM Category (score)
W001	PEM1E	0.10	--	1 (18)
W002	PEM1E	0.03	--	1 (18)
W003	PEM/PFO1E	0.11	0.06	1 (29.5)
W004	PEM1E	0.08	--	1 (22)
W005	PFO1E	0.02	0.02	1 (20)
Total Acres		**0.34**	**0.08**	

[1]Classification codes as defined in Cowardin et al. (1979): PEM1 = Palustrine emergent, persistent vegetation; PFO1 = Palutsrine, forested, broadleaf deciduous; E = Seasonally flooded/saturated.

Wetland W001 is a wide drain that has developed into an emergent wetland within the floodplain of Big Renox Creek. W001 exhibits hydric soils and an ephemeral hydrologic connection to Big Renox Creek. Much of the wetland area was bare soil. W001 was dominated by hydrophytic vegetation that includes flat sedge and spikerush.

Wetland W002 is a wide drain that has developed into an emergent wetland within the floodplain of Big Renox Creek. W002 exhibits hydric soils and an ephemeral hydrologic connection to Big Renox Creek. This wetland area had recently been cut over when the surrounding agricultural fields were harvested for hay. W002 was dominated by hydrophytic vegetation that includes flat sedge, several path rushes, and wool grass.

Wetland W003 is an emergent/forested wetland located at the base of a hillside. W003 exhibits hydric soils and an ephemeral drain to Big Renox Creek. W003 was dominated by hydrophytic vegetation that includes sycamore, green ash, path rush, and wool grass.

Wetland W004 is an emergent wetland located along a drain in the south ditch along SR 90. W004 does not exhibit hydric soils; instead, rock and gravel, likely left from road construction, form the substrate. This wetland exhibits drains into Haggard Branch, and exhibited flowing water during our site visit. W004 was dominated by hydrophytic vegetation that includes sycamore jewel weed, several sedges, and green bulrush.

Wetland W005 is a forested wetland located in a wide drain that bisects an agricultural field. This wetland totals 0.02 acre within the ROW, and was located adjacent to a farm road used for accessing the fields on either side of the drain. W005 exhibits hydric soils, and drains into Haggard Branch via unnamed tributaries. W005 was dominated by hydrophytic vegetation that includes black willow and green ash.

3.10. Archaeological and Historic Resources

Federal agencies are required by the National Historic Preservation Act (NHPA) and by the National Environmental Protection Act (NEPA) to consider the possible effects of their undertakings on historic properties. Undertaking means any project, activity, or program that has the potential to have an effect on a historic property and that is under the direct or

indirect jurisdiction of a federal agency, or is licensed or assisted by a federal agency. Considering an undertaking's possible effects on historic properties is accomplished through a four-step review process outlined in 36 CFR Part 800, regulations implementing Section 106 of NHPA. These steps are: 1) initiation (defining the undertaking and the area of potential effects, or area of potential effect (APE), and identifying the parties to be consulted in the process); 2) identification (studies to determine whether cultural resources are present in the APE and whether they qualify as historic properties); 3) assessment of adverse effects (determining whether the undertaking would damage the qualities that make the property eligible for the NRHP); and resolution of adverse effects (by avoidance, minimization, or mitigation). Throughout the process the agency must consult with the appropriate SHPO, Native American tribes that have an interest in the undertaking, and any other party with a vested interest in the undertaking.

A project may have effects on a historic property that are not adverse, if those effects do not diminish the qualities of the property that identify it as eligible for listing on the NRHP. However, if the agency determines (in consultation) that the undertaking's effect on a historic property within the APE would diminish any of the qualities that make the property eligible for the NRHP (based on the criteria for evaluation at 36 CFR Part 60.4), the effect is agreed to be adverse. Examples of adverse effects would be ground disturbing activity in an archaeological site, or erecting structures within the viewshed of a historic building in such a way as to diminish the building's historic setting. Adverse effects must be resolved. Resolution may consist of avoidance (such as redesigning a project to avoid impacts), minimization (such as planting visual screenings), or mitigation. Adverse effects on archaeological sites are typically mitigated by means of excavation to recover the important scientific information contained within the site. Adverse effects on a historic building are sometimes mitigated through documentation of the building by compiling historic records, studies, and photographs.

TVA, in consultation with the KYSHPO, determined the APE for archaeological resources to be the area that includes: a 100-foot ROW centered on the centerline of the approximately 8.5-mile long proposed transmission line; a proposed 5-acre laydown area (located on a cultivated tract that was later determined to be unsuitable for use for other reasons); six proposed access roads (totaling approximately 2.0 miles) to the proposed Burkesville 161-kV Transmission Line (access road (AR)-4, AR-9, AR-11, AR-14, AR-15, and AR-16); and a proposed 15-acre site located in Burkesville in which a portion could serve as a laydown area. The APE for historic architectural resources has been determined to be the proposed ROW and those areas that fall within visual line-of-sight within a 0.5-mile radius surrounding the proposed transmission line.

Background research at the Kentucky Heritage Council (KHC) in Frankfort and the Kentucky Office of State Archaeology in Lexington identified one previously recorded archaeological site is located within AR-11 (15CU96). This site was determined ineligible for the NRHP according to records on file at the Kentucky Office of State Archaeology. The investigation showed that site 15CU97 does not extend into the project APE. No previously recorded archaeological historic properties are located within the other parts of the APE.

Sixty-one previously recorded architectural resources are located within the architectural APE of the proposed project. According to information provided by the KHC, one of these properties, the James Baker House (CU-26) is listed on the NRHP. In addition, seven of the properties (CU-217, 219, 222, 224, 230, 231, and 269) have been identified by the KHC as eligible for the NRHP.

Phase I cultural resources surveys were conducted for each of the APE areas: the transmission line ROW corridor (Hockersmith and Karpynec 2011), the access roads and 5-acre laydown area (Hockersmith 2012), and a second proposed 4-acre laydown area site located on an approximate 15-acre property (Hockersmith and Karpynec 2012)

The Phase I surveys found that most locations within the access road portions of the APE have been heavily impacted by logging, plowing and erosion. Seven archaeological resources were identified within the transmission line ROW APE: 15CU124, 15CU125, 15CU126, and isolated finds IF-1, IF-2, IF-3, and IF-4. Sites 15CU124 and 15CU125 and IFs 1 and 2 are low-density lithic scatters that lack intact buried deposits. TVA determined that these archaeological resources are ineligible for the NRHP. Site 15CU126 was discovered on a low knoll along AR-14, and consists of a late 19th- mid-20th century family cemetery, known locally as “Turk Cemetery.” Site 15CU126 is recommended ineligible for inclusion in the NRHP because it does not meet the criteria considerations for cemeteries as outlined in 36 CFR part 60.4(d) ("a cemetery which derives its primary significance from graves of persons of transcendent importance, from age, from distinctive design features, or from association with historic events…”). Isolated find IF-3 consisted of a low density historic scatter with no associated structures or features, and was determined ineligible for the NRHP. Isolated find IF-4 consists of a single Madison projectile point base fragment recovered from a shovel test within AR-14 west of the cemetery. TVA has determined that IF-4 is ineligible for the NRHP due to a lack of potential as a source of important scientific information. The surveys failed to identify any cultural material associated with previously recorded site 15CU96A, leading TVA to conclude that the site is ineligible for the NRHP. No archaeological sites were identified within the 5-acre laydown area located on a cultivated tract. This site was determined not to be a viable location and was removed from consideration for the project. The direct APE for another site as a potential laydown area consists of an approximate 4-acre gravel parking lot on a 15-acre property site. The indirect APE consists of a grassy area, a forested area, and a lagoon or detention pond. No archaeological sites were identified in the survey area. The survey found that the laydown area has been heavily affected by grading associated with the existing parking lot and adjacent building.

A Phase I historic/architectural survey designed to document and assess architectural resources located within the project’s architectural APE was also carried out (Karpynec 2011). This survey resulted in the identification of nine previously unrecorded architectural resources (HS-1–9), and re-evaluated the 61 existing historic architectural resources in the APE. Based on the results of the historic architectural survey, TVA finds that one structure (the James Baker House) is listed on the NRHP, six structures (CU-5, 110, 217, 230, 231, and CUB-1) are eligible for inclusion on the NRHP, and one (CE-269, Renox Creek Swinging Bridge) may be eligible. TVA finds that two properties determined eligible for the NRHP by the KHC, CU-224 and CU-269, are ineligible due to their lack of architectural distinction and poor integrity. Three properties previously determined eligible for the NRHP by the KHC (CU2-219, CU-222, and CU-224) have been destroyed since that determination was made. TVA finds that one structure (the James Baker House) is listed on the NRHP, six structures (CU-5, 110, 217, 230, 231, and CUB-1) are eligible for inclusion on the NRHP, and one (CE-269, Renox Creek Swinging Bridge) may be eligible.

3.11. Aesthetics

3.11.1. Visual Resources

The physical, biological, and man-made features of an area combine to make the visual landscape character both identifiable and unique. Scenic resources are evaluated based on existing landscape character, distances of available views, sensitivity of viewing points, human perceptions of landscape beauty/sense of place (scenic attractiveness), and the degree of visual unity and wholeness of the natural landscape in the course of human alteration (scenic integrity). The varied combinations of natural features and human alterations that shape landscape character also help define their scenic importance. Where and how the landscape is viewed would affect the more subjective perceptions of its aesthetic quality and sense of place.

Views of a landscape are described in terms of what is seen in foreground, middleground, and background distances. In the foreground, an area within 0.5 mile of the observer, details of objects are easily distinguished in the landscape. In the middleground, normally between 0.5 and 4 miles from the observer, objects may be distinguishable, but their details are weak and they tend to merge into larger patterns. Details and colors of objects in the background, the distant part of the landscape, are not normally discernible unless they are especially large and standing alone. The impressions of an area's visual character can have a significant influence on how it is appreciated, protected, and used. The general landscape character of the study area is described in this section, with additional details provided in Section 4.11.

The proposed line would be approximately 8.5 miles long, beginning at the Wolf Creek HP Summershade 161-kV Transmission Line. There are few homes located within the viewshed of the tap point. Minor and insignificant views of the tap point can be seen briefly in the foreground by motorists along local roads.

The transmission line would be routed south towards the new substation. The route is along mainly steep terrain that is heavily vegetated. There are few homes along the route and access would be along local, unimproved roads. At the new substation site the line would be seen in the foreground by area residents and motorists along numerous local roads. Scenic attractiveness ranges from distinctive, along the undeveloped portion of the route, to minimal, at the proposed substation site. Scenic integrity ranges from high, along the steeper portions of the route, to very low in the residential areas.

3.11.2. Noise

Noise is measured in decibels (dB), a logarithmic unit, so an increase of 3 dB is just noticeable, and an increase of 10 dB is perceived as a doubling of sound level. Because not all noise frequencies are perceptible to the human ear, A-weighted decibels (dBA), which filter out sound in frequencies above and below human hearing, are typically used in noise assessments.

To correlate annoyance and noise exposure, the Federal Interagency Committee on Noise (FICON) used population surveys (FICON 1992). The surveys provide estimates of the percentage of typical residential populations that would be highly annoyed from a range of background noise and the average community reaction that would be expected (Table 3-7). The level of possible community reaction shown in these surveys does not necessarily

equate to a determination that potential noise impacts would constitute a significant environmental impact in the context of a NEPA review.

Table 3-7. Estimated Annoyance From Background Noise

Day/Night Level (dBA)	Percent Highly Annoyed	Average Community Reaction
75 and above	37	Very severe
70	25	Severe
65	15	Significant
60	9	Moderate
55 and below	4	Slight

For comparative purposes, typical background Day/Night levels (DNL) for rural areas range from about 40 dBA in undeveloped areas to 48 dBA in mixed residential/agricultural areas (Cowan 1993). Noise levels are typically higher in higher-density residential and urban areas. Background noise levels greater than 65 dBA can interfere with normal conversations, requiring people to speak in a raised voice in order to carry on a normal conversation.

Sources of noise expected during the transmission line construction would include equipment used for clearing the ROW, for transporting structures and conductors to the site, construction of the transmission line, and revegetation of the ROW. These sources would generate noise above ambient levels in areas that are undergoing clearing and construction. Similarly, noise related to periodic line and vegetation maintenance is also expected to occur for short durations during the operation of the transmission line. In residential areas, the need for periodic ROW vegetation maintenance (i.e., mowing) would be limited or nonexistent.

Under certain weather conditions, high-voltage transmission lines, such as the proposed 161-kV line, may produce an audible low-volume hissing or crackling noise. This noise is generated by the corona resulting from the dissipation of energy and heat as high voltage is applied to a small area. Under normal conditions, corona-generated noise is not audible. The noise may be audible under some wet conditions, but the resulting noise level away from the ROW would be well below the levels that can produce interference with hearing.

Both the USEPA and the Department of Housing and Urban Development (HUD) have established noise guidelines. USEPA guidelines are based on an equivalent DNL sound level that is a 24-hour average sound level with 10 dB added to hours between 10 p.m. and 7 a.m., since people are more sensitive to nighttime noise. USEPA recommends a guideline of DNL less than 55 dBA to protect the health and well-being of the public with an adequate margin of safety. HUD guidelines use an upper limit DNL of 65 dBA for acceptable residential development and an upper limit DNL of 75 dBA for acceptable commercial development. TVA generally uses the USEPA guideline of 55 dBA DNL at the nearest residence and 65 dBA at the property line in industrial areas to assess the noise impact of a project. In addition, TVA gives consideration to the FICON (1992) recommendation that a 3-dB increase indicates possible impact, requiring further analysis when the existing DNL is 65 dBA or less.

3.11.3. Odors

Vehicles and equipment used during the construction of the transmission line and periodic maintenance of the ROW would emit exhaust fumes. During the construction period, trees and other combustible materials removed during transmission line construction may be burned. These odors may be noticed by nearby residents, but would occur only for a short duration. Construction and operation of the line are not expected to produce any other noticeable odors.

3.12. Recreation, Parks, and Natural Areas

The proposed transmission line passes through privately owned property that includes a mix of cleared and forested lands. There are no public outdoor recreation areas or facilities in the vicinity of the project. However, a limited amount of informal outdoor recreation uses, such as nature observation, hunting or walking for pleasure, may occur in the immediate vicinity of the proposed route.

The Cumberland River Nationwide Rivers Inventory (NRI) stream, located in Monroe, Cumberland, Clinton and Russell Counties is located 0.3 mile southeast of the southern terminus of the proposed project. This stream is designated from river mile (RM) 385, located one mile below the town of Vernon, to RM 462, US 127 bridge over Wolf Creek Dam, and is recognized by the U.S. National Park Service as an NRI stream. This 77-mile segment is noted for its scenic, recreational, geological, fisheries and wildlife values.

No natural areas are crossed by, or adjacent to, the proposed transmission line project. There are no Wild and Scenic Rivers crossed by, adjacent to, or within three miles of the proposed project.

3.13. Socioeconomics and Environmental Justice

The proposed transmission line would be located in Cumberland County, Kentucky, Census Tract 9501, Block Groups 1, 3, and 4. These block groups have a combined population of 2,454, according to the U. S. Census of Population, 2010 (U. S. Census Bureau 2011). The total population of Cumberland County in 2010 was 6,856, a decline of 4.1 percent from the 2000 population of 7,147. The area along the proposed transmission line route is sparsely populated.

Per capita personal income in Cumberland County in 2009 was $25,668, about 64.8 percent of the national average of $39,635 and 79.6 percent of the state average of $32,258 (U. S. Department of Commerce 2011). Total employment in Cumberland County in 2009 was 2,900, of which 477, or 16.4 percent, was farm employment, compared to 3.7 percent statewide and 1.5 percent nationally. Health care and social assistance also accounted for a relatively large share of employment in Cumberland County, 16.1 percent compared to 10.4 percent statewide and 10.8 percent nationally. Wholesale and retail trade, along with finance and insurance, accounted for relatively small shares of total employment in the county.

The minority population of Cumberland County, as of the 2010 Census of Population, is 348, about 5.1 percent of the total (U. S. Census Bureau 2011). Almost 55 percent of minorities in Cumberland County live in Census Tract 9501, Block Groups 3 and 5, north and east of the proposed transmission line. Among the Census Blocks that the proposed line would pass through or be in close proximity to, the minority population is about 12.6 percent of the total population, about 59 persons. About 52 individuals live in Census

Block 3002 in the area north and northeast of the proposed line near the Burkesville Substation. The proposed line would be near the southeastern edge of Block 3002. However, this portion of the block is relatively unpopulated.

The poverty level in Cumberland County was estimated to be 25.2 percent of the population in 2009 (ibid), well above the state level of 18.4 percent and the national level of 14.3 percent. According to the U. S. Census of Population, 2000, (ibid), Block Groups 1, 3, and 4 all had poverty levels higher than both the state and the nation in 1999. More recent estimates of the poverty level for areas below the county level are not available.

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CHAPTER 4

4.0 ENVIRONMENTAL CONSEQUENCES

The potential effects of adopting and implementing the No Action Alternative and the Action Alternative on the various resources described in Chapter 3 were analyzed, and findings are documented in this chapter. The potential effects are presented by resource, and the consequences of resources is parallel to that in Chapter 3.

As stated in Section 2.1.1, under the No Action Alternative, TVA would not construct the proposed transmission line to provide power to TCEMC's planned Burkesville Substation. However, TCEMC could opt to construct a new transmission line to serve the Burkesville Substation. In this event, the potential environmental effects resulting from the implementation of the No Action Alternative would likely be comparable to those from the adoption of the Action Alternative. Potential effects of this new, distributor-built line would depend on various factors, including the particular route chosen, as well as TCEMC's construction and maintenance methods.

In the event that TCEMC were to choose not to construct the planned Burkesville Substation or the transmission line to serve the new substation, the transmission system in the Burkesville area would continue to operate with a high risk of interruption due to overloaded situations and possible equipment failures. This risk is projected to increase over time.

Some of the possible outcomes under the No Action Alternative are speculative and beyond TVA's ability to control. Because of the speculative nature of those situations, TVA's analysis of potential effects of adopting the No Action Alternative focuses on determining the effects of TVA not building the proposed transmission line to provide power to the Burkesville Substation.

4.1. Land Use

4.1.1. No Action Alternative

If the No Action Alternative were adopted, TVA would neither construct the proposed transmission line nor acquire easements for new ROW. Thus, there would be no changes in land use due to ROW clearing or from the imposition of use restrictions along the route of the proposed transmission line. Over time, some changes in land use in the area could occur due to future residential, commercial, or industrial development. However, the lack of a reliable and adequate power supply locally would tend to retard such development in the long term.

4.1.2. Action Alternative

Most of the ROW for the proposed transmission line is currently used for agricultural uses and forestry. Agricultural operations are consistent with transmission line operations, and no prime farmland would be removed from production by the proposed line. Approximately 85 acres of forested land within the proposed ROW would be cleared (see Section 4.2.2). The proposed transmission line route tends to avoid residences and commercial areas, and there are no houses within 500 feet of the edge of the ROW. Because of this distance, no significant effects to residential land use are expected. Thus, no noticeable changes in land

use or restrictions on uses of adjacent properties would result from the construction and operation of the proposed transmission line.

4.2. Vegetation

4.2.1. No Action Alternative

Adoption of the No Action Alternative would not result in any project-related direct, indirect, or cumulative impacts to the terrestrial ecology of the region because terrestrial communities would not change. However, changes to local plant communities resulting from natural ecological processes and human-related disturbance would continue to occur, but the changes would not result from the proposed project. The invasive species found near the project area are common throughout the region, and their extent and abundance would likely remain relatively unchanged because no project-related work would take place.

4.2.2. Action Alternative

Adoption of the Action Alternative would not significantly affect the vegetation of the region. Implementation of this alternative would require clearing of approximately 85 acres of forest. These forested communities are common and well represented throughout the region. Converting 85 acres of forestland to managed ROW would be a long-term effect and would be insignificant. As of 2010, there were at least 813,000 acres of forestland in Cumberland County and the adjacent Kentucky and Tennessee counties (United States Forest Service (USFS) 2011). The cumulative project-related effects to forest resources would be negligible when considered in the context of the total forestland occurring in the region. Project-related work would temporarily affect herbaceous plant communities, but these areas would likely recover to their pre-project condition in less than one year. Adoption of the Action Alternative would not significantly affect the vegetative terrestrial ecology of the region.

Much of the project area currently has a large component of invasive terrestrial plants. Adoption of the Action Alternative would not significantly affect the extent or abundance of these species at the county, regional, or state level. Some areas of mature deciduous forest in the project area currently have low concentrations of invasive plants. Disturbance associated with the construction and operation of the proposed transmission line would likely promote increases of invasive plants in these areas. However, the use of TVA's standard operating procedure of revegetating with noninvasive species (Muncy 1999) would help limit the introduction and spread of invasive species in the project area.

4.3. Wildlife

4.3.1. No Action Alternative

Under the No Action Alternativethe proposed transmission line would not be built, and the proposed ROW would not be cleared. Therefore, the ROW corridor and the locations of the access roads for the proposed transmission line would likely remain in their current condition, and there would be no direct or indirect effects to local wildlife or wildlife habitats resulting from TVA's action. Changes to local animal communities resulting from natural ecological processes and human-related disturbance would continue to occur, but the changes would not result from the proposed project.

4.3.2. Action Alternative

Under the Action Alternative, construction of the proposed transmission line and access roads would result in a change in the composition of wildlife habitats in the project area. Construction of the ROW for the proposed tap line would involve clearing of about 85 acres of forest habitat that would be converted and maintained as early successional habitat. This condition would persist within the ROW during operation of the line. The initial clearing would increase fragmentation of the remaining adjacent forests within the proposed project area and would likely temporarily displace larger animals, such as deer and turkey, from the project area into surrounding areas. Some smaller less mobile animals occupying the areas to be cleared, such as mice, shrews, frogs, and salamanders, would be impacted by construction activities. Following the construction and revegetation of the previously forested areas, wildlife favoring forest edge and early successional habitat would occupy the proposed ROW, changing the overall species' composition of the area to species typical of early successional or scrub-shrub habitat rather than forest-dwelling species. The loss of forested habitat in the proposed project area and further fragmentation of adjacent forested areas would impact species favoring forested habitats. Most species that would be affected by these changes are common locally and regionally and the effects on wildlife would be minor.

With the exception of potentially suitable habitat for the Indiana bat, discussed in Section 4.5.2.2, no unique terrestrial habitat or habitat important to terrestrial animal species (e.g., caves, clusters of vernal pools, old-growth forests) were observed within the project area. As well, no wading bird colonies or other aggregate migratory bird colonies were observed. Environmental impacts to unique or important terrestrial habitat or bird colonies are thus not expected to occur because of the proposed actions. The proposed transmission line and the use of existing access roads are not expected to result in significant direct or indirect impacts to terrestrial wildlife or their habitats.

4.4. Aquatic Ecology

4.4.1. No Action Alternative

Under the No Action Alternative, no changes to aquatic resources within the project area would occur from TVA's action, and no direct, indirect, or cumulative impacts to aquatic communities on, or adjacent to, the project area would occur. However, changes to aquatic life would likely occur over the long term due to factors such as population growth and land use changes within the area.

4.4.2. Action Alternative

Aquatic life could be affected by the proposed action. Impacts would either occur directly by the alteration of habitat conditions within the stream or indirectly due to modification of the riparian zone and storm water runoff resulting from construction and maintenance activities along the transmission line corridor and proposed access roads.

Potential impacts due to removal of streamside vegetation within the riparian zone include increased erosion and siltation, loss of in-stream habitat, and increased stream temperatures. Other potential effects resulting from transmission line construction and maintenance include alteration of stream banks and stream bottoms by heavy equipment and by herbicide runoff into streams.

Siltation has a detrimental effect on many aquatic animals adapted to riverine environments. Turbidity caused by suspended sediment can negatively impact spawning and feeding success of many fish species (Sutherland et al. 2002).

Watercourses that convey only surface water during storm events (i.e., wet-weather conveyances) and that could be affected by the proposed transmission line route would be protected by standard BMPs as identified in Muncy (1999). These BMPs are designed in part to minimize disturbance of riparian areas, and subsequent erosion and sedimentation that can be carried to streams. TVA also provides additional categories of protection to watercourses based on the variety of species and habitats that exist in the ponds or streams, as well as the state and federal requirements to avoid harming certain species. The width of the SMZs is determined by the type of watercourse, primary use of the water resource, topography, or other physical barriers (Muncy 1999).

The three ponds and all intermittent streams would be protected by Standard Stream Protection (Category A) as defined in Muncy (1999). This standard (basic) level of protection for streams and the habitats around them is to minimize the amount and length of disturbance to the water bodies without causing adverse impacts on the construction work. Additionally, with the exception of 001AR all perennial streams would be protected by Standard Stream Protection (Category A).

The watercourse identified as 001AR is a perennial spring that flows to 002AR. This watercourse would warrant Protection of Unique Habitats (Category C) with a SMZ of 100 feet. This category of protection is used when there is one or more specific reason(s) why a temporary or permanent (always-flowing) stream requires special protection beyond that provided by standard BMPs. This relatively uncommon additional protection category level is appropriate when a unique habitat is known to occur on or adjacent to the construction corridor (Appendix D).

Because appropriate BMPs and SMZs would be implemented during construction, operation, and maintenance of the proposed transmission line, any impacts to aquatic life resulting from the proposed action would be minor and insignificant.

4.5. Endangered and Threatened Species

The ESA provides broad protection for species of fish, wildlife, and plants that are listed as threatened or endangered in the United States or elsewhere. The Act outlines procedures for federal agencies to follow when taking actions that may jeopardize federally listed species. The policy of Congress is that federal agencies must seek to conserve endangered and threatened species and use their authorities in furtherance of the Act's purposes.

4.5.1. No Action Alternative

Under the No Action Alternative, TVA would not construct the proposed transmission line, access roads, or laydown area. Thus, there would be no direct effects to federally or state-listed endangered and threatened species or their habitats caused by TVA project-related actions.

Changes to local plant communities resulting from natural ecological processes and human-related disturbance would likely continue to occur. These changes could potentially affect listed plant and terrestrial animal species. However, these changes would not be caused by or result from the proposed project.

The status and conservation of any potentially affected listed species would continue to be determined by the actions of others under the No Action Alternative. Changes to the area would likely occur over time, as factors such as population trends, land use and development, quality of air, water, and soil, recreational patterns, and cultural, ecological, and educational interests change within the area.

4.5.2. Action Alternative

4.5.2.1. Plants

No plant species federally listed as endangered or threatened are known to occur within the project area (i.e., within the proposed ROW or within the roadways for the access roads) or in nearby areas that could be affected by the construction and operation of the proposed transmission line. Field investigations documented previously unknown specimens of the state-listed butternut tree in Cumberland County, Kentucky, but the tree is known from at least 34 Kentucky counties (United States Department of Agriculture (USDA), Natural Resources Conservation Service 2011; KSNPC 2006). One butternut tree is located about 50 feet from the edge of the ROW, but would not be impacted by the proposed project. Another 30-foot tall tree is situated near the middle of the proposed ROW and would be removed during ROW clearing. Although the fungal pathogen butternut canker is jeopardizing the long-term viability of the species, butternut is currently sufficiently common in Kentucky that adoption of the Action Alternative would not significantly impact the species.

The KSNPC ranking of the Carolina anglepod indicates uncertainty in the exact rarity of the species across the state (Table 3-3). The fact that none of the eleven occurrences of Carolina anglepod in the project area were observed in unique habitat, and that observations of the species were evenly distributed across the project area does suggest that the species may be more common than previously thought. However, only three extant occurrences of Carolina anglepod were previously known to occur in Kentucky prior to field surveys for the proposed project. Of these, two are known to occur in disturbed habitat associated with a transmission line and highway ROW. This apparent preference for somewhat disturbed habitat is substantiated by field surveys of the proposed project area. Observations consistently found Carolina anglepod in early successional environments associated with artificial openings in the forest canopy.

Construction of new transmission line and access roads can result in substantial ground disturbance that can negatively impact individual plants in the affected area. The permanent opening created by the ROW through otherwise forested areas habitat may benefit an early successional species, such as Carolina anglepod, over the long-term if direct impacts to the species can be minimized during clearing, construction, and maintenance of the transmission line. One small occurrence of Carolina anglepod containing a few plants was observed along an access road that would require grading to facilitate heavy equipment access. Direct impacts to these plants cannot be avoided, but the conservation measures listed below would be used to minimize impacts to the other ten occurrences of the species located in the project area. The proposed action would not significantly impact Carolina anglepod. Mitigation measures for areas containing Carolina anglepod along the proposed transmission line ROW would include:

- Clearing of woody vegetation in these areas would be accomplished with a feller-buncher.

- Heavy equipment would not be used during construction to re-contour, remove tree stumps, or otherwise intentionally disturb the soil profile in these areas.

- TVA would not use aerial application of herbicides in areas where this species has been identified; instead, mowing or selective spraying of herbicides would be used to control woody vegetation.

4.5.2.2. Terrestrial Animals

Suitable habitat for karst snowfly is characterized as spring-fed streams in karst habitat. Such habitat was not observed along the proposed transmission line route or associated access roads. Impacts to this species are not expected to occur as a result of proposed actions.

Suitable habitat for Bewick's wren is present in the project area in the form of previously disturbed, early successional habitat. Because this species tends to inhabit disturbed areas, including forest edge and forest clearings, adverse impacts are not expected to occur. In contrast, the action alternative may result in additional available habitat that is potentially suitable for Bewick's wren.

Eastern small-footed and evening bats forage and travel along rivers and streams adjacent to the project area. Suitable roosting habitat for both species is available in tree cavities and loose bark within the project area. However, such habitat is available in abundance outside of the project area and thus removal of hollow trees is not expected to adversely impact these species. Stream and river crossings serve as foraging, drinking, and travel corridor resources. Although habitat alteration may result in minor changes to foraging behavior, impacts to these species resulting from the proposed project would be minimal, temporary, and immeasurable with the implementation of BMPs.

Suitable foraging habitat for the gray bat is available along the project area where the route intersects Big Renox Creek, and marginally suitable habitat occurs along some of the smaller streams, both along the transmission line corridor and near proposed access roads. Impacts to foraging habitat for the gray bat from proposed actions would be minimal, temporary, and immeasurable because of the implementation of BMPs at all stream and river crossings. However, habitat alteration may result in minor changes to foraging behavior. Since no caves were identified within the project area during field investigations, proposed actions are not expected to impact suitable summer roosting or winter hibernating habitat for the gray bat.

Direct and permanent impacts to forested habitat would occur within the project area. Approximately 69 acres of potential Indiana bat habitat has been identified as potentially suitable habitat for summer roosting Indiana bat. The majority of the habitat (60 acres) occurs along the transmission line ROW. The remainder (9 acres) occurs along 10 of the access roads scheduled to be cleared or expanded. Construction activities would remove potential roost trees.

Noise associated with forest clearing, establishment of transmission line structures, or grading of the roadways could result in flushing of Indiana bats from nearby roosts or avoidance of traditional foraging areas during construction. Potential sources of noise during clearing of the ROW and road construction include chainsaws, skidders, bulldozers, tractors, and low ground-pressure feller-bunchers. Potential sources of noise during establishment of transmission line structures include use of trucks, truck-mounted augers, drills, blasting, tracked cranes, and bulldozers. These would be temporary direct effects that would terminate with the completion of the construction phase of the project.

Direct impacts are also possible from noise associated with operations and maintenance activities as described in Section 2.2.2. Some of these activities may cause any Indiana bats that are roosting nearby to flush from their roost. This impact would temporary and short-term and it is not expected that this would have any long-term effects on any affected individuals.

Smoke from burning woody debris associated with clearing the ROW and access roads could also result in the flushing of Indiana bats from nearby roosts or in the avoidance of traditional foraging areas at or close to locations where burning occurs. This too is a potential temporary direct effect that would cease once clearing is complete. This short-term action is not expected to have any long-term effects on any affected individuals.

Temporary modifications to permanent streams at intersections of the proposed ROW and access roads may occur where it is necessary to establish culverts for use during the construction phase of the project. Some culverts may be removed after construction. Some of these stream areas may currently serve as foraging habitat for Indiana bats (USFWS 2007). Modification of such riparian areas could result in avoidance of foraging areas located where these stream crossings occur due to a decrease in vegetation along the stream bank.

Long-term maintenance activities that may have potential direct effects include removal of danger trees adjacent to the ROW. TVA conducts vegetation maintenance of ROWs for danger trees on approximately three- to five-year cycles (see Section 2.2.2). Trees located within a forest block and close to the edge of the ROW receive increased solar exposure. Trees adjacent to the ROW are also subject to any immediate drift from application of herbicide within the ROW, which may result in premature death. The combined effect may result in clumps of snags near the edge of the ROW that may become suitable roosting habitat for Indiana bats. Indiana bats may thus be present in trees identified as danger trees and slated for removal.

Per TVA standard methods, prior to transmission line maintenance, an environmental review of proposed maintenance would be conducted. Under this EA, seasonal restrictions have been placed on any sections of transmission line ROW that may contain danger trees with sloughing bark, and that occur within 10 miles of documented Indiana bat occurrence. This seasonal restriction prohibits removal of trees with sloughing bark between April 1 and October 14 to prevent direct impacts to Indiana bat individuals potentially present. To prevent direct impacts to potential Indiana bat habitat, all danger trees identified during transmission line maintenance would be cleared between October 15 and March 31. Clearing of danger trees outside of this timeframe would only be done after consultation with appropriate biological staff.

Indirect effects from the proposed project would primarily include loss of available potentially suitable habitat for use during subsequent summer maternity and swarming seasons. Repeated use of specific snags or a specific cluster of snags over multiple summer seasons (site fidelity) has been documented in Indiana bats (Gumbert et al. 2002). Any loss of habitat used by adult females for maternity colonies may result in these females (or their female offspring) searching for suitable habitat for a longer period of time at the beginning of the maternity season, thereby expending more energy than they may have if they were returning to a known maternity roost tree or cluster of roost trees.

Indirect effects also may include impacts to contiguous forested travel corridors used to transition between summer habitat and hibernacula. Fragmentation of the landscape and establishment of the ROW may become a barrier to movement. However, Indiana bats have been documented moving through habitats with patchy, diverse cover types (non-contiguous forest) (Watrous et al. 2006) and have been captured along roads within bisected forest (Kurta et al. 2002). It is possible that ROW and access roads could serve as a corridor along which Indiana bats would travel between roosts and foraging areas.

With implementation of standard BMPs, little impact from storm water runoff and sedimentation are expected to affect the streams and other aquatic features present in, and adjacent to, the ROW and access roads. Thus, indirect effects to foraging habitat through impacts to water quality are not expected.

Non-federal actions within or in the vicinity of the TVA project include TCEMC's plan to upgrade their existing Burkesville 69-kV Substation to 161-kV operation, potential private land use activity within the proposed ROW that occurs as a result of clearing the ROW (e.g., deer hunting, expansion of livestock pasture), and potential residential and commercial growth in the area. Residential and commercial growth could lead to future clearing of forest on private land, further fragmenting the forest cover in the action area. Clearing of forest could result in disruption to Indiana bat roosting areas and to connectivity of roosting-foraging and migration corridors. While these non-federal actions are not within TVA's control, the cumulative impact of TVA's project, when added to past or reasonably foreseeable future actions, is not expected to be significant.

In a Section 7 consultation letter to USFWS dated January 11, 2012 (see Appendix A), TVA stated that the proposed project is not likely to adversely affect the gray bat. Further, TVA stated the proposed project could potentially affect suitable habitat Indiana bat. The primary effect would be direct loss and/or modification of 69 acres of forested habitat potentially suitable as summer roosting habitat in the project area.

TVA proposes to mitigate for the loss of potentially suitable summer roosting Indiana bat habitat that would occur under the Action Alternative by entering into an Indiana bat conservation MOA with the Kentucky Ecological Services Office of the USFWS. The MOA provides recovery-based conservation benefits for the Indiana bat in the form of a payment to the Indiana Bat Conservation Fund (IBCF), administered by the Kentucky Natural Lands Trust. The IBCF will fund Indiana bat habitat protection, conservation, restoration, and/or priority monitoring, and research projects for the Indiana bat. TVA's payment of $100,050 is based on the assumption that the removal of all, or an undetermined portion, of Indiana bat habitat will likely occur during the timeframe when the Indiana bat is not anticipated to be present (i.e., unoccupied), which is between the dates of October 15 to March 31. If additional forested areas were to be removed, TVA would coordinate with the USFWS to

determine if modifications to the MOA would be necessary. To mitigate for this impact, TVA has committed to the following:

- Removal of trees located within or adjacent to the proposed ROW along the identified 10-mile area of documented Indiana bat occurrence would be seasonally restricted to occur between October 15 and March 31.

- As described in the MOA, TVA would pay $100,050 to the Indiana Bat Conservation Fund to compensate for impacts to 69 acres of potentially suitable summer roosting habitat.

Entering into this MOA satisfies TVA's obligation to consult with the USFWS under Section 7 of the ESA, relative to the Indiana bat, in order to ensure that the proposed project does not jeopardize the continued existence of the Indiana bat or result in adverse modification of its critical habitat. ESA consultation for the other species that could occur in the project area was completed on February 9, 2012, when the USFWS concurred with TVA's "no effect" and "not likely to adversely affect" determinations on those species (Appendix A).

4.5.2.3. Aquatic Animals

The aquatic species listed in Table 3-5, with the exception of the ring pink, purple lilliput, and the elusive clubtail, are only known in the project area from historical records and are likely no longer present due to general habitat loss or other degradation of the environment. Habitat for the ring pink, clubshell, fluted kidneyshell, and little-wing pearlymussel within the project area is only found in the Cumberland River. Since the Cumberland River would not be crossed by the proposed route, impacts to these federally listed species would not occur.

Suitable habitat in the form of fields and open areas along ridge tops is available within the project area for the adult stage of the elusive clubtail dragonfly. Impacts to field habitat along the proposed route are not expected to occur as a result of proposed actions. Clearing of ridge tops within the proposed route would potentially provide additional open ridge top habitat suitable for this species. Large clear river systems habitat, associated with the juvenile stage of this species, are not present within the proposed route and thus would not be impacted. Adverse impacts to the elusive clubtail dragonfly are not expected to occur as a result of proposed actions.

Increases in sediment entering downstream habitats from adjacent watercourses could occur during riparian vegetation clearing, soil disturbances associated with transmission line and access roads construction, or maintenance activities at stream crossings. Should the state-listed purple lilliput still occur in the project area or downstream, these activities could result in indirect impacts from increased siltation. However, as described in Section 4.4.2, watercourses that could be affected by the proposed transmission line route would be protected by standard BMPs and additional protection measures as identified in Muncy (1999). These BMPs are designed in part to minimize disturbance of riparian areas, and subsequent erosion and sedimentation that can be carried to streams. Because appropriate BMPs and SMZs would be implemented during construction, operation, and maintenance of the proposed transmission line and access roads, no impacts to state-listed aquatic species are anticipated to occur.

4.6. Surface Water

4.6.1. No Action Alternative

Because the proposed transmission line would not be built and operated under the No Action Alternative, there would be no effects to local surface waters from TVA's actions. Any changes in local surface water conditions would be independent of TVA's actions.

4.6.2. Action Alternative

Soil disturbances associated with access roads or other construction activities can potentially result in adverse water quality impacts. Soil erosions and sedimentation can clog small streams and threaten aquatic life. Removal of the tree canopy along stream crossings can increase water temperatures, algal growth, dissolved oxygen depletion, and adverse impacts to aquatic biota. Improper use of herbicides to control vegetation could result in runoff to streams and subsequent aquatic impacts.

TVA routinely includes precautions in the design, construction, and maintenance of its transmission line projects to minimize these potential impacts. Permanent stream crossings that cannot be avoided are designed to not impede runoff patterns and the natural movement of aquatic fauna. Temporary stream crossings and other construction and maintenance activities would comply with appropriate state permit requirements and TVA requirements as described in Muncy (1999). Canopies in all SMZs would be left undisturbed unless there were no practical alternative. ROW maintenance would employ manual and low-impact methods wherever possible. In areas requiring chemical treatment, only USEPA-registered herbicides would be used, in accordance with label directions designed in part to restrict applications near receiving waters and to prevent unacceptable aquatic impacts. With proper implementation of these controls, only minor impacts to local surface waters are expected. Because these impacts are minor, no cumulative impacts are anticipated.

4.7. Groundwater and Geology

4.7.1. No Action Alternative

Under the No Action Alternative, there would be no effects to groundwater resources or geological features from TVA's action because the proposed transmission line would not be built.

4.7.2. Action Alternative

BMPs as described in *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority* will be used to avoid many impacts on groundwater (Muncy 1999). BMPs will be used to control sediment infiltration of sinkholes. Construction activities will avoid springs and sinkholes as practical. Additional BMPs, specific to working around sinkholes, may be needed or may be required by the State to prevent sediment from entering groundwater bodies.

The project area lies within a mature karst terrain, groundwater recharge from the surface can be rapid and can easily contaminate private wells; therefore, during revegetation and maintenance activities, herbicides with groundwater contamination warning would not be used and the use of fertilizers and herbicides would be considered with caution before application and applied according to the manufacturer's label. TVA's BMPs for herbicide and fertilizer application will be used and would prevent impacts to groundwater. With the

application of appropriate BMPs during construction, operation, and maintenance of the proposed transmission line, potential effects to groundwater under the Action Alternative would be insignificant.

4.8. Floodplains

As a federal agency, TVA is subject to the requirements of EO 11988 (Floodplain Management). The objective of EO 11988 is "...to avoid to the extent possible the long- and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative" (United States Water Resources Council 1978). The EO is not intended to prohibit floodplain development in all cases, but rather to create a consistent government policy against such development under most circumstances. The EO requires that agencies avoid the 100-year floodplain unless there is no practical alternative.

4.8.1. No Action Alternative

Under the No Action Alternative, there would be no direct or indirect adverse effects to floodplains because there would be no physical changes to the current conditions found within local floodplains due to TVA's action. Changes in land use resulting from residential, commercial, or industrial development could affect floodplain functions over the long term. However, these changes would be independent of TVA's action

4.8.2. Action Alternative

The proposed transmission line route crosses several floodplain areas in Cumberland County (see Section 3.6). Consistent with EO 11988, the construction of an overhead transmission line and related support structures is considered to be a repetitive action in the 100-year floodplain. The construction of the support structures for the power line within the 100-year floodplain is not expected to cause any increase in flood hazard either because of changes in flood elevations or flow-carrying capacity of the streams being crossed. However, to minimize adverse impacts on natural and beneficial floodplain values, the ROW would be revegetated where natural vegetation is removed, as described in Appendix C.

The Burkesville 69-kV Substation is located outside of the 100-year floodplain, so any construction at that substation by TCEMC would not be located within the 100-year floodplain. Therefore, any activities at the substation would be consistent with EO 11988. Several access roads would cross the 100-year floodplain. Consistent with EO 11988, access road are considered repetitive actions in the 100-year floodplain. To minimize adverse impacts, new road construction in the floodplain would be done in such a manner that upstream flood elevations would not be increased. With such measures in place, potential effects to beneficial floodplain functions would be minor and insignificant.

4.9. Wetlands

Activities in wetlands are regulated under Section 401 and 404 of the Clean Water Act and are addressed by EO 11990 (Protection of Wetlands). Section 401 requires water quality certification by the state for projects permitted by the federal government (Strand 1997). Section 404 implementation requires activities resulting in the discharge of dredge or fill into waters of the United States to be authorized through a Nationwide General Permit or Individual Permit issued by the USACE. EO 11990 requires federal agencies to minimize wetland destruction, loss, or degradation, and preserve and enhance natural and beneficial

wetland values, while carrying out agency responsibilities. TVARAM is used to guide wetland mitigation decisions consistent with TVA's independent responsibilities under NEPA and the EO 11990.

4.9.1. No Action Alternative

Under the No Action Alternative, the transmission line would not be built and no project-related disturbance to wetlands within the proposed transmission line ROW would occur. Therefore, no wetlands would be affected directly under this alternative. Changes to wetlands could nonetheless occur over time as other factors, such as population trends, land use and development, quality of air/water/soil, recreational patterns, and cultural, ecological, and educational interests, change within the area.

4.9.2. Action Alternative

Under the Action Alternative 0.08 acre of forested wetland located within the ROW would be affected by conversion to scrub-shrub/emergent wetland habitat. Due to the existing low functional capacity of these wetland areas, the conversion of this 0.08 acre of forested wetland would not significantly reduce the functional capacity these wetlands currently exhibit. The emergent wetland areas located within the proposed ROW areas would be spanned by the transmission line, thus allowing emergent wetlands to continue functioning in the same capacity as current conditions. Because the wetlands located within the proposed ROW boundaries would be subject to a periodic ROW vegetation management, these areas would continue to be maintained as emergent/scrub wetland areas.

The analysis of cumulative impact to wetlands considered wetland loss and conversion at a watershed-level scale. However, this project would not result in any significant loss of wetland function. Therefore, no cumulative wetland impacts are anticipated from implementing the proposed new transmission line project.

Consistent with EO 11990, potential wetland impacts would be reduced to an insignificant level during the transmission line construction and ROW maintenance activities through implementation of appropriate BMPs (Muncy 1999). Because of these measures, the proposed project would have no significant adverse direct, indirect, or cumulative impacts to wetland areas or to the associated wetland functions and values provided within the general watershed.

4.10. Archaeological and Historic Resources

Historic and cultural resources, including archaeological resources, are protected under various federal laws, including the Archeological Resources Protection Act, the Native American Graves Protection and Repatriation Act, and the NHPA. Section 106 of the NHPA requires federal agencies to afford the Advisory Council on Historic Preservation (Advisory Council) an opportunity to comment on the possible effects of their undertakings on historic properties. The Advisory Council's regulations in 36 CFR Part 800 require agencies to consult with the appropriate SHPO when proposed federal actions could affect these resources.

4.10.1. No Action Alternative

Under the No Action Alternative, there would be no direct, indirect, or cumulative impacts to historic or archaeological resources because there would be no changes to the project area. Changes to cultural resources may occur over time, independently of TVA's actions,

due to factors such as population increases, changes in land use, and the potential for development to occur in the area.

4.10.2. Action Alternative

Because the archaeological surveys identified no NRHP-listed or eligible archaeological sites within the APE, no project alternatives would affect archaeological historic properties. Pursuant to regulations (36 CFR Part 800) implementing Section 106 of the NHPA, TVA consulted with the KYSHPO, by letter dated July 21, 2011, regarding TVA's determination that no archaeological sites would be affected by the Action Alternative, and KYSHPO concurred on August 16, 2011 (Appendix A).

Although 15CU126 (Turk Cemetery) is ineligible for the NRHP, TVA selected an alternative route for AR14 to avoid the cemetery consistent with the requirements for treatment of graves and human remains under Kentucky State laws. TVA investigated two alternative access road routes for AR-14, one north and one south of the initially proposed route. No cultural resources were identified within either alternative route. TVA would avoid potential impacts to 15CU126 by relocating AR-14 to the southern alternative route. By doing so, TVA also would avoid impacts to IF-3. TVA consulted with KYSHPO regarding these determinations and the avoidance measure in a letter dated January 24, 2012 (Appendix A). The letter also stated that the proposed 5-acre laydown area was no longer under consideration, and that TVA would consult with KYSHPO upon identifying another suitable location for a laydown area. KYSHPO concurred with TVA's determinations on February 23, 2012 (Appendix A). In a letter dated February 13, 2012, TVA consulted with KYSHPO regarding TVA's determination that the relocated laydown area contains no historic properties (Appendix A). KYSHPO concurred with TVA's determinations on February 28, 2012 (Appendix A).

TVA finds that the Action Alternative would have a visual effect on one NRHP-listed (Baker House) and six NRHP-eligible architectural properties (CU-5, 110, 217, 230, 231, and CUB-1) due to the visibility of transmission line structures and wires from those properties. However, in all seven cases the effect would not be adverse due to the naturally mitigating effects of distance and vegetation, which lessen the potential visual impacts of the project on these resources.

In a letter dated September 20, 2011 TVA consulted with KYSHPO regarding the latter "no adverse effect" determination (Appendix A). KYSHPO concurred on October 24, 2011, with TVA's determination on all but three of the properties (Appendix A). These properties include CU-264 (Baker Cemetery), for which the architectural survey report included conflicting information; CU-269 (Renox Creek Swinging Bridge), for which KYSHPO claimed that the documentation provided by TVA was insufficient to allow them to assess TVA's determination that the bridge was ineligible; and Liberty Baptist Church Cemetery, for which KYSHPO found there was insufficient information to comment on TVA's "ineligible" determination. KYSHPO's letter stated that this cemetery may be eligible as an archaeological site. KYSHPO also disagreed with TVA's determination that the Action Alternative would have no effect on NRHP-eligible site CU-5 (C.H. Hill House). TVA responded to these points of disagreement by letter dated December 20, 2011. In that letter, TVA agreed that CU-264 is eligible and presented a revision of the survey report that resolved the conflicting information in the first draft; agreed that CU-269 may be eligible; and stated TVA's agreement that the undertaking would have no effects on Liberty Baptist Cemetery. In addition, TVA's letter noted that the revised report presented new evidence that CU-5 would not be affected by the undertaking. KYSHPO stated concurrence with

TVA's determinations for all of these properties by letter dated January 11, 2012, and that no additional consultation with KYSHPO would be required.

In summary, pursuant to regulations (36 CFR Part 800) implementing Section 106 of the NHPA, TVA consulted with the KYSHPO regarding TVA's findings of no adverse effect on historic properties. In letters dated August 16, 2011, October 24, 2011, January 11, 2012, February 23, 2012, and February 28, 2012 the KYSHPO concurred with TVA's findings (see Appendix A). Accordingly, TVA's obligations under Section 106 of the NHPA have been met.

4.11. Aesthetics

Potential impacts to scenic resources were examined based on changes between the existing landscape and the landscape character after alteration, identifying changes in the landscape character based on commonly held perceptions of landscape beauty and the aesthetic sense of place.

4.11.1. No Action Alternative

Under the No Action Alternative, the proposed transmission line corridor and ROW would not be constructed. Aesthetics including visual resources, noise, and air quality would not be affected. Changes to scenic quality of the area, noise levels, and air quality would nonetheless occur over time as other factors such as population trends, land use and development, quality of air/water/soil, recreational patterns, and cultural, ecological, and educational interests change within the area.

4.11.2. Action Alternative

4.11.2.1. Visual Resources

The visual attributes of existing scenery, along with the anticipated attributes resulting from the proposed action are reviewed and classified in the visual analysis process. The classification criteria are adapted from a scenic management system developed by the USFS, and integrated with planning methods used by TVA. The classifications are based on methodology and descriptions from the USDA (1995) and TVA (2003). Sensitivity of viewing points available to the general public, their viewing distances, and visibility of proposed changes are also considered during the analysis. Scenic integrity indicates the degree of intactness or wholeness of the landscape character. These measures help identify changes in visual character based on commonly held perceptions of landscape beauty, and the aesthetic sense of place. The foreground, middleground, and background viewing distances were previously described in Section 3.11.

At the proposed tap point the new line would be seen by a few area residents and motorists along local roads. These views would be visually similar to lines and structures seen in the landscape now.

As the line continues south towards the new substation, views are intermittent and brief along local roads and for a few scattered residents. Steep topography and heavy vegetation would obscure most views and minimize the visual impacts of additional structures and lines. Closer to the proposed substation, new lines and structures would add to the number of discordantly contrasting elements in the landscape seen from area residents and motorists. These new structures and lines would contribute to minor and insignificant cumulative impacts.

Operation, construction, and maintenance of the proposed transmission line and temporary access roads would be visually insignificant. There may be some minor visual discord during the construction period due to an increase in personnel and equipment and the use of laydown and materials storage areas. These minor visual obtrusions would be temporary until the proposed ROW and laydown areas are restored through the use of TVA standard BMPs (Muncy 1999). Therefore, overall visual impacts are anticipated to be minor and insignificant as a result of this project.

4.11.2.2. Noise

Construction Noise

Construction noise impacts would vary with the number and specific types of equipment on the job, the construction methods, the scheduling of the work, and the distance to sensitive noise receptors, such as houses. Typical transmission line and switching station construction activities are described in Sections 2.2.1 and 2.2.2, respectively. Maximum noise levels generated by the various pieces of construction equipment typically range from about 70 to 85 dBA at 50 feet (Bolt, Beranek, and Newman 1971).

Project-related construction noise levels would likely exceed background noise levels by more than 10 dBA at distances from within 500 feet in developed areas to over 1,000 feet in rural areas with little development. A 10-dBA increase would be perceived as a large increase over the existing noise level and could result in annoyance to adjacent residents. The residential noise level guideline of 55 dBA could also be temporarily exceeded for residences near construction activities.

Noise-related effects associated with construction of the transmission line is expected to be temporary and insignificant because of the short construction period. In the more densely populated areas along the ROW, construction techniques would be used to limit noise as much as possible.

These techniques include limiting construction activities to daylight hours and ensuring that construction equipment would be adequately muffled and maintained. Because of the sequence of construction activities, construction noise at a given point along the transmission line would be limited to a few periods of a few days each. The temporary nature of construction would reduce the duration of noise impacts on nearby residents.

Operational Noise

Transmission lines can produce audible noise by corona on high-voltage transmission lines that is different from other noise sources (e.g., traffic). Corona discharge is the electrical breakdown of air into charged particles. Corona noise is composed of both broadband noise, characterized as a crackling noise, and pure tones, characterized as a humming noise. Corona noise is greater with increased voltage and is also affected by weather. It occurs during all types of weather when air ionizes near irregularities, such as nicks, scrapes, dirt, and insects on the conductors. During dry weather, the noise level is low and often indistinguishable off the ROW from background noise. In wet conditions, water drops that collect on the conductors can cause louder corona discharges.

The human response to corona noise is subjective and depends on the background noise. For example, corona intensifies during rain, but at the same time, background noise levels are also much higher, thus the annoyance level is lower. During very moist, nonrainy conditions, such as heavy fog, the resulting small increase in the background noise levels is not expected to result in annoyance to adjacent residents.

As reference for audible noise related to transmission lines, fair weather values are accepted. It is generally accepted that noise between 35-45 dBA corresponds to a quiet library environment. Audible noise levels generated by 161-kV lines during fair weather are very low, below 30 dB, and in rainy weather would be at no point higher than 35 dB. Therefore, in all cases, the audible noise generated by the proposed 161-kV transmission line would be well below the recommended maximums of the USEPA DNL sound levels (Dezé Energy Corporation 2008). Corona is not associated with any adverse health effects in humans or livestock.

Periodic maintenance activities, particularly vegetation management, would produce noise comparable to that of some phases of transmission line construction. This noise, particularly from bush hogging or helicopter operation, would be loud enough to cause some annoyance. Maintenance activities, however, would be of very short duration and very infrequent occurrence and therefore expected to be insignificant.

4.11.2.3. Odors

Vehicles and equipment used during construction and operation would emit exhaust fumes. To limit exhaust emissions, equipment and vehicles would be properly muffled and maintained. Additionally, trees and other vegetation cleared from the ROW during construction may be burned. The resulting odors may be noticeable by nearby residents, but would be expected to be temporary and insignificant because of the relatively short-term activities of construction. Appendices B and C contain procedures to address objectionable odors caused by smoke or fumes that could result during the construction and operation of the proposed transmission line. Construction and operation of the transmission line is not expected to produce any other noticeable odors.

4.12. Recreation, Parks, and Natural Areas

4.12.1. No Action Alternative

Under the No Action Alternative, no changes to the project area would occur and no direct, indirect, or cumulative effects to local recreational opportunities or experiences, natural areas, NRI streams or Wild and Scenic Rivers are anticipated. Changes to these features, as well as their management objectives, would nonetheless occur over time as other factors such as population trends, land use and development, quality of air/water/soil, recreational patterns, and cultural, ecological, and educational interests within the area change.

4.12.2. Action Alternative

Under the Action Alternative, development of the proposed transmission line could cause some minor shifts in any informal outdoor recreation activities that may currently take place in the immediate vicinity of this project. However, the extent of any such impacts would be minor and insignificant.

Because BMPs would be implemented (Muncy 1999) and the distance from the project to the NRI stream is sufficient for the type work indicated, no direct, indirect or cumulative effects to natural areas, NRI streams or Wild and Scenic Rivers is anticipated.

4.13. Socioeconomic and Environmental Justice

4.13.1. No Action Alternative

Under the No Action Alternative, the area served by the existing transmission line would continue to experience an unacceptably high number of outages, likely with increasing frequency. These outages would have negative impacts on the ability of businesses in the area to operate. Residents of the area would also incur negative impacts from outages, including more frequent loss of heating or cooling, as well as other household activities such as cooking or clothes washing. These conditions would clearly diminish the quality of life for residents in the area and would have negative impacts on property values in the area. Any such impacts would affect all populations in the region negatively.

4.13.2. Action Alternative

Under the Action Alternative, the new transmission line would help maintain reliable service in the area and decrease the frequency of outages. Continued stability of electrical service would help maintain economic stability in the area and would facilitate economic growth. Construction activity would be temporary and would generally have little impact on residents of the area. The transmission line would be constructed through sparsely populated areas and would be highly visible to only a few homes. At most, scenic impacts would be minor for most residents. The proposed transmission line would become visual background and would have little or no affect on quality of life or property values. While it is possible that a few properties could have small negative impacts, these impacts would be much smaller than those that would occur if no new lines were constructed. Various studies have concluded that such transmission lines have little or no impact on the value of nearby properties, and that if impacts do occur they tend to dissipate over time (Des Rosier 2002; Pitts and Jackson 2007; Chalmers and Voorvaart 2009).

A segment of the proposed line would be near the southwestern boundary of Block 3002, which has a relatively large minority population (see Section 3.13). However, the line would be well removed from almost all of the population in Block 3002. Therefore, disproportionate negative impacts to disadvantaged populations are unlikely.

Any negative social, economic, or environmental justice impacts that might occur under the Action Alternative would be small, tending to diminish over time, and would be much smaller than negative impacts under the No Action Alternative.

4.14. Long-Term and Cumulative Effects

Long-term effects are consequences of the proposed action that either persist for an extended period or that are manifested at a point later in time following the action. Cumulative effects are those effects that result from the incremental impact of the proposed action when added to other past, present, and reasonably foreseeable future actions, regardless of the entity undertaking those actions.

4.14.1. No Action Alternative

As stated in Section 2.1.1, TCEMC could proceed with construction of the planned Burkesville Substation and could independently provide transmission service to power its new substation. However, if TCEMC were to choose not to construct the new substation or a transmission line to power the planned substation, the reliability of the power system in the Burkesville area would continue to degrade. This could lead to long-term and

cumulative socioeconomic effects, as the area would not be especially attractive to new or additional residential, commercial, or industrial development.

4.14.2. Action Alternative

In conducting the analysis of potential cumulative effects, reasonably foreseeable actions in the local area, as well as likely regional trends in environmental conditions, were considered. The predominant land use along the proposed 8.5-mile transmission route is forest and agriculture. Other than construction of the planned Burkesville Substation, no other major land-clearing activities or large-scale changes in local land use are foreseeable. The proposed transmission line ROW would occupy about 103 acres, and construction of the line would require clearing of about 85 acres of forest. The terrestrial communities are common locally and regionally thus, any project-related cumulative effects to terrestrial life would be minor and insignificant.

Potential effects to surface water and groundwater quality and to aquatic life would be insignificant with the application of protective measures (e.g., BMPs and SMZs) during construction and maintenance of the proposed transmission line. TCEMC's construction and operation of the proposed Burkesville Substation could affect surface water quality, depending on the control measures employed. Applicable requirements under the federal Clean Water Act would mitigate such impacts. Overall, any cumulative effects to local water quality and aquatic life resulting from TVA's proposed action would be insignificant.

As stated in Section 4.9.2, construction of the proposed transmission line would affect about 0.08 acre of a forested wetland resulting in conversion to scrub/shrub/emergent habitat, but the functional capability of this wetland would not be significantly reduced. Cumulatively, effects to local wetlands would be insignificant.

Although the proposed transmission line route would cross several minor floodplain areas, the placement of structures within such areas would not cause an increase in flood hazard due to changes in flood elevations or in flow-carrying capacity. Several access roads would cross the 100-year floodplain, but they would be designed so that upstream flood elevations would not be increased. Therefore, any cumulative effects to floodplain functions would be insignificant.

TVA determined, and the KYSHPO has concurred, that no historic properties potentially eligible for inclusion in the NRHP would be adversely affected by the proposed undertaking. Thus, there would be no cumulative effects to historic resources.

Some visual effects would be experienced during TVA's construction of the proposed transmission line and during the construction of the adjacent substation by TCEMC. However, after construction, changes in visual character would be long term but nevertheless insignificant. Because there are no reasonably foreseeable changes in the visual character of the area, the cumulative visual effects of TVA's action are expected to be minor and insignificant.

The provision of a local power supply under the Action Alternative would provide a long-term (i.e., 20 years or more) solution to the power reliability problems in the Burkesville area. Consequently, this could result in some localized long-term and cumulative socioeconomic benefits compared to the No Action Alternative, in that the area could accommodate residential, commercial, and industrial expansion or development.

4.15. Postconstruction Effects

Transmission lines, like all other types of electrical wiring, generate both electric and magnetic fields (EMFs). The voltage on the conductors of a transmission line generates an electric field that occupies the space between the conductors and other conducting objects such as the ground, transmission line structures, or vegetation. A magnetic field is generated by the current (i.e., the movement of electrons) in the conductors. The strength of the magnetic field depends on the current, the design of the line, and the distance from the line.

The fields from a transmission line are reduced by mutual interference of the electrons that flow around and along the conductors and between the conductors; the result is even greater dissipation of the low energy. Most of this energy is dissipated on the ROW, and the residual very low amount is reduced to background levels near the ROW or energized equipment.

Magnetic fields can induce currents in conducting objects. Electric fields can create static charges in ungrounded, conducting materials. The strength of the induced current or charge under a transmission line varies with: the strength of the electric or magnetic field, the size and shape of the conducting object, and whether the conducting object is grounded. Induced currents and charges can cause shocks under certain conditions by making contact with objects in an electric or magnetic field.

The proposed transmission line, like other transmission lines, has been designed to minimize the potential for such shocks. This is done, in part, by maintaining sufficient clearance between the conductors and objects on the ground. Stationary conducting objects, such as metal fences, pipelines, and highway guardrails, that are near enough to the transmission line to develop a charge (typically, these would be objects located within the ROW) would be grounded by TVA to prevent them from being a source of shocks.

Other public interests and concerns have included potential interference with AM radio reception, television reception, satellite television, and implanted medical devices. Interference with radio or television reception is typically due to unusual failures of powerline insulators or poor alignment of the radio or television antenna and the signal source. Both conditions are correctable and would be repaired if reported to TVA.

Implanted medical devices historically had a potential for power equipment strong-field interference when they came within the influence of low-frequency, high-energy workplace exposure. However, the older devices and designs (i.e., those beyond 5 to 10 years old) have been replaced with different designs and different shielding that prevent potential for interference from external field sources up to and including the most powerful magnetic resonance imaging medical scanners. Unlike high-energy radio frequency devices that can still interfere with implanted medical devices, low-frequency and low-energy powered electric or magnetic devices no longer potentially interfere (American Medical Association 2007).

Research has been done on the effects of EMFs on animal and plant behavior, growth, breeding, development, reproduction, and production. Research has been conducted in the laboratory and under environmental conditions, and no adverse effects or effects on health or the above considerations have been reported for the low-energy power frequency fields (World Health Organization [WHO] 2007a). Effects associated with ungrounded, metallic object's static charge accumulation and discharge in dairy facilities have been

found when the connections from a distribution line meter have not been properly installed on the consumer's side of a distribution circuit.

There is some public concern as to the potential for adverse health effects that may be related to long-term exposure to EMFs. A few studies of this topic have raised questions about cancer and reproductive effects on the basis of biological responses observed in cells or in animals or on associations between surrogate measures of powerline fields and certain types of cancer. Research has been ongoing for several decades.

The consensus of scientific panels reviewing this research is that the evidence does not support a cause-and-effect relationship between EMFs and any adverse health outcomes (e.g., American Medical Association 1994; National Research Council 1997; National Institute of Environmental Health Sciences [NIEHS] 2002). Some research continues on the statistical association between magnetic field exposure and a rare form of childhood leukemia known as acute lymphocytic leukemia. A review of this topic by the WHO (International Association for Research on Cancer 2002) concluded that this association is very weak, and there is inadequate evidence to support any other type of excess cancer risk associated with exposure to EMFs.

TVA follows medical and health research related to EMFs, along with media coverage and reports that may not have been peer reviewed by scientists or medical personnel. No controlled laboratory research has demonstrated a cause-and-effect relationship between low-frequency electric or magnetic fields and health effects or adverse health effects even when using field strengths many times higher than those generated by power lines. Statistical studies of overall populations and increased use of low-frequency electric power have found no associations (WHO 2007b).

Neither medical specialists nor physicists have been able to form a testable concept of how these low-frequency, low-energy power fields could cause health effects in the human body where natural processes produce much higher fields. To date, there is no agreement in the scientific or medical research communities as to what, if any, electric or magnetic field parameters might be associated with a potential health effect in a human or animal. There are no scientifically or medically defined safe or unsafe field strengths for low-frequency, low-energy power substation or line fields.

The current and continuing scientific and medical communities' position regarding the research and any potential for health effects from low-frequency power equipment or line fields is that there is no reproducible or conclusive data demonstrating an effect or an adverse health effect from such fields (WHO 2007c). In the United States, national organizations of scientists and medical personnel have recommended no further research on the potential for adverse health effects from such fields (American Medical Association 1994; United States Department of Energy 1996; NIEHS 1998).

Although no federal standards exist for maximum EMF strengths for transmission lines, two states (New York and Florida) do have such regulations. Florida's regulation is the more restrictive of the two, with field levels being limited to 150 milligaus at the edge of the ROW for lines with voltages of 230-kV and less. The expected magnetic field strengths at the edge of the proposed ROW would fall well below these standards. Consequently, the construction and operation of the proposed transmission line are not anticipated to cause any significant impacts related to EMFs.

4.15.1. Lightning Strike Hazard

TVA transmission lines are built with overhead ground wires that lead a lightning strike into the ground for dissipation. Thus, a safety zone is created under the ground wires at the top of structures and along the line for at least the width of the ROW. The NESC is strictly followed when installing, repairing, or upgrading TVA lines or equipment. Transmission lines structures are well grounded, and the conductors are insulated from the structure. Therefore, touching a structure supporting a transmission line poses no inherent shock hazard.

4.15.2. Transmission Structure Stability

The steel-pole structures that would be used on the proposed 161-kV transmission lines (see Figure 2-1) have demonstrated a good safety record. They are not prone to rot or crack, like wooden poles, nor are they subject to substantial storm damage due in part to increasingly stringent NESC loading criteria. They have an expected life cycle of about 50 years.

Additionally, as mentioned in Section 2.2.2.1, all TVA transmission structures are examined visually at least once a year. Thus, the proposed structures do not pose any significant physical danger. TVA does not typically construct barricades or fences around structures.

4.16. Summary of TVA Commitments and Proposed Mitigation Measures

The following routine measures would be employed to reduce the potential for adverse environmental effects during construction of the proposed transmission line and switch structures.

- To retard the introduction and spread of invasive species in the project area, TVA would employ the standard operating procedure of revegetating with noninvasive plant species.

- Wet-weather conveyances that could be affected by the proposed transmission line route would be protected by implementing standard BMPs, as identified in Muncy (1999).

- Nine perennial and 13 intermittent streams that would be crossed by the proposed transmission line would be protected by the implementation of Standard Stream Protection (Category A), as defined in Muncy (1999) and Appendix D.

- The perennial watercourse identified as 001AR that would be crossed by the proposed transmission line would be protected by the implementation of Protection of Unique Habitats (Category C), as defined in Muncy (1999) and Appendix D.

- TVA would utilize BMPs, as described by Muncy (1999), to minimize erosion during construction and operation.

- BMPs dealing with herbicide application would be used to prevent impacts to groundwater.

- In areas requiring chemical treatment, only USEPA-registered herbicides would be used, in accordance with label directions designed in part to restrict applications near receiving waters and to prevent unacceptable aquatic impacts.

- To minimize adverse impacts on natural and beneficial floodplain values, the ROW would be revegetated where natural vegetation is removed, as described in TVA's *Environmental Quality Protection Specifications for Transmission Line Construction* (Appendix C).

- To minimize adverse floodplain impacts, any new road construction in the floodplain would be done in such a manner that upstream flood elevations would not be increased.

- At TCEMC's existing 69-kV substation location, TCEMC would retire the existing 13-kV capacitor banks and metering package, and TVA would handle the disposal of this equipment. The retired metering equipment would be retained for reuse, recycled, sent for disposal, or handled through Investment Recovery. The retired 13-kV capacitors would be disposed of per TVA's Environmental Protection Procedures.

The following nonroutine measures would be applied during construction and operation of the proposed transmission line to reduce the potential for adverse environmental effects.

- A state-listed endangered plant, Carolina anglepod, occurs in the project area. In order to minimize impacts to this plant along the ROW and access roads, the following measures will be implemented where this species was identified:
    - Clearing of woody vegetation in these areas would be accomplished with a feller-buncher.
    - Heavy equipment would not be used during construction to re-contour, remove tree stumps, or otherwise intentionally disturb the soil profile in these areas.
    - TVA would not use aerial application of herbicides; instead, mowing or selective spraying of herbicides would be used to control woody vegetation.

- Potential Indiana bat summer roosting habitat occurs in the project area. In order to minimize adverse effects to the Indiana bat, the following measures, identified in the MOA, would be implemented:
    - To prevent direct impacts to Indiana bats during operations and maintenance activities, any removal of trees located within or adjacent to the proposed ROW along the identified 10-mile area of documented Indiana bat occurrence would be seasonally restricted to occur between October 15 and March 31. Should it be necessary to remove trees outside of this period, appropriate biological staff would conduct field surveys to ensure that the trees did not provide potential habitat for the Indiana bat, indicating their possible presence and, if needed, to coordinate with the USFWS to determine if modifications to the MOA would be required.
    - TVA would pay $100,050 to the Indiana Bat Conservation Fund to compensate for impacts to potentially suitable summer roosting Indiana bat habitat.

CHAPTER 5

5.0 LIST OF PREPARERS

5.1. NEPA Project Management

Anita E. Masters

Position:	Project Manager, NEPA Interface
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Involvement:	Visual Resources and Historic Architectural Resources

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CHAPTER 6

6.0 LIST OF AGENCIES, ORGANIZATIONS, AND PERSONS TO WHOM COPIES ARE SENT

Federal Agencies

United States Fish and Wildlife Service

State Agencies

Kentucky Heritage Council

Tribes

- Absentee Shawnee Tribe of Oklahoma
- Alabama-Quassarte Tribal Town
- The Cherokee Nation
- Eastern Band of Cherokee Indians
- Eastern Shawnee Tribe of Oklahoma
- Kentucky State Nature Preserves Commission
- Kialegee Tribal Town
- The Muscogee (Creek) Nation
- Seminole Tribe of Florida
- The Shawnee Tribe
- Thlopthlocco Tribal Town
- United Keetoowah Band of Cherokee
- Indians in Oklahoma

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CHAPTER 7

7.0 LITERATURE CITED

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Appendix A – Correspondence

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STEVEN L. BESHEAR
GOVERNOR

TOURISM, ARTS AND HERITAGE CABINET
KENTUCKY HERITAGE COUNCIL

MARCHETA SPARROW
SECRETARY

THE STATE HISTORIC PRESERVATION OFFICE
300 WASHINGTON STREET
FRANKFORT, KENTUCKY 40601
PHONE (502) 564-7005
FAX (502) 564-5820
www.heritage.ky.gov

LINDY CASEBIER
ACTING EXECUTIVE DIRECTOR AND
STATE HISTORIC PRESERVATION OFFICER

February 28, 2012

Richard Yarnell
Tennessee Valley Authority
400 W. Summit Hill Drive
WT 11D– Cultural Resources
Knoxville, Tennessee 37902

RE: ***Phase I Archaeological Survey of a Laydown Yard Associated with the Proposed TVA Burkesville 161kV Transmission Line Project, Cumberland County, Kentucky*, by Kelly Hockersmith of TRC Environmental Corporation, Nashville, TN**

Mr. Yarnell,

This office has received the above mentioned report for review. The author reports no evidence of prehistoric or early historic occupation in the project area, and recommends no further archaeological investigation. I concur with the author's findings. Therefore, we have no further comments and responsibility to consult with the Kentucky State Historic Preservation Officer under the Section 106 review process for archaeology on this project is fulfilled.

Should you have any questions, please contact Phillip Johnson of my staff at (502) 564-7005 ext 122.

Sincerely,

Lindy Casebier, Acting Executive Director
Kentucky Heritage Council and
State Historic Preservation Officer

LC:prj

Cc: Dr. George Crothers (UK-OSA)
Larry McKee (TRC)

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STEVEN L. BESHEAR
GOVERNOR

TOURISM, ARTS AND HERITAGE CABINET
KENTUCKY HERITAGE COUNCIL

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LINDY CASEBIER
ACTING EXECUTIVE DIRECTOR AND
STATE HISTORIC PRESERVATION OFFICER

February 23, 2012

Clinton E. Jones
Tennessee Valley Authority
400 W. Summit Hill Drive
WT 11A-K – Cultural Resources
Knoxville, Tennessee 37902

RE: ***Phase I Archaeological Survey of a Laydown Yard and Access Road Associated with the Proposed TVA Burkesville 161kV Transmission Line Project, Cumberland County, Kentucky*, by Kelly Hockersmith and Ted Karpynec of TRC Environmental Corporation, Nashville, TN**

Mr. Jones,

This office has received the above mentioned report for review. The survey documented one previously unrecorded historic cemetery site (15Cu126) one isolated find, and revisited a previously recorded site (15Cu96) that is partially located in the project area. The authors recommend that neither 15Cu126 nor the portion of 15Cu96 that is located within the APE is eligible for listing on the National Register of Historic Places. Based on these findings the authors recommend avoidance of the historic cemetery (15Cu126) and no further archaeological evaluation of the project area. I concur with the authors' recommendations. Your letter dated January 24, 2012 states that the project area has been redesigned to avoid impacts to the historic cemetery (15Cu126), and that the TVA will consult with our office regarding the portions of the relocated APE that were not covered in the above mentioned report. We look forward to reviewing information regarding the relocated direct APE, as well as the indirect APE for this undertaking.

Should you have any questions, please contact Phillip Johnson of my staff at (502) 564-7005 ext 122.

Sincerely,

Lindy Casebier, Acting Executive Director
Kentucky Heritage Council and
State Historic Preservation Officer

LC:prj

Cc: Dr. George Crothers (UK-OSA)
Larry McKee (TRC)

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A01 120215 001

February 15, 2012

Mr. Hugh Archer
Executive Director
Kentucky Natural Lands Trust
433 Chestnut Street
Berea, Kentucky 40403

Dear Mr. Archer:

TENNESSEE VALLEY AUTHORITY (TVA) – BURKESVILLE 161-kV TRANSMISSION LINE – MITIGATION FOR IMPACTS TO INDIANA BAT HABITAT

By way of this letter, TVA agrees to pay the amount of $100,050 to the Indiana Bat Conservation Fund (IBCF) administered by the Kentucky Natural Lands Trust (KNLT). As described in the enclosed Memorandum of Agreement, this contribution is to mitigate impacts to Indiana bat habitat associated with TVA's Burkesville 161-kV Transmission Line project in Cumberland County, Kentucky. Payment will be made by electronic transfer. Nathan Melton of our Business Services group will get in touch with you about the transfer of payment.

Upon receipt of this payment, please provide me a copy of the final banking agreement for our files. If you have any questions or need additional information to support this request, please contact Todd Liskey at (423) 751-7631 or by e-mail at *tcliskey@tva.gov*.

Sincerely,

(Original signed by Clayton L. Clem)

Clayton L. Clem

Enclosure
CLC:TCL:MLP
cc: John T. (Bo) Baxter, WT 11B-K
B. Keith Elder, MR 4B-C
Helen S. Layne, BR 5A-C
Holly G. LeGrand, WT 11C-K
Todd C. Liskey, MR 4G-C
Nathan R. Melton, MR 3B-C
Aaron B. Nix, BR 4A-C
Carolyn B. Marvil, MR 3F-C
Paul J. Pearman, MR 4K-C
Michael B. Shirey, MR 4B-C
EDMS, WT CA-K (Enclosure)

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Kentucky Ecological Services Field Office
330 West Broadway, Suite 265
Frankfort, Kentucky 40601
(502) 695-0468

February 9, 2012

Clayton L. Clem
Tennessee Valley Authority
Vice President, Electric System Projects
1101 Market Street, MR 3F-C
Chattanooga, Tennessee 37402

Re: FWS 2011-B-0767: Indiana Bat Conservation MOA and species effects determination for Tennessee Valley Authority in association with the Burkesville Transmission Line Project in Cumberland County, Kentucky

Dear Mr. Clem:

Please find the attached Indiana Bat Conservation Memorandum of Agreement (MOA) between the U.S. Fish & Wildlife Service (Service) and the Tennessee Valley Authority accounting for adverse effects to the Indiana bat in association with the subject project. Please review for any questions or changes. If you do not have any, please have the responsible party sign, date, and return to our office via fax, email, or mail.

Execution of the attached MOA and the Indiana Bat Conservation Fund (IBCF) contribution that it requires will allow the Tennessee Valley Authority to be in compliance with the Endangered Species Act relative to the Indiana bat. If necessary to fulfill requirements of the U.S. Army Corps of Engineers and/or other federal nexus agencies obligations per section 7 of the ESA, please provide them with a copy of this letter, fully executed Conservation MOA, and proof of payment for their records.

In order to complete payment per the Conservation MOA (Section 6.4 of the MOA) please:

1) Make check, EFT, or money order payable to **Kentucky Natural Lands Trust,**
2) Reference. **Tennessee Valley Authority, FWS 2011-B-0767– IBCF** in the memo line.
3) Remit payment to: **Kentucky Natural Lands Trust**
c/o Hugh Archer, Executive Director
433 Chestnut Street
Berea, Kentucky 40403
Phone: 877-367-5658
4) Provide proof of payment (copy of the check or receipt) to our office via fax, email, or mail.

In addition to the Indiana bat, your January 11, 2012 correspondence also addressed concerns regarding potential adverse effects to other federally listed species that are known or have the potential to occur within Cumberland County, Kentucky and/or the project vicinity. Effects were considered for the following federally listed species: gray bat, purple catspaw pearlymussel, Cumberland bean pearlymussel, fanshell, oyster mussel, Cumberlandian combshell, clubshell, sheepnose, fluted kidneyshell, and littlewing perarlymussel. Our review found the Tennessee Valley Authority's effects analysis on the species to be adequate, and we believe it supports the conclusion of "no effect" on the aforementioned mussel species. Further, we concur with Tennessee Valley Authority's determination that the proposed project is "not likely to adversely affect" the gray bat.

If you have any questions regarding the information that we have provided, please contact Phil DeGarmo of my office at (502) 695-0468 extension 110.

Sincerely,

Leroy M. Koch

for Virgil Lee Andrews, Jr.
Field Supervisor

Attachment

INDIANA BAT CONSERVATION MEMORANDUM OF AGREEMENT BETWEEN THE U.S. FISH AND WILDLIFE SERVICE AND THE TENNESSEE VALLEY AUTHORITY

This Memorandum of Agreement (MOA) is entered into by the United States Department of the Interior, U.S. Fish and Wildlife Service (Service) and the Tennessee Valley Authority to promote the survival and recovery of the Indiana bat (*Myotis sodalis*), a federally listed endangered species. Together, the Service and the Tennessee Valley Authority are referred to as "Cooperators."

Section 1: PURPOSE AND OBJECTIVES

The Indiana bat is a federally listed endangered species native to a large portion of the eastern United States and the Commonwealth of Kentucky. This MOA will implement recovery-focused conservation measures that will be undertaken by the Cooperators and afford a measurable conservation benefit for the Indiana bat as set forth in the Service's Indiana Bat Mitigation Guidance as modified January 3, 2011 and hereby incorporated by reference. These measures will be implemented in association with the proposed project as detailed in section 4 of this MOA. All measures will be implemented according to the terms of this MOA. The Cooperators understand and intend that the MOA's benefits may also provide conservation benefits for other federal protected species and native fish and wildlife.

Section 2: AUTHORITY

This MOA is hereby entered into under the authorities of the Endangered Species Act (16 U.S.C. 1531 *et seq.*) (ESA), Fish and Wildlife Act of 1956 (16 U.S.C. 742a. *et seq.*), and the Tennessee Valley Authority Act (16 U.S.C. 831 *et seq.*). Section 5 of the ESA provides that, "The Secretary...shall establish and implement a program to conserve fish, wildlife, and plants, including those which are listed as endangered species or threatened species..." and "shall utilize land acquisition and other authority under the Fish and Wildlife Act, as amended, and the Migratory Bird Conservation Act, as appropriate". Section 7(a) (1) of the ESA further directs Federal agencies to "utilize their authorities in furtherance of the purposes of this Act [ESA] by carrying out programs for the conservation of endangered species and threatened species." The Fish and Wildlife Act of 1956 provides that the Secretary shall "...take such steps as may be required for the development, advancement, management, conservation, and protection of fish and wildlife resources...." Finally, the TVA Act authorizes the President to effectuate "the proper use, conservation, and development of the natural resources of the Tennessee River drainage basin and of such adjoining territory as may be related to or materially affected by the development consequent to [the TVA] Act. ..."

The authorization for any incidental take of the Indiana bat, as defined in section 9 of the ESA, and resulting from impacts that may be associated with the qualified project(s), as defined in section 4 of this MOA, is provided through the Service's incidental take statement and January 3, 2011 intra-Service biological opinion, which is incorporated herein by this reference. This biological opinion covers the Service's development of conservation agreements for the Indiana bat, including this MOA, that are based on implementation of the Indiana Bat Mitigation Guidance and provide incidental take of Indiana bats in the form of up to 2,500 acres of forested Indiana bat habitat removal per year through 2016.

Section 3: STATEMENT OF MUTUAL INTEREST

The mission of the Service is to work with others to conserve, protect, and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people. The Service's major responsibilities are for endangered species, threatened species, migratory birds, marine mammals, and freshwater and anadromous fish. The Service recognizes the ability and interest of Tennessee Valley Authority to contribute to the conservation and recovery of the Indiana bat, and recognizes Tennessee Valley Authority as a partner in the recovery and habitat conservation of the species. Tennessee Valley Authority recognizes the Service's mission and its interest in developing partnerships to protect, restore, and manage important habitats on private and public lands for federal listed species. The Cooperators understand the collaboration for this MOA is voluntary.

Section 4: PROJECT DESCRIPTION

The proposed Burkesville Transmission Line Project involves the construction of approximately 8.5 miles of overhead transmission line, upgrades to the existing substation, and addition of switching stations. The project would require the establishment of a 100-foot wide right-of-way (ROW), temporary and permanent access roads, fences and gates as necessary, grading of topsoil, and installation of transmission line structures. The proposed ROW would occur entirely within Cumberland County, Kentucky. The following information was derived and calculated from the Tennessee Valley Authority's January 11, 2012 correspondence and attachments.

The proposed project would result in the direct loss of 69 acres of forested habitat from one (1) Indiana bat habitat type as depicted in Table 1 below.

Table 1

Habitat Type	Forested Acreage Removed
Potential Summer Habitat	69 acres

These Indiana bat habitat impacts are the impacts that are covered by this agreement and that were analyzed by the Service to assess the direct, indirect, and cumulative effects of the proposed project on Indiana bats.

Section 5: EFFECTIVE DATE AND TERMS OF AGREEMENT

This MOA is valid for the Tennessee Valley Authority's consideration for 45 days from the date of the Service's signature below, shall be deemed effective on the last date signed below, and shall remain in effect until all terms of the agreement have been fulfilled, except as modified in Section 8 hereof.

The Tennessee Valley Authority has determined that the removal of all or an undetermined portion of Indiana bat habitat will likely occur during the timeframe when the Indiana bat is not anticipated to be present (i.e., unoccupied), which is between the dates of October 15 – March 31. However, the Tennessee Valley Authority has indicated that some of the tree clearing may need to occur during the timeframe when the Indiana bat is anticipated to be present (i.e.; occupied), which is between the dates of April 1 – October 14. The Indiana Bat Conservation Fund contribution amount that is identified in section 6.4 of the MOA is based on the assumption that all of the tree removal associated with the project will be conducted during the unoccupied timeframe. If tree clearing must occur during the occupied timeframe, the Tennessee Valley Authority must notify the Service in advance of occupied clearing and the MOA must be amended to appropriately account for the types of adverse effects to Indiana bats that would occur as a result of tree clearing between the dates of April 1 – October 14. In addition, if additional forested areas not considered in Section 4 of this MOA are to be removed, the Tennessee Valley Authority must coordinate with the Service to determine if additional modification of this MOA is necessary, and, if found necessary, the Tennessee Valley Authority will seek such modification.

Section 6: SPECIFIC OBLIGATIONS OF THE COOPERATORS

The Tennessee Valley Authority and the Service agree to fulfill the following conditions to minimize the potential level of take of the Indiana bat, compensate for adverse effects on the Indiana bat that may result from construction of the project, and promote future conservation and recovery of the Indiana bat:

6.1 The Service will take the necessary steps to ensure that the project covered under this MOA meets federal requirements for compliance with the National Environmental Policy Act (NEPA) and ESA. If the Tennessee Valley Authority has NEPA requirements beyond the scope of this MOA, the Tennessee Valley Authority or other Federal action agency are responsible for those additional requirements.

With regard to the ESA, the Biological Opinion authorizes incidental take of Indiana bats associated with forested habitat removal. As such, paragraphs 6.3 and 6.4 are incorporated to ensure compliance with the Reasonable and Prudent Measures and Terms and Conditions of the biological opinion. The Tennessee Valley Authority acknowledges that any material divergence from these measures and conditions may result in a violation of Section 9 of the ESA.

6.2 The Tennessee Valley Authority will take the necessary steps to ensure that the project covered under this MOA meets federal requirements for compliance with the National Historic Preservation Act (NHPA).

6.3 The project proposed by the Tennessee Valley Authority, as described in Section 4, will result in the incidental take of Indiana bats in the form of habitat loss totaling not more than 69 acres of potential Indiana bat summer habitat. The Tennessee Valley Authority may remove this habitat during unoccupied time from (October 15 – March 31). As stated in Section 5, if tree clearing is necessary during the occupied timeframe (April 1 – October 14), the Tennessee Valley Authority must notify the Service in advance of that date so that the MOA and Indiana Bat Conservation Fund contribution amount can be amended accordingly. Funding amounts will be consistent with the Indiana Bat Mitigation Guidance and the Service's Biological Opinion. Additionally, the Tennessee Valley Authority shall prepare a report on the project's tree clearing progress by March 31, 2012, that indicates the amount of forested acreage, if any, which would need to be cleared during the period between April 1, 2012 and October 14, 2012. Forested habitat associated with the proposed project, but not considered in this MOA, shall not be removed without further coordination with the Service.

6.4 The Tennessee Valley Authority shall contribute $100,050.00 to the Indiana Bat Conservation Fund (IBCF) administered by the Kentucky Natural Lands Trust (KNLT). This contribution is based on 69 acres of impact to potential Indiana bat summer habitat using the process identified in the Indiana Bat Mitigation Guidance. Funds shall be provided to KNLT within thirty (30) days of the last signature to this MOA. The Tennessee Valley Authority shall provide the Service with a copy of the check or transaction receipt within seven (7) business days of payment that shows the date and amount of the deposit.

In summary, this MOA provides recovery based conservation benefits for the Indiana bat in the form of IBCF contributions which, in turn, will fund Indiana bat habitat protection, conservation, restoration and/or priority monitoring and research projects.

Section 7: COOPERATION

Entering into this MOA satisfies the Tennessee Valley Authority's obligation to consult with the Service under Section 7(a)(2) of the ESA relative to the Indiana bat in order to ensure that the proposed project does not jeopardize the continued existence of the Indiana bat or result in adverse modification of its critical habitat. ESA compliance for other federally listed species that could occur in the project area was completed on February 9, 2012, when the Service concurred with the Tennessee Valley Authority's "no effect" and "not likely to adversely affect" determinations on those species. Both the Service and Tennessee Valley Authority acknowledge that it is their desire to facilitate the processes set forth in this MOA by open communication and cooperation. Both parties agree to exercise their rights and obligations under this MOA in good faith. If the Tennessee Valley Authority has questions regarding this MOA or the Guidance, the Service agrees to make itself available for consultation in a timely fashion.

Section 8: MODIFICATION OR TERMINATION

Modifications to this MOA may be proposed by either party in writing and will become effective upon being reduced to a written instrument and being signed by duly authorized representatives of the Cooperators.

The Tennessee Valley Authority or the Service may terminate this MOA at any time within or prior to thirty (30) days of the last signature to this MOA upon written notification from the other signatory party. Failure to fulfill the provisions, as specified, within paragraph 6.4 will result in automatic termination of this MOA.

Section 9: OTHER PROVISIONS

9.1 The Cooperators agree that they shall be liable for the negligent or wrongful acts or omissions of their employees, agents, and assigns only to the extent liable under applicable law. Nothing in this MOA shall be interpreted or construed as constituting a waiver by any party of sovereign immunity or statutory limitation on liability.

9.2 Each provision of this MOA shall be interpreted in such a manner as to be effective and valid under applicable law, but if any provision of the MOA shall be prohibited or invalid under applicable law, such provision shall be ineffective to the extent of such prohibition or invalidity, without invalidating the remainder of such provision or the remaining provisions of this MOA.

9.3 No provision of this MOA shall be interpreted as or constitute a commitment or requirement that either party take actions in contravention of applicable laws, either substantive or procedural.

9.4 Nothing in the MOA shall be interpreted as or constitute a commitment or requirement that the Service obligate or pay funds in contravention of the Anti-Deficiency Act, 31 U.S.C. §1341, or any other law or regulation.

9.5 Third Parties Not to Benefit: This MOA does not grant rights or benefits of any nature to any party not named or identified in this MOA.

9.6 Merger: This MOA contains the sole and entire MOA of the parties. No oral representations of any nature form the basis of or may amend this MOA. This MOA may be extended, renewed, or amended only when agreed to in writing by the parties.

9.7 Waiver: Failure to enforce any provision of this agreement by either party shall not constitute waiver of that provision, nor a waiver of a claim for subsequent breach of the same type, nor a waiver of any other term of this agreement. The waiver of any provision must be express and evidenced in writing.

9.8 Assignment: No part of this agreement shall be assigned to any other party.

9.9 Fulfilling the terms of this MOA (including any amended payments) will satisfy TVA's obligations under this Section 7(a)(2) ESA consultation relative to the Indiana bat.

Section 10: NOTICES AND AUTHORIZED REPRESENTATIVES

Notices shall be made in writing to the persons at the addresses listed below and may be given by personal delivery, mail or by telecopy (FAX) to the duly authorized representatives listed below. If there are changes in a party's representative, each party shall notify the other party, in writing, within thirty (30) days of the change in their representative.

U.S. Fish and Wildlife Service
Virgil Lee Andrews, Jr.
Field Office Supervisor
330 West Broadway, Room 265
Frankfort, Kentucky 40601
502/695-0468 (telephone)
502/695-1024 (fax)

Tennessee Valley Authority
Clayton L. Clem
Vice President, Electric System Projects
1101 Market Street, MR 3F-C
Chattanooga, Tennessee 37402
423-751-3872 (telephone)
423-751-4621 (fax)

Each party hereby indicates its acceptance of the terms of the MOA as outlined herein by its signature below. The parties hereto have executed this MOA as of the last written date below:

U.S. DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE

BY: Henry M. Koch

for TITLE: Field Supervisor

DATE: Feb 9, 2012

TENNESSEE VALLEY AUTHORITY

BY: Clayton L. Clem

TITLE: VP, Electric System Projects

DATE: Feb 13, 2012

Tennessee Valley Authority, 400 West Summit Hill Drive, WT 11A-K, Knoxville, Tennessee 37902

January 24, 2012

cc: Cynthia M. Anderson, LP 5D-C
Brenda E. Brickhouse, LP 5U-C
Todd Liskey, MR 4G-C
Khushid K. Mehta, WT 6A-K
EDMS, WT 11D-K

Mr. Lindy Casebier
State Historic Preservation Officer
and Executive Director
Kentucky Heritage Council
300 Washington Street
Frankfort, Kentucky 40601

Dear Mr. Casebier:

TENNESSEE VALLEY AUTHORITY (TVA), PHASE I ARCHAEOLOGICAL SURVEY, BURKESVILLE 161-kV TRANSMISSION LINE LAYDOWN YARD AND ACCESS ROADS, CUMBERLAND COUNTY, KENTUCKY

As part of its plan to construct the Burkesville 161-kV Transmission Line (TL), TVA proposes four access roads totaling 1.6 miles and a 5-acre laydown yard for worker assembly, vehicle parking, and material storage. TVA identified the area of potential effects (APE) for archaeology as the 5-acre proposed laydown yard plus 1.6 miles of 20-foot wide proposed access roads. TVA has determined that the project has no potential for visual effects to historic architecture.

One previously recorded archaeological site (15CU96) is located within the project APE.

TVA contracted with TRC Environmental Corporation to conduct a phase I archaeological survey within the APE. Enclosed are two hard copies of the draft report titled *Phase I Archaeological Survey of a Laydown Yard and Access Roads Associated With the TVA Burkesville 161-kV Transmission Line Project, Cumberland County, Kentucky*, each of which contains an electronic copy on CD.

The survey found no cultural material within the portion of 15CU96 that is within the APE. The survey identified one previously unrecorded site, 15CU126, consisting of an historic cemetery. This cemetery lies within proposed access road AR-14. The survey also identified one isolated find (IF-1) within AR-14. TRC recommends that the cemetery and IF-1 are both ineligible for listing on the National Register of Historic Places. However, TVA will avoid project effects on the cemetery and on IF-1 by re-routing AR-14 to the southern edge of the field in which they are located. No historic properties were identified within the re-routed access road or the other portions of the APE.

The proposed laydown yard surveyed as a part of the APE is no longer under consideration. Upon identifying another suitable location for a laydown yard TVA will consult with your office regarding the potential for effects on historic properties.

Mr. Lindy Casebier
Page 2
January 24, 2012

Pursuant to 36 CFR Part 800.3(f)(2), TVA is consulting with federally recognized Indian tribes regarding historic properties within the proposed project's APE that may be of religious and cultural significance and are eligible for the NRHP.

TVA has reviewed the enclosed report and agrees with the recommendations of the authors. TVA finds that no NRHP-listed or eligible archaeological resources are located within the APE, which has been revised to avoid 15CU126. Pursuant to 36 CFR Part 800.4(d)(1), we are seeking your concurrence with TVA's determination that no historic properties would be affected by the proposed undertaking.

If you have any questions or comments, please contact Richard Yarnell by telephone at (865) 632-3463 or by email at wryarnell@tva.gov.

Sincerely,

Clinton E. Jones
Senior Manager, Biological and Cultural Compliance
Environmental Permits and Compliance
WT 11A-K

Enclosures
WRY:SLY

STEVEN L. BESHEAR
GOVERNOR

TOURISM, ARTS AND HERITAGE CABINET
KENTUCKY HERITAGE COUNCIL

MARCHETA SPARROW
SECRETARY

THE STATE HISTORIC PRESERVATION OFFICE
300 WASHINGTON STREET
FRANKFORT, KENTUCKY 40601
PHONE (502) 564-7005
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LINDY CASEBIER
ACTING EXECUTIVE DIRECTOR AND
STATE HISTORIC PRESERVATION OFFICER

January 11, 2012

Clinton E. Jones, Senior Manager
Biological and Cultural Compliance
Tennessee Valley Authority
400 West Summit Hill Dr.
Knoxville, TN 37902-1499

Re: Proposed TVA Burkesville 161-kV Transmission Line, Cumberland County, Kentucky – REVISED REPORT

Dear Mr. Jones,

On December 21, the State Historic Preservation Office received a revised report addressing comments in our October 24, 2011, letter for the above referenced project.

To complete Section 106 consultation with our office, comment has been requested on effect assessments for CU-269 (Renox Creek Swinging Bridge) and CU-5 (C.H. Hill House). TVA has determined that CU-269 may be eligible for listing in the National Register, but the site would not be affected by the proposed undertaking. Furthermore, TVA determined there would be no adverse effect to CU-5.

We concur with your determinations for these sites. Based on all historic properties and resources identified and evaluated in the report, this undertaking as a whole should have no adverse effect on historic properties. No additional consultation with our office would be required at this time.

We appreciate the opportunity to review the revised report and findings for this undertaking. If you have questions regarding these comments, please contact Jill Howe of my staff at (502) 564-7005, extension 121.

Sincerely,

Lindy Casebier
Acting Executive Director and
State Historic Preservation Officer

LC:jh

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An Equal Opportunity Employer M/F/D

Tennessee Valley Authority, 400 West Summit Hill Drive, Knoxville, Tennessee 37902

cc: Todd C. Liskey, MR 4G-C
EDMS, WT 11D-K

January 11, 2012

Mr. Lee Andrews
Field Supervisor
U. S. Fish and Wildlife Service
330 West Broadway, Room 265
Frankfort, Kentucky 40601

Dear Mr. Andrews:

REQUEST FOR ENTRY INTO AN INDIANA BAT CONSERVATION Memorandum of Agreement (MOA): CONSTRUCTION OF A 161 - kV (kilovolt) TRANSMISSION LINE, BURKESVILLE, KENTUCKY

Tri-County Electric Membership Corporation (TCEMC) serves the Burkesville, Kentucky area from their Burkesville 69-kV Substation. Due to recent and increasing outages, TCEMC proposes to upgrade the existing 69-kV substation, located on High Street in Burkesville, to a 161-kV substation. TVA proposes to supply power to the new substation by constructing a 161-kV transmission line approximately 8.5 miles long from an existing TVA transmission line (Wolf Creek HP-Summer Shade #1 161-kV Transmission Line). The new right-of-way for the line would be 100 feet wide, and the line would be constructed on H-frame (two-pole) steel structures.

Two switches would be added to the source line, and a third switch would be installed in the new transmission line ROW. TVA would provide a metering package for the distributor to install in their new substation. We would complete construction and begin operation of the proposed transmission line and substation by December 2012, or as soon as possible after that date.

Historically, Cumberland County, Kentucky, has supported a number of aquatic species and one terrestrial species that currently are listed as endangered according to the provisions of the Endangered Species Act. These include 1 mammal and 5 mussels. Four additional mussels and one additional mammal, also listed as endangered or as candidates for listing, also have the potential to occur within Cumberland County based on historic range, proximity to known occurrence records, biological characteristics and/or physiographic characteristics. See Table 1 below for listing of species.

TVA has determined that construction of the Burkesville transmission line project would have no effect on purple catspaw pearlymussel, Cumberland bean pearlymussel, fanshell, oyster mussel, Cumberlandian combshell, clubshell, sheepnose, fluted, kidneyshell, or little-wing pearlymussel because these species do not occur in areas potentially affected by construction or operation of this transmission line. Use of appropriate Best Management Practices (BMPs) to minimize disturbance in streams or riparian areas crossed by this transmission line would

Mr. Lee Andrews
Page 2
January 11, 2012

further ensure that there is no potential to affect individuals or populations of these species in areas downstream of transmission line crossings.

Suitable foraging habitat for gray bat is available along the project area where the route intersects Big Renox Creek, and marginally suitable habitat occurs along some of the small aquatic features both along the route and near proposed access roads. Direct impacts to foraging habitat for gray bat from proposed actions would be minimal, temporary and immeasurable because of the implementation of BMPs at all stream and river crossings. However, habitat alteration may result in minor indirect changes to foraging behavior. Since no caves were identified within the project area during field investigations, proposed actions are not expected to directly or indirectly impact suitable winter hibernating habitat for gray bat. TVA has therefore determined that the project may minimally affect foraging habitat for gray bat, but is not likely to adversely affect gray bat.

In addition, TVA has determined that the project could affect potentially suitable habitat for Indiana bat. The effect would be the clearing of ~69 acres of forested habitat identified as potentially suitable summer roosting habitat for Indiana bat. TVA, therefore, proposes to compensate for the loss of ~69 acres of potential Indiana bat habitat by entering into a Conservation Memorandum of Agreement with the Service. TVA would contribute to the Indiana Bat Conservation Fund established by the Kentucky Ecological Services office of the Service in order to satisfy its Endangered Species Act Section 7 responsibilities regarding this species.

REQUESTED INFO FOR CONSIDERATION OF INDIANA BAT CONSERVATION MOA

Table 2. ESA Coordination History with the KY Ecological Services Office

Date	Location /Type of correspondence	Participants	Discussion topic
September 17, 2010	Hampton Inn, London, KY	Lee Andrews, Jim Gruhala, USFWS; Todd Liskey, Peggy Shute, Holly LeGrand, TVA	Burkesville TL was mentioned as future proposed action during meeting about TVA's Byrdstown TL; FWS interest was in what TVA's options would be regarding Section 7 Consultation with respect to Indiana bat

Mr. Lee Andrews
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January 11, 2012

Table 2. ESA Coordination History with the KY Ecological Services Office Continued

Date	Location /Type of correspondence	Participants	Discussion topic
October 15-18, 2010	Email correspondence	Lee Andrews and Holly LeGrand	Verification of calculation of possible mitigation costs for clearing of forested habitat along proposed Burkesville route and Section 7 ESA options available to TVA
July 25, 2011	Telephone and Email correspondence	Teresa Welch, USFWS; and Holly LeGrand	Maps of the surveyed transmission line with polygons representing field-identified potentially suitable Indiana bat habitat were emailed to Teresa Welch who was to print out and provide the info to Lee Andrews for review and feedback.
July 29, 2011	Telephone conversation	Phil DeGarmo, USFWS; and Holly LeGrand	Follow-up to USFWS receipt of maps. Phil would look over info and provide TVA some feedback. Recommended to TVA to plan on calculating mitigation under the assumption that all potentially suitable habitat would be cleared during the Unoccupied season.

Mr. Lee Andrews
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January 11, 2012

Table 2. ESA Coordination History with the KY Ecological Services Office Continued

Date	Location /Type of correspondence	Participants	Discussion topic
October 2011	Telephone conversation	Phil DeGarmo; Bo Baxter, TVA	Follow-up on USFWS review of info provided by TVA. FWS still needed some time to review. Recommended TVA examine the project in the context of how much available habitat was present in the nearby areas, to give some indication of the relative loss of available habitat.
November 30, 2011	Telephone conversation	Phil DeGarmo and Holly LeGrand	Discussion of what to include in TVA's MOA request
November 30, 2011	Email correspondence	Phil DeGarmo and Holly LeGrand	FWS indicated current mitigation cost per acre; guidelines on what to include in request for MOA

Proposed Transmission Line Coordinates:

Northern terminus: 85° 23'9.5" W, 36° 53'35.34" N;
Southern terminus: 85° 22'40.47" W, 36° 47'17.27" N

Discussion of forested habitat within the project boundary:

The project is located in Cumberland County, KY. No forested areas in the proposed project area had structural characteristics indicative of old growth forest. All forest in the project area is deciduous in composition. Deciduous forest is characterized by trees with overlapping crowns where deciduous species account for more than 75 percent of the canopy cover. Throughout the project area species composition varied with factors like landscape position and previous land use, but common overstory species observed included American beech, blackgum, chestnut oak, pignut hickory, red maple, sugar maple, white oak, and yellow-poplar. Some of the forests within the proposed ROW were heavily impacted by previous logging or grazing, but more than half of the forest in the project area is comprised of mature hardwoods with diameters at breast height commonly reaching 18 to 24 inches.

Forested habitat was interspersed with early successional habitat. Early successional fields, existing transmission line right-of-way, and agricultural fields are the most common types of herbaceous vegetation found along the proposed transmission line corridor. These areas are heavily disturbed by previous and/or present land use and contain plant species indicative of early successional habitats. Common species observed in the herbaceous vegetation type include broomsedge, goldenrod, Japanese honeysuckle, Johnsongrass, orchard grass, rabbit tobacco, red clover, sericea lespedeza, tall fescue, and white clover.

During field surveys, invasive plants were observed in both forest and herbaceous vegetation types, but areas of herbaceous vegetation generally contained both greater numbers and cover of nonnative, invasive plant species. This likely reflects the frequency and magnitude of disturbance present in areas of herbaceous vegetation. Disturbances associated with mowing, grazing, and right-of-way maintenance prevent tree species from becoming established, but can also encourage invasion and establishment of weedy species.

Converting forest land to managed ROW for construction of the proposed transmission line would be long term in duration, but insignificant. As of 2010, there was at least 813,000 acres of forested land in Cumberland and the adjacent Kentucky and Tennessee counties (United States Forest Service 2011). Completion of the project, as currently proposed, would result in clearing of about 85 acres of forest along the proposed transmission line right-of-way. Of the ~85 acres, approximately 69 acres were identified as containing suitable habitat for Indiana bats. Cumulatively, project-related effects to forest resources would be negligible when compared to the total amount of forestland occurring in the region.

United States Forest Service. 2011. Forest Inventory Data Online (FIDO). Version 1.4.2. Retrieved from < http://apps.fs.fed.us/fido/ > (accessed June 2011).

Amount of potentially suitable Indiana bat habitat to be removed and methods for calculating amount to be removed:

Field surveys along the proposed transmission line and associated access roads were conducted in June and November, 2011, respectively. Field crews walked the proposed right-of-way, looking for potentially suitable roost trees (trees equal to or greater than 5 inches DBH with exfoliating bark, cracks or crevices) and documenting habitat. When crews entered into potentially suitable habitat, the spatial location was recorded (e.g., a GPS point was taken). When crews exited suitable habitat and entered non-suitable habitat (e.g., roadway, field, young dense stand, recently logged stand, cedar dominated stand) the spatial location was documented. This resulted in accumulation of beginning and ending points for suitable and non-suitable habitat throughout the proposed transmission line right-of-way and along the proposed access roads.

These spatial locations were then uploaded into a GIS-generated map and overlaid onto the proposed transmission line route. Polygons were drawn around the portions of the proposed right-of-way and access roads identified as potential habitat. These polygons were then measured to calculate the acreage represented by each polygon. The calculations were added

Mr. Lee Andrews
Page 6
January 11, 2012

together to determine the total amount of acreage identified as potentially suitable Indiana bat habitat. The amount of potentially suitable Indiana bat habitat included ~60 acres along the proposed right-of-way and ~9 acres along the access roads, totaling ~69 acres. Based on the current rate of $2900 per acre and the intent to clear the ~69 acres by March 31, 2012, which is associated with a mitigation factor of 0.5, the total mitigation cost would be $100,050.

Overall the Burkesville area is a series of ridge tops and stream valleys connected by steep slopes. These ridges and valleys alternate for most of the proposed line. The area is a mixture of pasture and oak/beech/cedar woodland over shale bedrock which is exposed in many areas. There is potential bat habitat in most deciduous wooded areas, unless the trees are too young/small or there is a very large (>75%) eastern red cedar composition. Bat habitat seems best along ridgelines where the forest is more open, trees are larger, and snags increase. Wooded slopes and stream beds are also potential habitat if sufficiently wooded with middle aged or older deciduous trees. See attached photos for examples of suitable and non-suitable habitat identified during field surveys.

Site maps: Enclosed

Time of year forested habitat would be removed: October 14 - March 31 (Unoccupied)

Official name of applicant entering MOA: Clayton Clem

Address of applicant: 1101 Market Street MR 3F, Chattanooga, TN 37402

Contact name and number: Todd Liskey, 423-751-7631

TVA has determined the project is not likely to adversely affect gray bat. TVA has determined the project would affect potential Indiana bat summer habitat, but these effects would be mitigated by actions carried out as part of the MOA. TVA respectfully requests concurrence for these determinations.

Sincerely,

John T. Baxter
Manager, Endangered Species Act Compliance
Environmental Permits and Compliance

HGL:SLY
Enclosures

Tennessee Valley Authority, 400 West Summit Hill Drive, WT 11A-K, Knoxville, Tennessee 37902

cc: Cynthia M. Anderson, LP 5D-C
Brenda E. Brickhouse, LP 5U-C
Todd Liskey, MR 4G-C
Khurshid K. Mehta, WT 6A-K
EDMS, WT 11D-K

December 20, 2011

Mr. Lindy Casebier
Acting Director and State Historic Preservation Officer
Kentucky Heritage Council
300 Washington Street
Frankfort, KY 40601

Dear Mr. Casebier:

TENNESSEE VALLEY AUTHORITY (TVA), BURKESVILLE 161-kV TRANSMISSION LINE DELIVERY POINT, CUMBERLAND COUNTY, KENTUCKY

On October 26, 2011 TVA received comments from your office concerning TVA's determinations on the possible effects to historic properties of the above-referenced transmission line (TL) project. You disagreed with TVA's determinations of the eligibility for the National Register of Historic Places (NRHP) of the following resources:

- CU-264 (Baker Cemetery). A table in the draft architectural survey report listed this resource as ineligible for the NRHP, but the description of NRHP-eligible site CU-217 (Baker Farmstead) mentioned that you have determined the cemetery to be eligible as an above-ground resource. Your letter indicated that the cemetery should be considered a contributing property to the Baker Farmstead.
- CU-269 (Renox Creek Swinging Bridge). It was TRC's recommendation, and TVA agreed, that although you determined this property eligible for the NRHP in 2005, it has deteriorated to the extent that it can no longer be considered eligible. Your letter indicated that the photograph provided did not adequately document the bridge's condition to allow you to assess this finding.
- CU-262 and CU-263 (two cemeteries now combined as the Liberty Baptist Church Cemetery). Your letter stated that you have insufficient information to comment on the eligibility of these properties as above-ground resources, but also stated that you consider them potentially eligible as an archaeological site.

After consideration of your comments and the findings of the TRC report, we agree with your assessment that CU-264 (Baker Cemetery) is eligible as a contributing resource to the Baker Farmstead. We have not evaluated CU-262 and CU-263 (Liberty Baptist Cemetery) as an archaeological site because they lie outside the archaeological APE of the project. However, we agree with the determination that the project will have no effects on CU-262 and CU-263. TRC has revised the draft report to reflect these changes. Enclosed are two copies of the revised draft report titled *Phase I Architectural Survey of the Proposed TVA Burkesville 161-kV Transmission Line, Cumberland County, Kentucky* along with two digital copies on CD.

Mr. Lindy Casebier
Page 2
December 20, 2012

The revised draft report presents additional photographs of CU-269 (Renox Creek Swinging Bridge) and reasserts TRC's opinion that is ineligible for the NRHP due to its loss of physical integrity and integrity of materials and setting. TVA agrees with the Kentucky Heritage Council's 2005 assessment of the bridge as eligible. TVA also agrees with TRC's recommendation that the project would cause no visual effect on the property.

Your comments agreed with TVA's determination that the project would have no adverse effects on historic properties in all but one case, that of CU-5 (C.H. Hill House). Your comment was that the proposed new transmission line would cause an adverse visual effect on this eligible property. In order to bring more information to bear on this question, we contracted with TRC to conduct Direct Line of Sight (LOS) analysis of the property and the proposed TL structures and wires. The revised report includes the results of the LOS analysis for CU-5. Based on the findings, TRC recommends that while the proposed new TL would result in a visual effect on CU-5, the effect would not be adverse due to the fact that the visible portions of the TL would make up a small fraction of the viewshed, and TVA agrees with this recommendation.

TVA has reviewed the enclosed report and agrees with the recommendation of the authors with the exception of their recommendation that CU-269 (Renox Creek Swinging Bridge) be considered ineligible for the NRHP. Pursuant to 36 CFR Part 800.5(a), we are seeking your concurrence with TVA's determination that CU-269 would not be affected by the proposed undertaking. In addition, pursuant to 36 CFR Part 800.5(c)(2)(i), we are consulting with you to resolve the disagreement concerning the effects on eligible property CU-5. We are seeking your concurrence with TVA's determination that the proposed undertaking would not result in an adverse effect on this property, based on the new information gained by the LOS analysis.

If you have any questions or comments, please contact Richard Yarnell in Knoxville, Tennessee, at (865) 632-3463 or by email at wryarnell@tva.gov.

Sincerely,

Clinton E. Jones
Senior Manager, Biological and Cultural Compliance
Environmental Permits and Compliance
WT 11A-K
WRY:SLY
Enclosure

STEVEN L. BESHEAR
GOVERNOR

TOURISM, ARTS AND HERITAGE CABINET
KENTUCKY HERITAGE COUNCIL

MARCHETA SPARROW
SECRETARY

THE STATE HISTORIC PRESERVATION OFFICE
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LINDY CASEBIER
ACTING EXECUTIVE DIRECTOR AND
STATE HISTORIC PRESERVATION OFFICER

October 24, 2011

Kim Pilarski, Acting Manager
Cultural Compliance
Tennessee Valley Authority
400 West Summit Hill Dr.
Knoxville, TN 37902-1499

Re: Proposed TVA Burkesville 161-kV Transmission Line, Cumberland County, Kentucky

Dear Ms. Pilarski,

On September 26, the State Historic Preservation Office received for review and comment a Phase 1 architectural survey for the above referenced project. According to your submission, the undertaking involves construction of 8.5 miles of single-circuit tap line from the Wolf Creek-Summer Shade #1 161-kV transmission line (TL). Maximum structure height utilized for the purposes of the report was 180 feet, resulting in a 0.5-mile APE around the center line of the project.

The report identified 61 previously surveyed historic resources and nine new historic resources. Resource CU-195 could not be located, so no National Register assessment was possible. However, the resource as it is currently mapped does not appear to be within an area where the TL will be visible.

Five previously recorded resources were located within the APE, but outside the project viewshed. Two of these have been demolished (CUB-17 and CUB-19); the three extant resources (CUB-18, CUB-22 and CUB-23) were not assessed for National Register eligibility.

The following resources were considered by the report's author as ineligible for listing, either because they did not meet National Register criteria or because they had been demolished since last surveyed: CU-25, CU-40, CU-42, CU-214 (demo), CU-215 (demo), CU-216, CU-218 (demo), CU-219 (demo), CU-220, CU-221, CU-222 (demo), CU-223 (demo), CU-224, CU-225 (demo), CU-226, CU-227, CU-228 (demo), CU-229 (demo), CU-232 (demo), CU-233 (demo), CU-234 (demo), CU-235 (demo), CU-236 (demo), CU-237, CU-261 (demo), CU-262, CU-263, CU-264, CU-265, CU-268, CU-269, CU-271, CU-272 (demo), CU-273, CU-375, CU-376, CU-377, CU-378, CU-379, CU-380, CU-381, CU-382, CUB-2, CUB-3, CUB-4, CUB-5 (demo), CUB-6, CUB-7 (demo), CUB-8, CUB-9 (demo), CUB-10, CUB-15, CUB-16, CUB-20, CUB-21, CUB-37 (demo), and CUB-54.

Page 2
Kim Pilarski
10/24/2011

The following resources were assessed by the report's author as eligible for listing: CU-5, CU-26 (listed), CU-110, CU-217, CU-230, CU-231 and CUB-1. We concur with all assessments of eligibility except the following:

- The report table lists CU-264 (Baker Cemetery) as ineligible, but the site description for resource CU-217 indicates that the cemetery may be eligible for the National Register as a contributing element to the Baker Farmstead.
- The photographs of CU-269 in both the existing survey form and the report are insufficient for us to adequately assess what types of changes may have taken place with the condition of the resource since it was last surveyed; therefore, we cannot agree that it is no longer eligible for the National Register.
- We maintain our position that we have insufficient information to comment on eligibility of CU-262 and CU-263 (two cemeteries now combined as the Liberty Baptist Church Cemetery) as above-ground resources; together, they are considered potentially eligible as an archaeological site.

The report acknowledges that there will be visual effects to National Register listed and eligible sites. The author and TVA recommend these effect will not be adverse. Considering the terrain, mature vegetation, and in some cases, other modern intrusions (and including those resources for which concurrence on eligibility cannot be established at this time), we are in agreement with the recommendations for visual effects for all but one site. It is our assessment that there is potential for adverse effect to the setting of CU-5.

At the time the report was written, specific structure offset heights and distances between structures was not known. It may be possible to avoid or sufficiently minimize effects to CU-5 based on where TL structures are actually placed. To continue discussion on this site, or if you have questions regarding these comments, please contact Jill Howe of my staff at (502) 564-7005, extension 121.

Sincerely,

Lindy Casebier
Acting Executive Director and
State Historic Preservation Officer

LC:jh

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STEVEN L. BESHEAR
GOVERNOR

TOURISM, ARTS AND HERITAGE CABINET
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MARCHETA SPARROW
SECRETARY

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LINDY CASEBIER
ACTING EXECUTIVE DIRECTOR AND
STATE HISTORIC PRESERVATION OFFICER

August 16, 2011

Ms. Susan J. Kelly
Tennessee Valley Authority
400 W. Summit Hill Drive
WT 11D – Cultural Resources
Knoxville, Tennessee 37902

RE: ***Phase I Archaeological Survey of the Proposed TVA Burkesville 161-KV Transmission Line Project, Cumberland County, Kentucky*, by Kelly Hockersmith and Ted Karpynec of TRC Environmental Corporation, Nashville, TN**

Ms. Kelly,

This office has received the above mentioned report for review. The report documented two previously unrecorded archaeological sites (15Cu124 and 15Cu125) and three isolated finds. The authors recommend that neither 15Cu124 nor 15Cu125 is eligible for listing on the National Register of Historic Places due to low artifact frequency and lack of depositional integrity. Based on these findings the authors recommend no further archaeological evaluation of the project area. I concur with the authors' recommendations. Therefore, we have no further comments and responsibility to consult with the Kentucky State Historic Preservation Officer regarding archaeology under the Section 106 review process on this project is fulfilled.

Should you have any questions, please contact Phillip Johnson of my staff at (502) 564-7005 ext 122.

Sincerely,

Lindy Casebier, Acting Executive Director
Kentucky Heritage Council and
State Historic Preservation Officer

LC:prj

Cc: Dr. George Crothers (UK-OSA)
Larry McKee (TRC)

From: Ezzell, Patricia Bernard
Sent: Monday, January 23, 2012 2:20 PM
To: Cole, Stephen C
Subject: FW: TVA, PHASE I ARCHAEOLOGICAL SURVEY, BURKESVILLE 161-kV TRANSMISSION LINE (TL) DELIVERY POINT, CUMBERLAND COUNTY, KENTUCKY (KY)

For Burkesville.

From: CHARLES COLEMAN [mailto:chascoleman@prodigy.net]
Sent: Tuesday, July 26, 2011 6:44 AM
To: Ezzell, Patricia Bernard
Subject: Re: TVA, PHASE I ARCHAEOLOGICAL SURVEY, BURKESVILLE 161-kV TRANSMISSION LINE (TL) DELIVERY POINT, CUMBERLAND COUNTY, KENTUCKY (KY)

Pat,

Thlopthlocco Tribal Town has an interest in the area. I have reviewed available Thlopthlocco Historical Data and have determined that your proposed undertaking should have no impact on any known Thlopthlocco historical, cultural, or sacred sites. Thlopthlocco has no objection to the construction.

However; not all of Thlopthlocco's historical, cultural, and sacred sites are known. The Tribe ask that should an inadvertent discovery of American Indian artifacts, or remains occurs that the Tribe be notified.
MTVO

Sincerely

Charles Coleman, THPO
Thlopthlocco Tribal Town

From: "Ezzell, Patricia Bernard" <pbezzell@tva.gov>
To: rallen@cherokee.org; Tyler B. Howe <tylehowe@nc-cherokee.com>; Lisa Larue <llarue@unitedkeetoowahband.org>; aberryhill@muscogeenation-nsn.gov; tisham@muscogeenation-nsn.gov; espain@muscogeenation-nsn.gov; Augustine Asbury <agttcultural@yahoo.com>; CHARLES COLEMAN <chascoleman@prodigy.net>; hlharjo@yahoo.com; hellis@astribe.com; Robin Dushane <RDushane@estoo.net>; Kim Jumper <kimjumper@shawnee-tribe.com>
Cc: russtown@nc-cherokee.com
Sent: Mon, July 25, 2011 8:09:41 PM
Subject: TVA, PHASE I ARCHAEOLOGICAL SURVEY, BURKESVILLE 161-kV TRANSMISSION LINE (TL) DELIVERY POINT, CUMBERLAND COUNTY, KENTUCKY (KY)

Good Day,
I hope this email finds you well. By this email, I am transmitting a letter regarding TVA's proposal to supply power to a proposed new Tri-County Electric Membership Corporation (TCEMC) 161-kV substation in Burkesville, Kentucky, by constructing a single circuit tap line approximately 8.5 miles long from the Wolf Creek HP-Summer Shade #1, 161-kV TL.

Please respond by August 26, 2011, if you have any comments on the proposed undertaking. As always, please contact me if you have any questions.

Sincerely,

Pat

Pat Bernard Ezzell
Program Manager
Tribal Liaison and Corporate Historian
Tennessee Valley Authority
400 W. Summit Hill Drive
460 WT 11D-K
Knoxville, Tennessee 37902
Phone: (865) 632-6461
E-mail: pbezzell@tva.gov

From: Ezzell, Patricia Bernard
Sent: Monday, January 23, 2012 2:21 PM
To: Cole, Stephen C
Subject: FW: TVA, PHASE I ARCHAEOLOGICAL SURVEY, BURKESVILLE 161-kV TRANSMISSION LINE (TL) DELIVERY POINT, CUMBERLAND COUNTY, KENTUCKY (KY)

Burkesville response from UKB

From: Lisa Larue [mailto:llarue@unitedkeetoowahband.org]
Sent: Tuesday, July 26, 2011 8:27 PM
To: Ezzell, Patricia Bernard
Subject: RE: TVA, PHASE I ARCHAEOLOGICAL SURVEY, BURKESVILLE 161-kV TRANSMISSION LINE (TL) DELIVERY POINT, CUMBERLAND COUNTY, KENTUCKY (KY)

The United Keetoowah Band of Cherokee Indians in OKlahoma has no objection to this project. As always, if any inadvertent discoveries are made of human remains, please cease work and contact us immediately. Best ~Lisa

Lisa LaRue

Acting Tribal Historic Preservation Officer

United Keetoowah Band of Cherokee Indians in Oklahoma

918-822-1952

From: Ezzell, Patricia Bernard [mailto:pbezzell@tva.gov]
Sent: Mon 7/25/2011 8:09 PM
To: rallen@cherokee.org; Tyler B. Howe; Lisa Larue; aberryhill@muscogeenation-nsn.gov; tisham@muscogeenation-nsn.gov; espain@muscogeenation-nsn.gov; Augustine Asbury; CHARLES COLEMAN; hlharjo@yahoo.com; hellis@astribe.com; Robin Dushane; Kim Jumper
Cc: russtown@nc-cherokee.com
Subject: TVA, PHASE I ARCHAEOLOGICAL SURVEY, BURKESVILLE 161-kV TRANSMISSION LINE (TL) DELIVERY POINT, CUMBERLAND COUNTY, KENTUCKY (KY)

Good Day,
I hope this email finds you well. By this email, I am transmitting a letter regarding TVA's proposal to supply power to a proposed new Tri-County Electric Membership Corporation (TCEMC) 161-kV substation in Burkesville, Kentucky, by constructing a single circuit tap line approximately 8.5 miles long from the Wolf Creek HP-Summer Shade #1, 161-kV TL.

Please respond by August 26, 2011, if you have any comments on the proposed undertaking. As always, please contact me if you have any questions.

Sincerely,

Pat

Pat Bernard Ezzell
Program Manager
Tribal Liaison and Corporate Historian
Tennessee Valley Authority
400 W. Summit Hill Drive
460 WT 11D-K
Knoxville, Tennessee 37902
Phone: (865) 632-6461
E-mail: pbezzell@tva.gov

Tennessee Valley Authority 400 West Summit Hill Drive, Knoxville, Tennessee 37902-1499

July 21, 2011

Mr. Mark Dennen
State Historic Preservation Officer
and Executive Director
Kentucky Heritage Council
300 Washington Street
Frankfort, Kentucky 40601

Dear Mr. Dennen:

TENNESSEE VALLEY AUTHORITY (TVA), PHASE I ARCHAEOLOGICAL SURVEY, BURKESVILLE 161-kV TRANSMISSION LINE (TL) DELIVERY POINT, CUMBERLAND COUNTY, KENTUCKY (KY)

TVA proposes to supply power to a proposed new Tri-County Electric Membership Corporation (TCEMC) 161-kV substation in Burkesville, Kentucky, by constructing a single circuit tap line approximately 8.5 miles long from the Wolf Creek HP-Summer Shade #1, 161-kV TL. TVA would construct a new access road off of Pine Branch Road in order to provide access to a new switch east of the tap point. TVA identified the area of potential effects (APE) as the 100-ft-wide right of way (ROW) centered on the proposed 8.5 mile long TL, plus the proposed access road for a total area of approximately 103.8 acres.

One previously recorded archaeological site (15CU97) borders the project APE.

TVA contracted with TRC Environmental Corporation to conduct a phase I archaeological survey within the APE. (A phase I architectural survey of the architectural APE is presented under separate cover.) Enclosed are two copies of the draft report titled *Phase I Archaeological Survey of the Proposed TVA Burkesville 161-kV Transmission Line Project, Cumberland County, Kentucky* along with two digital copies on CD. The survey included an examination of that part of 15CU97 that borders the APE.

The archaeological survey identified two previously unrecorded archaeological sites (15CU124 and 15CU125) and three isolated finds (IFs 1-3). TVA finds that both sites and all three isolated finds are ineligible for the National Register of Historic Places (NRHP) due to the small quantity of material present, the relatively shallow and disturbed soil profiles, and the lack of intact cultural horizons or features, all of which indicate a low potential for yielding important scientific information. No cultural materials were identified at the boundary of 16CU97 that borders the project APE. Therefore, TVA finds that no NRHP-listed or eligible archaeological resources are located within the APE.

Pursuant to 36 CFR Part 800.3(f)(2), TVA is consulting with federally recognized Indian tribes regarding historic properties within the proposed project's APE that may be of religious and cultural significance and are eligible for the NRHP.

Mr. Mark Dennen
Page 2
July 21, 2011

TVA has reviewed the enclosed report and agrees with the recommendations of the authors. Pursuant to 36 CFR Part 800.4(d)(1), we are seeking your concurrence with TVA's findings and recommendations that no historic properties would be affected by the proposed undertaking.

If you have any questions or comments, please contact Richard Yarnell in Knoxville, Tennessee, at (865) 632-3463 or by email at wryarnell@tva.gov.

Sincerely,

Susan J. Kelly
Senior Manager and
Federal Preservation Officer
Federal Determinations
LP 5U-C

WRY:JSB:PLS
Enclosures
cc: Cynthia M. Anderson, LP 5D-C
Brenda E. Brickhouse, LP 5U-C
Susan J. Kelly, LP 5U-C
Khurshid K. Mehta, WT 6A-K
Kim Pilarski, WT 11D-K
EDMS, WT 11D-K (Enclosures)

Appendix B – Tennessee Valley Authority Right-of-Way Clearing Specifications

1. General - The clearing contractor shall review the environmental evaluation documents (categorical exclusion checklist, environmental assessment, or environmental impact statement) for the project or proposed activity, along with all clearing and construction appendices, conditions in applicable general and/or site-specific permits, the storm water pollution prevention plan, and any Tennessee Valley Authority (TVA) commitments to property owners. The contractor shall then plan and carry out operations using techniques consistent with good engineering and management practices as outlined in TVA's best management practices (BMPs) manual (Muncy 1992, and revisions thereto). The contractor will protect areas that are to be left unaffected by access or clearing work at and adjacent to all work sites. In sensitive areas and their buffers, the contractor will retain as much native ground cover and other vegetation as possible.

   If the contractor fails to use BMPs or to follow environmental expectations discussed in the prebid or prework meeting or present in contract specifications, TVA will order corrective changes and additional work as deemed necessary in TVA's judgment to meet the intent of environmental laws and regulations or other guidelines. Major violations or continued minor violations will result in work suspension until correction of the situation is achieved or other remedial action is taken at the contractor's expense. Penalty clauses may be invoked as appropriate.

2. Regulations - The clearing contractor shall comply with all applicable federal, state, and local environmental and antipollution laws, regulations, and ordinances including without limitation all air, water, solid and hazardous waste, noise, and nuisance laws, regulations, and ordinances. The contractor shall secure or ensure that TVA has secured all necessary permits or authorizations to conduct work on the acres shown on the drawings and plan and profile for the contract. The contractor's designated project manager will actively seek to prevent, control, monitor, and safely abate all commonly recognized forms of workplace and environmental pollution. Permits or authorizations and any necessary certifications of trained or licensed employees shall be documented with copies submitted to TVA's right-of-way inspector or construction environmental engineer before work begins. The contractor will be responsible for meeting all conditions specified in permits. Permit conditions shall be reviewed in prework discussions.

3. Land and Landscape Preservation - The clearing contractor shall exercise care to preserve the condition of cleared soils by avoiding as much compacting and deep scarring as possible. As soon as possible after initial disturbance of the soil and in accordance with any permit(s) or other state or local environmental regulatory requirements, cover material shall be placed to prevent erosion and sedimentation of water bodies or conveyances to surface water or groundwater. In areas outside the clearing, use, and access areas, the natural vegetation shall be protected from damage. The contractor and his employees must not deviate from delineated access

routes or use areas and must enter the site at designated areas that will be marked. Clearing operations shall be conducted to prevent any unnecessary destruction, scarring, or defacing of the remaining natural vegetation and adjacent surroundings in the vicinity of the work. In sensitive public or environmental areas, appropriate buffer zones shall be observed and the methods of clearing or reclearing modified to protect the buffer and sensitive area. Some areas may require planting native plants or grasses to meet the criteria of regulatory agencies or commitments to special program interests.

4. Streamside Management Zones - The clearing contractor must leave as many rooted ground cover plants as possible in buffer zones along streams and other bodies of water or wet-weather conveyances thereto. In such streamside management zones (SMZ), tall-growing tree species (trees that would interfere with TVA's National Electrical Safety Code clearances) shall be cut, and the stumps may be treated to prevent resprouting. Low-growing trees identified by TVA as marginal electrical clearance problems may be cut, and then stump treated with growth regulators to allow low, slow-growing canopy development and active root growth. Only approved herbicides shall be used, and herbicide application shall be conducted by certified applicators from TVA's Transmission, Operations, and Maintenance (TOM) organization after initial clearing and construction. Cutting of trees within SMZs must be accomplished by using either hand-held equipment or other appropriate clearing equipment, such as a feller-buncher. The method will be selected based on site-specific conditions and topography to minimize soil disturbance and impacts to the SMZ and surrounding area. Disturbed soils in SMZs must be stabilized by appropriate methods immediately after the right-of-way is cleared. Stabilization must occur within the time frame specified in applicable storm water permits or regulations. Stumps within SMZs may be cut close to the ground but must not be removed or uprooted. Trees, limbs, and debris shall be immediately removed from streams, ditches, and wet areas using methods that will minimize dragging or scarring the banks or stream bottom. No debris will be left in the water or watercourse. Equipment will cross streams, ditches, or wet areas only at locations designated by TVA after the application of appropriate erosion control BMPs consistent with permit conditions or regulatory requirements.

5. Wetlands - In forested wetlands, tall trees will be cut near the ground, leaving stumps and roots in place. The cambium may be treated with herbicides applied by certified applicators from the TOM organization to prevent regrowth. Understory trees that must be initially cut and removed may be allowed to grow back or may be treated with tree growth regulators selectively to slow growth and increase the reclearing cycle. The decision will be situationally made based on existing ground cover, wetland type, and tree species since tall tree removal may "release" understory species and allow them to grow quickly to "electrical clearance problem" heights. In many circumstances, herbicides labeled for water and wetland use may be used in reclearing.

6. Sensitive Area Preservation - If prehistoric or historic artifacts or features that might be of archaeological significance are discovered during clearing or reclearing operations, the activity shall immediately cease within a 100-foot radius, and a TVA right-of-way inspector or construction environmental engineer and the Cultural Resources Program manager shall be notified. The site shall be protected and left as found until a determination about the resources, their significance, and site treatment is made by

TVA's Cultural Resources Program. Work may continue beyond the finding zone and the 100-foot radius beyond its perimeter.

7. Water Quality Control - The contractor's clearing and disposal activities shall be performed using BMPs that will prevent erosion and entrance of spillage, contaminants, debris, and other pollutants or objectionable materials into drainage ways, surface water, or groundwater. Special care shall be exercised in refueling equipment to prevent spills. Fueling areas shall be remote from any sinkhole, crevice, stream, or other water body. Open burning debris will be kept away from streams and ditches and shall be incorporated into the soil.

   The clearing contractor will erect and (when TVA or contract construction personnel are unable) maintain BMPs such as silt fences on steep slopes and adjacent to any stream, wetland, or other water body. BMPs will be inspected by the TVA field engineer or other designated TVA or contractor personnel routinely and during periods of high runoff, and any necessary repairs will be made as soon as practicable. BMP inspections will be conducted in accordance with permit requirements. Records of all inspections will be maintained on site, and copies of inspection forms will be forwarded to the TVA construction environmental engineer.

8. Turbidity and Blocking of Streams - If temporary clearing activities must interrupt natural drainage, appropriate drainage facilities and erosion/sediment controls shall be provided to avoid erosion and siltation of streams and other water bodies or water conveyances. Turbidity levels in receiving waters or at storm water discharge points shall be monitored, documented, and reported if required by the applicable permit. Erosion and sediment control measures such as silt fences, water bars, and sediment traps shall be installed as soon as practicable after initial access, site, or right-of-way disturbance in accordance with applicable permit or regulatory requirements.

   Mechanized equipment shall not be operated in flowing water except when approved and, then, only to construct necessary stream crossings under direct guidance of TVA. Construction of stream fords or other crossings will only be permitted at approved locations and to current TVA construction access road standards. Material shall not be deposited in watercourses or within stream bank areas where it could be washed away by high stream flows. Any clearing debris that enters streams or other water bodies shall be removed as soon as possible. Appropriate U.S. Army Corps of Engineers and state permits shall be obtained for stream crossings.

9. Air Quality Control - The clearing or reclearing contractor shall take appropriate actions to limit the amount of air emissions created by clearing and disposal operations to well within the limits of clearing or burning permits and/or forestry or local fire department requirements. All operations must be conducted in a manner that prevents nuisance conditions or damage to adjacent land crops, dwellings, highways, or people.

10. Dust and Mud Control - Clearing activities shall be conducted in a manner that minimizes the creation of fugitive dust. This may require limitations as to type of equipment, allowable speeds, and routes utilized. Control measures such as water, gravel, etc., or similar measures may be used subject to TVA approval. On new construction sites and easements, the last 100 feet before an access road approaches a county road or highway shall be graveled to prevent transfer of mud onto the public road.

11. Burning - The contractor shall obtain applicable permits and approvals to conduct controlled burning. The contractor will comply with all provisions of the permit, notification, or authorization including burning site locations, controlled draft, burning hours, and such other conditions as stipulated. If weather conditions such as wind speed or wind direction change rapidly, the contractor's burning operation may be temporarily stopped by TVA's field engineer. The debris to be burned shall be kept as clean and dry as possible and stacked and burned in a manner that produces the minimum amount of smoke. Residue from burning will be disposed of according to permit stipulations. No fuel starters or enhancements other than kerosene will be allowed.

12. Smoke and Odors - The contractor will properly store and handle combustible and volatile materials that could create objectionable smoke, odor, or fumes. The contractor shall not burn oil or refuse that includes trash, rags, tires, plastics, or other manufactured debris.

13. Vehicle Exhaust Emissions - The contractor shall maintain and operate equipment in a manner that limits vehicle exhaust emissions. Equipment and vehicles will be kept within the manufacturers' recommended limits and tolerances. Excessive exhaust gases will be eliminated, and inefficient operating procedures will be revised or halted until corrective repairs or adjustments are made.

14. Vehicle Servicing - Routine maintenance of personal vehicles will not be performed on the right-of-way. However, if emergency or "have to" situations arise, minimal/temporary maintenance to personal vehicles will occur in order to mobilize the vehicle to an off-site maintenance shop. Heavy equipment will be serviced on the right-of-way, except in designated sensitive areas. The clearing or reclearing contractor will properly maintain these vehicles with approved spill protection controls and countermeasures. If emergency maintenance in a sensitive or questionable area arises, the area environmental coordinator or construction environmental engineer will be consulted. All wastes and used oils will be properly recovered, handled, and disposed/recycled. Equipment shall not be temporarily stored in stream floodplains, whether overnight or on weekends or holidays.

15. Noise Control - The contractor shall take steps to avoid the creation of excessive sound levels for employees, the public, or the site and adjacent property owners. Concentration of individual noisy pieces as well as the hours and locations of operation should be considered.

16. Noise Suppression - All internal combustion engines shall be properly equipped with mufflers. The equipment and mufflers shall be maintained at peak operating efficiency.

17. Sanitation - A designated representative of TVA or the clearing contractor shall contact a sanitary contractor who will provide sanitary chemical toilets convenient to all principal points of operation for every working party. The facilities shall comply with applicable federal, state, or local health laws and regulations. They shall not be located closer than 100 feet to any stream or tributary or to any wetland. The facilities shall be required to have proper servicing and maintenance, and the waste disposal contractor shall verify in writing that the waste disposal will be in state-approved facilities. Employees shall be notified of sanitation regulations and shall be required to use the toilet facilities.

18. Refuse Disposal - The clearing or reclearing contractor shall be responsible for daily cleanup and proper labeling, storage, and disposal of all refuse and debris on the site produced by his operations and employees. Facilities that meet applicable regulations and guidelines for refuse collection will be required. Only approved transport, storage, and disposal areas shall be used.

19. Brush and Timber Disposal (Reclearing) - The reclearing contractor shall place felled tree boles in neat stacks at the edge of the right-of-way, with crossing breaks at least every 100 feet. Property owner requests shall be reviewed with the project manager or right-of-way specialist before accepting them. Lop and drop activities must be specified in the contract and on plan and profile drawings with verification with the right-of-way specialist before conducting such work. When tree trimming and chipping is necessary, disposal of the chips on the easement or other locations on the property must be with the consent of the property owner and the approval of the right-of-way specialist. No trees, branches, or chips shall remain in a surface water body or be placed at a location where washing into a surface water or groundwater source might occur.

20. Brush and Timber Disposal (Initial Clearing) - For initial clearing, trees are commonly part of the contractor's contract to remove as they wish. Trees may be removed from the site for lumber or pulpwood or they may be chipped or stacked and burned. All such activities must be coordinated with the TVA field engineer, and the open burning permits, notifications, and regulatory requirements must be met. Trees may be cut and left in place only in areas specified by TVA and approved by appropriate regulatory agencies. These areas may include sensitive wetlands or SMZs where tree removal would cause excessive ground disturbance or in very rugged terrain where windrowed trees are used as sediment barriers along the edge of the right-of-way.

21. Restoration of Site - All disturbed areas, with the exception of farmland under cultivation and any other areas as may be designated by TVA's specifications, shall be stabilized in the following manner unless the property owner and TVA's engineer specify a different method:

    A. The subsoil shall be loosened to a minimum depth of 6 inches if possible and worked to remove unnatural ridges and depressions.

    B. If needed, appropriate soil amendments will be added.

    C. All disturbed areas will initially be seeded with a temporary ground cover such as winter wheat, rye, or millet, depending on the season. Perennials may also be planted during initial seeding if proper growing conditions exist. Final restoration and final seeding will be performed as line construction is completed. Final seeding will consist of permanent perennial grasses such as those outlined in TVA's *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Transmission Construction and Maintenance Activities.* Exceptions would include those areas designated as native grass planting areas. Initial and final restoration will be performed by the clearing contractor.

    D. TVA holds the option, depending upon the time of year and weather condition, to delay or withdraw the requirement of seeding until more favorable planting conditions are certain. In the meantime, other stabilization techniques must be applied.

Revision April 2007

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Appendix C – Tennessee Valley Authority Environmental Quality Protection Specifications for Transmission Line Construction

1. General – Tennessee Valley Authority (TVA) and/or the assigned contractor shall plan, coordinate, and conduct operations in a manner that protects the quality of the environment and complies with TVA's environmental expectations discussed in the preconstruction meeting. This specification contains provisions that shall be considered in all TVA and contract construction operations. If the contractor fails to operate within the intent of these requirements, TVA will direct changes to operating procedures. Continued violation will result in a work suspension until correction or remedial action is taken by the contractor. Penalties and contract termination will be used as appropriate. The costs of complying with the Environmental Quality Protection Specifications are incidental to the contract work, and no additional compensation will be allowed. At all structure and conductor pulling sites, protective measures to prevent erosion will be taken immediately upon the end of each step in a construction sequence, and those protective measures will be inspected and maintained throughout the construction and right-of-way rehabilitation period.

2. Regulations - TVA and/or the assigned contractor shall comply with all applicable federal, state, and local environmental and antipollution laws, regulations, and ordinances related to environmental protection and prevention, control, and abatement of all forms of pollution.

3. Use Areas - TVA and/or the assigned contractor's use areas include but are not limited to site office, shop, maintenance, parking, storage, staging, assembly areas, utility services, and access roads to the use areas. The construction contractor shall submit plans and drawings for their location and development to the TVA engineer and project manager for approval. Secondary containment will be provided for fuel and petroleum product storage pursuant to 29CFR1910.106(D)(6)(iii)(OSHA).

4. Equipment - All major equipment and proposed methods of operation shall be subject to the approval of TVA. The use or operation of heavy equipment in areas outside the right-of-way, access routes, or structure, pole, or tower sites will not be permitted without permission of the TVA inspector or field engineer. Heavy equipment use on steep slopes (greater than 20 percent) and in wet areas will be held to the minimum necessary to construct the transmission line. Steps will be taken to limit ground disturbance caused by heavy equipment usage, and erosion and sediment controls will be instituted on disturbed areas in accordance with state requirements.

   No subsurface ground-disturbing equipment or stump-removal equipment will be used by construction forces except on access roads or at the actual structure, pole, or tower sites, where only footing locations and controlled runoff diversions shall be created that disturb the soil. All other areas of ground cover or in-place stumps and roots shall remain in place. (Note: Tracked vehicles disturb surface layer of the ground due to size and function.) Some disking of the right-of-way may occur for proper seedbed preparation.

   Unless ponding previously occurred (i.e., existing low-lying areas), water should not be allowed to pond on the structure sites except around foundation holes; the water must

be directed away from the site in as dispersed a manner as possible. At tower or structure sites, some means of upslope interruption of potential overland flow and diversion around the footings should be provided as the first step in construction-site preparation. If leveling is necessary, it must be implemented by means that provide for continuous gentle, controlled, overland flow or percolation. A good grass cover, straw, gravel, or other protection of the surface must be maintained. Steps taken to prevent increases in the moisture content of the in-situ soils will be beneficial both during construction and over the service life of any structure.

5. Sanitation - A designated TVA or contractor representative shall contact a sanitary contractor who will provide sanitary chemical toilets convenient to all principal points of operation for every working party. The facilities shall comply with applicable federal, state, or local health laws and regulations. They shall not be located closer than 100 feet to any stream or tributary or to any wetland. The facilities shall be required to have proper servicing and maintenance, and the waste disposal contractor shall verify in writing that the waste disposal will be in state-approved facilities. Employees shall be notified of sanitation regulations and shall be required to use the toilet facilities.

6. Refuse Disposal - Designated TVA and/or contractor personnel shall be responsible for daily inspection, cleanup, and proper labeling, storage, and disposal of all refuse and debris produced by his operations and by his employees. Suitable refuse collecting facilities will be required. Only state-approved disposal areas shall be used. Disposal containers such as dumpsters or roll-off containers shall be obtained from a proper waste disposal contractor. Solid, special, construction/demolition, and hazardous wastes as well as scrap are part of the potential refuse generated and must be properly managed with emphasis on reuse, recycle, or possible give away, as appropriate, before they are handled as waste. Contractors must meet similar provisions on any project contracted by TVA.

7. Landscape Preservation - TVA and its contractors shall exercise care to preserve the natural landscape in the entire construction area as well as use areas, in or outside the right-of-way, and on or adjacent to access roads. Construction operations shall be conducted to prevent any unnecessary destruction, scarring, or defacing of the natural vegetation and surroundings in the vicinity of the work.

8. Sensitive Areas Preservation - Certain areas on site and along the right-of-way may be designated by the specifications or the TVA engineer as environmentally sensitive. These areas include but are not limited to areas classified as erodible, geologically sensitive, scenic, historical and archaeological, fish and wildlife refuges, water supply watersheds, and public recreational areas such as parks and monuments. Contractors and TVA construction crews shall take all necessary actions to avoid adverse impacts to these sensitive areas and their adjacent buffer zones. These actions may include suspension of work or change of operations during periods of rain or heavy public use; hours may be restricted or concentrations of noisy equipment may have to be dispersed. If prehistoric or historic artifacts or features are encountered during clearing or construction operations, the operations shall immediately cease for at least 100 feet in each direction, and TVA's right-of-way inspector or construction superintendent and Cultural Resources Program shall be notified. The site shall be left as found until a significance determination is made. Work may continue elsewhere beyond the 100-foot perimeter.

9. Water Quality Control - TVA and contractor construction activities shall be performed by methods that will prevent entrance or accidental spillage of solid matter, contaminants, debris, and other objectionable pollutants and wastes into flowing caves, sinkholes, streams, dry watercourses, lakes, ponds, and underground water sources.

   The clearing contractor will erect and (when TVA or contract construction personnel are unable) maintain best management practices (BMPs) such as silt fences on steep slopes and adjacent to any stream, wetland, or other water body. Additional BMPs may be required for areas of disturbance created by construction activities. BMPs will be inspected by the TVA field engineer or other designated TVA or contractor personnel routinely and during periods of high runoff, and any necessary repairs will be made as soon as practicable. BMP inspections will be conducted in accordance with permit requirements. Records of all inspections will be maintained on site, and copies of inspection forms will be forwarded to the TVA construction environmental engineer.

   Acceptable measures for disposal of waste oil from vehicles and equipment shall be followed. No waste oil shall be disposed of within the right-of-way, on a construction site, or on access roads.

10. Turbidity and Blocking of Streams - Construction activities in or near SMZs or other bodies of water shall be controlled to prevent the water turbidity from exceeding state or local water quality standards for that stream. All conditions of a general storm water permit, aquatic resource alteration permit, or a site-specific permit shall be met including monitoring of turbidity in receiving streams and/or storm water discharges and implementation of appropriate erosion and sediment control measures.

    Appropriate drainage facilities for temporary construction activities interrupting natural site drainage shall be provided to avoid erosion. Watercourses shall not be blocked or diverted unless required by the specifications or the TVA engineer. Diversions shall be made in accordance with TVA's *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Transmission Construction and Maintenance Activities.*

    Mechanized equipment shall not be operated in flowing water except when approved and, then, only to construct crossings or to perform required construction under direct guidance of TVA. Construction of stream fords or other crossings will only be permitted at approved locations and to current TVA construction access road standards. Material shall not be deposited in watercourses or within stream bank areas where it could be washed away by high stream flows. Appropriate U.S. Army Corps of Engineers and state permits shall be obtained.

    Wastewater from construction or dewatering operations shall be controlled to prevent excessive erosion or turbidity in a stream, wetland, lake, or pond. Any work or placing of equipment within a flowing or dry watercourse requires the prior approval of TVA.

11. Clearing - No construction activities may clear additional site or right-of-way vegetation or disturb remaining retained vegetation, stumps, or regrowth at locations other than the structure sites and conductor setup areas. TVA and the construction contractor(s) must provide appropriate erosion or sediment controls for areas they have disturbed that have previously been restabilized after clearing operations. Control measures shall be implemented as soon as practicable after disturbance in accordance with applicable federal, state, and/or local storm water regulations.

12. Restoration of Site - All construction disturbed areas, with the exception of farmland under cultivation and any other areas as may be designated by TVA's specifications, shall be stabilized in the following manner unless the property owner and TVA's engineer specify a different method:

    A. The subsoil shall be loosened to a minimum depth of 6 inches if possible and worked to remove unnatural ridges and depressions.

    B. If needed, appropriate soil amendments will be added.

    C. All disturbed areas will initially be seeded with a temporary ground cover such as winter wheat, rye, or millet, depending on the season. Perennials may also be planted during initial seeding if proper growing conditions exist. Final restoration and final seeding will be performed as line construction is completed. Final seeding will consist of permanent perennial grasses such as those outlined in TVA's *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Transmission Construction and Maintenance Activities.* Exceptions would include those areas designated as native grass planting areas. Initial and final restoration will be performed by the clearing contractor.

    D. TVA holds the option, depending upon the time of year and weather condition, to delay or withdraw the requirement of seeding until more favorable planting conditions are certain. In the meantime, other stabilization techniques must be applied.

13. Air Quality Control - Construction crews shall take appropriate actions to minimize the amount of air pollution created by their construction operations. All operations must be conducted in a manner that avoids creating a nuisance and prevents damage to lands, crops, dwellings, or persons.

14. Burning - Before conducting any open burning operations, the contractor shall obtain permits or provide notifications as required to state forestry offices and/or local fire departments. Burning operations must comply with the requirements of state and local air pollution control and fire authorities and will only be allowed in approved locations and during appropriate hours and weather conditions. If weather conditions such as wind direction or speed change rapidly, the contractor's burning operations may be temporarily stopped by the TVA field engineer. The debris for burning shall be piled and shall be kept as clean and as dry as possible, then burned in such a manner as to reduce smoke. No materials other than dry wood shall be open burned. The ash and debris shall be buried away from streams or other water sources and shall be in areas coordinated with the property owner.

15. Dust and Mud Control - Construction activities shall be conducted to minimize the creation of dust. This may require limitations as to types of equipment, allowable speeds, and routes utilized. Water, straw, wood chips, dust palliative, gravel, combinations of these, or similar control measures may be used subject to TVA's approval. On new construction sites and easements, the last 100 feet before an access road approaches a county road or highway shall be graveled to prevent transfer of mud onto the public road.

16. Vehicle Exhaust Emissions - TVA and/or the contractors shall maintain and operate equipment to limit vehicle exhaust emissions. Equipment and vehicles that show

excessive emissions of exhaust gasses and particulates due to poor engine adjustments or other inefficient operating conditions shall not be operated until corrective repairs or adjustments are made.

17. Vehicle Servicing - Routine maintenance of personal vehicles will not be performed on the right-of-way. However, if emergency or "have to" situations arise, minimal/temporary maintenance to personal vehicles will occur in order to mobilize the vehicle to an off-site maintenance shop. Heavy equipment will be serviced on the right-of-way except in designated sensitive areas. The Heavy Equipment Department within TVA or the construction contractor will properly maintain these vehicles with approved spill prevention controls and countermeasures. If emergency maintenance in a sensitive or questionable area arises, the area environmental coordinator or construction environmental engineer will be consulted. All wastes and used oils will be properly recovered, handled, and disposed/recycled. Equipment shall not be temporarily stored in stream floodplains, whether overnight or on weekends or holidays.

18. Smoke and Odors - TVA and/or the contractors shall properly store and handle combustible material that could create objectionable smoke, odors, or fumes. The contractor shall not burn refuse such as trash, rags, tires, plastics, or other debris.

19. Noise Control - TVA and/or the contractor shall take measures to avoid the creation of noise levels that are considered nuisances, safety, or health hazards. Critical areas including but not limited to residential areas, parks, public use areas, and some ranching operations will require special considerations. TVA's criteria for determining corrective measures shall be determined by comparing the noise level of the construction operation to the background noise levels. In addition, especially noisy equipment such as helicopters, pile drivers, air hammers, chippers, chain saws, or areas for machine shops, staging, assembly, or blasting may require corrective actions when required by TVA.

20. Noise Suppression - All internal combustion engines shall be properly equipped with mufflers as required by the Department of Labor's *Safety and Health Regulations for Construction*. TVA may require spark arresters in addition to mufflers on some engines. Air compressors and other noisy equipment may require sound-reducing enclosures in some circumstances.

21. Damages - The movement of construction crews and equipment shall be conducted in a manner that causes as little intrusion and damage as possible to crops, orchards, woods, wetlands, and other property features and vegetation. The contractor will be responsible for erosion damage caused by his actions and especially for creating conditions that would threaten the stability of the right-of-way or site soil, the structures, or access to either. When property owners prefer the correction of ground cover condition or soil and subsoil problems themselves, the section of the contract dealing with damages will apply.

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Appendix D – Tennessee Valley Authority Transmission Construction Guidelines Near Streams

Even the most carefully designed transmission line project eventually will affect one or more creeks, rivers, or other type of water body. These streams and other water areas are protected by state and federal law, generally support some amount of fishing and recreation, and, occasionally, are homes for important and/or endangered species. These habitats occur in the stream and on strips of land along both sides (the streamside management zone [SMZ]) where disturbance of the water, land, or vegetation could have an adverse effect on the water or stream life. The following guidelines have been prepared to help Tennessee Valley Authority (TVA) Transmission Construction staff and their contractors avoid impacts to streams and stream life as they work in and near SMZs. These guidelines expand on information presented in *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Construction and Maintenance Activities.*

Three Levels of Protection

During the preconstruction review of a proposed transmission line, TVA Environmental Stewardship and Policy staff will have studied each possible stream impact site and will have identified it as falling into one of three categories: (A) standard stream protection, (B) protection of important permanent streams, or (C) protection of unique habitats. These category designations are based on the variety of species and habitats that exist in the stream as well as state and federal requirements to avoid harming certain species. The category designation for each site will be marked on the plan and profile sheets. Construction crews are required to protect streams and other identified water habitats using the following pertinent set(s) of guidelines:

(A) Standard Stream Protection

This is the standard (basic) level of protection for streams and the habitats around them. The purpose of the following guidelines is to minimize the amount and length of disturbance to the water bodies without causing adverse impacts on the construction work.

Guidelines:

1. All construction work around streams will be done using pertinent best management practices (BMPs) such as those described in *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Construction and Maintenance Activities,* especially Chapter 6, “Standards and Specifications.”

2. All equipment crossings of streams must comply with appropriate state permitting requirements. Crossings of all drainage channels, intermittent streams, and permanent streams must be done in ways that avoid erosion problems and long-term changes in water flow. Crossings of any permanent streams must allow for natural movement of fish and other aquatic life.

3. Cutting of trees within SMZs must be accomplished by using either hand-held equipment or other appropriate clearing equipment (e.g., a feller-buncher) that would result in minimal soil disturbance and damage to low-lying vegetation. The

method will be selected based on site-specific conditions and topography to minimize soil disturbance and impacts to the SMZ and surrounding area. Stumps can be cut close to ground level but must not be removed or uprooted.

4. Other vegetation near streams must be disturbed as little as possible during construction. Soil displacement by the actions of plowing, disking, blading, or other tillage or grading equipment will not be allowed in SMZs; however, a minimal amount of soil disturbance may occur as a result of clearing operations. Shorelines that have to be disturbed must be stabilized as soon as feasible.

(B) Protection of Important Permanent Streams

This category will be used when there is one or more specific reason(s) why a permanent (always-flowing) stream requires protection beyond that provided by standard BMPs. Reasons for requiring this additional protection include the presence of important sports fish (trout, for example) and habitats for federal endangered species. The purpose of the following guidelines is to minimize the disturbance of the banks and water in the flowing stream(s) where this level of protection is required.

Guidelines:

1. Except as modified by guidelines 2-4 below, all construction work around streams will be done using pertinent BMPs such as those described in *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Construction and Maintenance Activities,* especially Chapter 6, “Standards and Specifications.”

2. All equipment crossings of streams must comply with appropriate state (and, at times, federal) permitting requirements. Crossings of drainage channels and intermittent streams must be done in ways that avoid erosion problems and long-term changes in water flow. Proposed crossings of permanent streams must be discussed in advance with Environmental Stewardship and Policy staff and may require an on-site planning session before any work begins. The purpose of these discussions will be to minimize the number of crossings and their impact on the important resources in the streams.

3. Cutting of trees within SMZs must be accomplished by using either hand-held equipment or other appropriate clearing equipment (e.g., a feller-buncher) that would result in minimal soil disturbance and damage to low-lying vegetation. The method will be selected based on site-specific conditions and topography to minimize soil disturbance and impacts to the SMZ and surrounding area. Cutting of trees near permanent streams must be limited to those required to meet National Electrical Safety Code and danger tree requirements. Stumps can be cut close to ground level but must not be removed or uprooted.

4. Other vegetation near streams must be disturbed as little as possible during construction. Soil displacement by the actions of plowing, disking, blading, or other tillage or grading equipment will not be allowed in SMZs; however, a minimal amount of soil disturbance may occur as a result of clearing operations. Shorelines that have to be disturbed must be stabilized as soon as possible and revegetated as soon as feasible.

(C) Protection of Unique Habitats

This category will be used when, for one or more specific reasons, a temporary or permanent aquatic habitat requires special protection. This relatively uncommon level of protection will be appropriate and required when a unique habitat (for example, a particular spring run) or protected species (for example, one that breeds in a wet-weather ditch) is known to occur on or adjacent to the construction corridor. The purpose of the following guidelines is to avoid or minimize any disturbance of the unique aquatic habitat.

Guidelines:

1. Except as modified by Guidelines 2-4 below, all construction work around the unique habitat will be done using pertinent BMPs such as those described in *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Construction and Maintenance Activities,* especially Chapter 6, "Standards and Specifications."

2. All construction activity in and within 30 meters (100 feet) of the unique habitat must be approved in advance by Environmental Stewardship and Policy staff, preferably as a result of an on-site planning session. The purpose of this review and approval will be to minimize impacts on the unique habitat. All crossings of streams also must comply with appropriate state (and, at times, federal) permitting requirements.

3. Cutting of trees within 30 meters (100 feet) of the unique habitat must be discussed in advance with Environmental Stewardship and Policy staff, preferably during the on-site planning session. Cutting of trees near the unique habitat must be kept to an absolute minimum. Stumps must not be removed, uprooted, or cut shorter than 0.30 meter (1 foot) above the ground line.

4. Other vegetation near the unique habitat must be disturbed as little as possible during construction. The soil must not be disturbed by plowing, disking, blading, or grading. Areas that have to be disturbed must be stabilized as soon as possible and revegetated as soon as feasible, in some cases with specific kinds of native plants. These and other vegetative requirements will be coordinated with Environmental Stewardship and Policy staff.

Additional Help

If you have questions about the purpose or application of these guidelines, please contact your supervisor or the environmental coordinator in the local Transmission Service Center.

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Comparison of Guidelines Under the Three Stream and Water Body Protection Categories (page 1)

Guidelines	A: Standard	B: Important Permanent Streams	C: Unique Water Habitats
1. Reference	• All TVA construction work around streams will be done using pertinent BMPs such as those described in *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Construction and Maintenance Activities,* especially Chapter 6, BMP "Standards and Specifications."	Except as modified by guidelines 2-4 below, all construction work around streams will be done using pertinent BMPs such as those described in *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Construction and Maintenance Activities,* especially Chapter 6, BMP "Standards and Specifications."	• Except as modified by guidelines 2-4 below, all construction work around the unique habitat will be done using pertinent BMPs such as those described in *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Construction and Maintenance Activities,* especially Chapter 6, BMP "Standards and Specifications."
2. Equipment Crossings	• All crossings of streams must comply with appropriate state and federal permitting requirements. • Crossings of all drainage channels, intermittent streams, and permanent streams must be done in ways that avoid erosion problems and long-term changes in water flow. • Crossings of any permanent streams must allow for natural movement of fish and other aquatic life.	• All crossings of streams must comply with appropriate state and federal permitting requirements. • Crossings of drainage channels and intermittent streams must be done in ways that avoid erosion problems and long-term changes in water flow. • Proposed crossings of permanent streams must be discussed in advance with Environmental Stewardship and Policy staff and may require an on-site planning session before any work begins. The purpose of these discussions will be to minimize the number of crossings and their impact on the important resources in the streams.	• All crossings of streams also must comply with appropriate state and federal permitting requirements. • All construction activity in and within 30 meters (100 feet) of the unique habitat must be approved in advance by Environmental Stewardship and Policy staff, preferably as a result of an on-site planning session. The purpose of this review and approval will be to minimize impacts on the unique habitat.

Comparison of Guidelines Under the Three Stream and Water Body Protection Categories (page 2)

Guidelines	A: Standard	B: Important Permanent Streams	C: Unique Water Habitats
3. **Cutting Trees**	• Cutting of trees within SMZs must be accomplished by using either hand-held equipment or other appropriate clearing equipment (e.g., a feller-buncher) that would result in minimal soil disturbance and damage to low-lying vegetation. The method will be selected based on site-specific conditions and topography to minimize soil disturbance and impacts to the SMZ and surrounding area. • Stumps can be cut close to ground level but must not be removed or uprooted.	• Cutting of trees with SMZs must be accomplished by using either hand-held equipment or other appropriate clearing equipment (e.g., a feller-buncher) that would result in minimal soil disturbance and damage to low-lying vegetation. The method will be selected based on site-specific conditions and topography to minimize soil disturbance and impacts to the SMZ and surrounding area. • Cutting of trees near permanent streams must be limited to those meeting National Electrical Safety Code and danger tree requirements. • Stumps can be cut close to ground level but must not be removed or uprooted.	• Cutting of trees within 30 meters (100 feet) of the unique habitat must be discussed in advance with Environmental Stewardship and Policy staff, preferably during the on-site planning session. Cutting of trees near the unique habitat must be kept to an absolute minimum. • Stumps must not be removed, uprooted, or cut shorter than 1 foot above the ground line.
4. **Other Vegetation**	• Other vegetation near streams must be disturbed as little as possible during construction. • Soil displacement by the actions of plowing, disking, blading, or other tillage or grading equipment will not be allowed in SMZs; however, a minimal amount of soil disturbance may occur as a result of clearing operations. • Shorelines that have to be disturbed must be stabilized as soon as feasible.	• Other vegetation near streams must be disturbed as little as possible during construction. • Soil displacement by the actions of plowing, disking, blading, or other tillage or grading equipment will not be allowed in SMZs; however, a minimal amount of soil disturbance may occur as a result of clearing operations. • Shorelines that have to be disturbed must be stabilized as soon as possible and revegetated as soon as feasible.	• Other vegetation near the unique habitat must be disturbed as little as possible during construction. • The soil must not be disturbed by plowing, disking, blading, or grading. • Areas that have to be disturbed must be stabilized as soon as possible and revegetated as soon as feasible, in some cases with specific kinds of native plants. These and other vegetative requirements will be coordinated with Environmental Stewardship and Policy staff.

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Appendix E – Tennessee Valley Authority Environmental Protection Procedures Right-of-Way Vegetation Management Guidelines

1.0 Overview

A. The Tennessee Valley Authority (TVA) must manage the vegetation on its rights-of-way and easements to ensure emergency maintenance access and routine access to structures, switches, conductors, and communications equipment. In addition, TVA must maintain adequate clearance, as specified by the National Electrical Safety Code, between conductors and tall-growing vegetation and other objects. This requirement applies to vegetation within the right-of-way as well as to trees located off the right-of-way.

B. Each year TVA assesses the conditions of the vegetation on and along its rights-of-way. This is accomplished by aerial inspections, periodic field inspections, aerial photography, and information from TVA personnel, property owners, and the general public. Important information gathered during these assessments includes the coverage by various vegetation types, the mix of plant species, the observed growth, the seasonal growing conditions, and the density of the tall vegetation. TVA also evaluates the proximity, height, and growth rate of trees adjacent to the right-of-way that may be a danger to the line or structures.

C. TVA right-of-way specialists develop a vegetation reclearing plan that is specific to each line segment and is based on terrain conditions, species mix, growth, and density.

2.0 Right-of-Way Management Options

A. TVA uses an integrated vegetation management approach. In farming areas, TVA encourages property owner management of the right-of-way using low-growing crops. In dissected terrain with rolling hills and interspersed woodlands, TVA uses mechanical mowing to a large extent.

B. When slopes become hazardous to farm tractors and rotary mowers, TVA may use a variety of herbicides specific to the species present with a variety of possible application techniques. When scattered small stands of tall-growing vegetation are present and access along the right-of-way is difficult or the path to such stands is very long, herbicides may be used.

C. In very steep terrain, in sensitive environmental areas, in extensive wetlands, at stream banks, and in sensitive property owner land use areas, hand clearing may be utilized. Hand clearing is recognized as one of the most hazardous occupations documented by the Occupational Safety and Health Administration. For that reason, TVA is actively looking at better control methods, including use of low-volume herbicide applications, occasional single tree injections, and tree growth regulators (TGRs).

D. TVA does not encourage tree reclearing by individual property owners because of the high hazard potential of hand clearing, possible interruptions of the line, and electrical safety considerations for untrained personnel that might do the work. Private property owners may reclear the right-of-way with trained reclearing professionals.

E. Mechanical mowers not only cut the tall saplings and seedlings on the right-of-way, they also shatter the stump and the supporting near-surface root crown. The tendency of resistant species is to resprout from the root crown, and shattered stumps can produce a multistem dense stand in the immediate area. Repeated use of mowers on short cycle reclearing with many original stumps regrowing in the above manner can create a single species thicket or monoculture. With the original large root system and multiple stems, the resistant species can produce regrowth at the rate of 5-10 feet in a year. In years with high rainfall, the growth can reach 12-15 feet in a single year. These dense, monoculture stands can become nearly impenetrable for even large tractors. Such stands have low diversity and little wildlife food or nesting potential and become a property owner's concern. Selective herbicide application may be used to control monoculture stands.

F. TVA encourages property owners to sign an agreement to manage rights-of-way on their land for wildlife under the auspices of "Project Habitat," a joint project by TVA, BASF, and wildlife organizations, e.g., National Wild Turkey Federation, Quail Unlimited, and Buckmasters. The property owner maintains the right-of-way in wildlife food and cover with emphasis on quail, turkey, deer, or other wildlife. A variation used in or adjacent to developing suburban areas is to sign agreements with the developer and residents to plant and maintain wildflowers on the right-of-way.

G. TVA places strong emphasis on managing rights-of-way in the above manner. When the property owners do not agree to these opportunities, TVA must maintain the right-of-way in the most environmentally acceptable, cost-effective, and efficient manner possible.

3.0 Herbicide Program

A. TVA has worked with universities (such as Mississippi State University, University of Tennessee, Purdue University, and others), chemical manufacturers, other utilities, U.S. Department of Transportation, U.S. Fish and Wildlife Service (USFWS), and U.S. Forest Service (USFS) personnel to explore options for vegetation control. The results have been strong recommendations to use species-specific, low-volume herbicide applications in more situations. Research, demonstrations, and other right-of-way programs show a definite improvement of rights-of-way treated with selective low-volume applications of new herbicides using a variety of application techniques and timing. Table 1 below identifies herbicides currently used on bare ground areas on TVA rights-of-way and in substations. Table 3 identifies TGRs that may be used on tall trees that have special circumstances that require trimming on a regular cycle. The rates of application utilized are those listed on the USEPA-approved label and consistent with utility standard practice throughout the Southeast.

Table 1 - Herbicides Currently Used on TVA Rights-of-Way

Trade Name	Active Ingredients	Label Signal Word
Accord	Glyphosate/Liquid	Caution
Arsenal	Imazapyr/Liquid/Granule	Caution
Chopper	Imazapyr/RTU	Caution
Escort	Metsulfuron Methyl/Dry Flowable	Caution
Garlon	Triclopyr/Liquid	Caution
Garlon 3A	Triclopyr/Liquid	Danger
Krenite S	Fosamine Ammonium	Caution
Pathfinder II	Triclopyr/RTU	Caution
Roundup	Glyphosate/Liquid	Caution
Roundup Pro	Glyphosate	Caution
Spike 20P	Tebuthiuron	Caution
Transline	Clopyralid/Liquid	Caution

Table 2 - Preemergent Herbicides Currently Used for Bare Ground Areas on TVA Rights-of-Way and Substations

Trade Name	Active Ingredients	Label Signal Word
Sahara	Diuron/Imazapyr	Caution
SpraKil SK-26	Tebuthiuron and Diuron	Caution
Topsite	Diuron/Imazapyr	Caution

Table 3 - Tree Growth Regulators (TGRs) Currently Used on TVA Rights-of-Way

Trade Name	Active Ingredients	Label Signal Word
Profile 2SC	TGR-paclobutrazol	Caution
TGR	Flurprimidol	Caution

B. The herbicides listed in Tables 1 and 2 and TGRs listed in Table 3 have been evaluated in extensive studies in support of registration applications and label requirements. Many have been reviewed in the USFS vegetation management environmental impact statements (EISs), and those evaluations are incorporated here by reference (USFS 1989a, 1989b, 2002a, and 2002b). Electronic copies can be accessed at http://www.fs.fed.us/r8/planning/documents/vegmgmt/. The result of these reviews has been a consistent finding of limited environmental impact beyond that of control of the target vegetation. All the listed herbicides have been found to be of low environmental toxicity when applied by trained applicators following the label and registration procedures, including prescribed measures, such as buffer zones, to protect threatened and endangered species.

C. Low-volume herbicide applications are recommended since research demonstrates much wider plant diversity after such applications. There is better ground erosion protection, and more wildlife food plants and cover plants develop. In most situations, there is increased development of wild flowering plants and shrubs. In

conjunction with herbicides, the diversity and density of low-growing plants provide control of tall-growing species through competition.

D. Wildlife managers often request the use of herbicides in place of rotary mowing in order to avoid damage to nesting and tunneling wildlife. This method retains ground cover year-round with a better mix of food species and associated high-protein insect populations for birds in the right seasons. Most also report less damage to soils (even when compared with rubber-tired equipment).

E. Property owners interested in tree production often request the use of low-volume applications rather than hand- or mechanical clearing because of the insect and fungus problems in damaged vegetation and debris left on the right-of-way. The insect and fungus invasions, such as pine tip moth, oak leaf blight, sycamore and dogwood blight, etc., are becoming widespread across the nation.

F. Best management practices (BMPs) governing application of herbicides are contained within *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Transmission Construction and Maintenance Activities* (Muncy 1999), which is incorporated by reference. Herbicides can be liquid, granular, or powder and can be applied aerially or by ground equipment and may be selectively applied or broadcast, depending on the site requirements, species present, and condition of the vegetation. Water quality considerations include measures taken to keep herbicides from reaching streams whether by direct application or through runoff of or flooding by surface water. “Applicators” must be trained, licensed, and follow manufacturers’ label instructions, U.S. Environmental Protection Agency (USEPA) guidelines, and respective state regulations and laws.

G. When herbicides are used, their potential adverse impacts are considered in selecting the compound, formulation, and application method. Herbicides that are designated “Restricted Use” by USEPA require application by or under the supervision of applicators certified by the respective state control board. Aerial and ground applications are either done by TVA or by contractors in accordance with the following guidelines identified in TVA’s BMPs manual (Muncy 1999):

1. The sites to be treated are selected and application directed by the appropriate TVA official.

2. A preflight walking or flying inspection is made within 72 hours prior to applying herbicides aerially. This inspection ensures that no land use changes have occurred, that sensitive areas are clearly identified to the pilot, and that buffer zones are maintained.

3. Aerial application of liquid herbicides will normally not be made when surface wind speeds exceed 5 miles per hour, in areas of fog, or during periods of temperature inversion.

4. Pellet application will normally not be made when the surface wind speeds exceed 10 miles per hour or on frozen or water-saturated soils.

5. Liquid application is not performed when the temperature reaches 95 degrees Fahrenheit or above.

6. Application during unstable, unpredictable, or changing weather patterns is avoided.

7. Equipment and techniques are used that are designed to ensure maximum control of the spray swath with minimum drift.

8. Herbicides are not applied to surface water or wetlands unless specifically labeled for aquatic use. Filter and buffer strips will conform at least to federal and state regulations and any label requirements. The use of aerial or broadcast application of herbicides is not allowed within a streamside management zone (SMZs) (200 feet minimum width) adjacent to perennial streams, ponds, and other water sources. Hand application of certain herbicides labeled for use within SMZs is used only selectively.

9. Buffers and filter strips (200 feet minimum width) are maintained next to agricultural crops, gardens, farm animals, orchards, apiaries, horticultural crops, and other valuable vegetation.

10. Herbicides are not applied in the following areas or times: (a) in city, state, and national parks or forests or other special areas without written permission and/or required permits, (b) off the right-of-way, and (c) during rainy periods or during the 48-hour interval prior to rainfall predicted with a 20 percent or greater probability by local forecasters, when soil active herbicides are used.

H TVA currently utilizes Activate Plus, manufactured by Terra, as an adjuvant to herbicides to improve the performance of the spray mixture. Application rates are consistent with the USEPA-approved label. The USFWS has expressed some concern on toxicity effects of surfactants on aquatic species. TVA is working in coordination with Mississippi State University and chemical companies to evaluate efficacy of additional low-toxicity surfactants, including LI700 as manufactured by Loveland Industries, through side-by-side test plots in the SMZs of area transmission lines.

I. TVA currently uses primarily low-volume applications of foliar and basal applications of Accord (glyphosate) and Accord- (glyphosate) Arsenal (imazapyr) tank mixes. Glyphosate is one of the most widely used herbicidal active ingredients in the world and has been continuously the subject of numerous exhaustive studies and scrutiny to determine its potential impacts on humans, animals, and the environment.

4.0 References

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Appendix F – Stream Crossings Along the Proposed Burkesville, KY 161-kV Transmission Line and Access Roads in Cumberland County, Kentucky

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Table F. Stream Crossings Along the Proposed Burkesville, KY 161-kV Transmission Line Route in Cumberland County, Kentucky

Stream Identification	Stream Type	Streamside Management Zone Category	Stream Name	Field Notes
001	Intermittent	Category A (50 feet)	Unnamed Tributary to the Strange Branch	5-foot-wide x 3-foot-deep channel with cobble/bedrock substrate.
002	Intermittent	Category A (50 feet)	Unnamed Tributary to the Strange Branch	8-foot-wide x 3-foot-deep channel with cobble/bedrock substrate.
003	Perennial	Category A (100 feet RDB/50 feet LDB)	Unnamed Tributary to the Strange Branch	6-foot-wide x 4-foot-deep channel with cobble/bedrock substrate. Crayfish observed.
004	Perennial	Category A (50 feet RDB/ 100 feet LDB)	Unnamed Tributary to Big Renox Creek	3-foot-wide x 3-foot-deep channel with sand/gravel substrate. Frogs observed.
005	Perennial	Category A (50 feet)	Big Renox Creek	Approximately 40-foot-wide x 4-foot-deep channel with bedrock substrate. Fish observed.
006	Other	Category A (50 feet)	N/A	Pond.
007	Perennial	Category A (100 feet RDB/50 feet LDB)	Little Renox Creek	Approximately 20-foot-wide x 5-foot-deep channel with bedrock substrate. Fish observed.
008	Intermittent	Category A (50 feet)	Unnamed Tributary to Little Renox Creek	15-foot-wide x 1-foot-deep channel with bedrock substrate.
009	Perennial	Category A (100 feet RDB/50 feet LDB)	Lewis Creek	12-foot-wide x 3-foot-deep channel with bedrock substrate.
010	Intermittent	Category A (50 feet)	Unnamed Tributary to Lewis Creek	8-foot-wide x 3-foot-deep channel with bedrock substrate.
011	Intermittent	Category A (50 feet)	Unnamed Tributary to Lewis Creek	4-foot-wide x 4-foot-deep channel with mud substrate. Cattle in stream.
012	Intermittent	Category A (50 feet)	Unnamed Tributary to Haggard Branch	6-foot-wide x 6-foot-deep channel with bedrock substrate. Cattle in stream
013	Intermittent	Category A (50 feet)	Unnamed Tributary to Haggard Branch	3-foot-wide x 1-foot-deep channel south of State Route 90.
014	Intermittent	Category A (50 feet)	Unnamed Tributary to Haggard Branch	3-foot-wide x 1-foot-deep channel with well defined bed and bank. Tractor crossing in ROW.
015	Intermittent	Category A (50 feet)	Haggard Branch	5-foot-wide x 2-foot-deep channel. Heavy deposits of gravel in ROW.

Stream Identification	Stream Type	Streamside Management Zone Category	Stream Name	Field Notes
001AR	Perennial	Category C (100 feet)	Spring	Small channel with bedrock substrate feeding 002AR.
002AR	Perennial	Category A (50 feet)	Unnamed Tributary to the Strange Branch	6-foot-wide x 2-foot-deep channel with bedrock substrate. Same stream as 003.
003AR	Perennial	Category A (50 feet)	Unnamed Tributary to the Strange Branch	3-foot-wide x 2-foot-deep pond discharge with channel.
004AR	Other	Category A (50 feet)	Pond	Farm Pond
005AR	Perennial	Category A (50 feet)	Unnamed	4-foot-wide x 4-foot-deep channel with clay substrate. Outflow from pond.
006AR	Intermittent	Category A (50 feet)	Unnamed Tributary to Little Renox Creek	5-foot-wide x 3-foot-deep channel with bedrock substrate
007AR	Other	Category A (50 feet)	Pond	Farm Pond
008AR	Intermittent	Category A (50 feet)	Unnamed Tributary to Lewis Creek	5-foot-wide x 2-foot-deep channel with bedrock substrate
009AR	Intermittent	Category A (50 feet)	Unnamed Tributary to Lewis Creek	4-foot-wide x 1-foot-deep channel with bedrock substrate
010AR	Intermittent	Category A (50 feet)	Unnamed Tributary to Lewis Creek	4-foot-wide x 4-foot-deep channel with mud/gravel/cobble/bedrock substrate. Cattle in creek causing bank erosion.