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PLATEAU 500-KV SUBSTATION
ENVIRONMENTAL ASSESSMENT
Cumberland County, Tennessee

Prepared by:
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ACRONYMS, ABBREVIATIONS, AND GLOSSARY OF TERMS USED

APE	Area of potential effect
BMPs	Best management practices or accepted construction practices designed to reduce environmental effects
conductors	Cables that carry electrical current
danger tree	A tree located outside the right-of-way that could pose a threat of grounding a line if allowed to fall near a transmission line or a structure
EA	Environmental Assessment
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
endangered species	A species in danger of extinction throughout all or a significant part of its range
EO	Executive Order
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 is used to prevent trees from falling into sensitive areas, such as a wetland
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
hydric soil	A soil that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop conditions of having no free oxygen available in the upper part.
hydrophytic vegetation	Aquatic and wetland plants that have developed physiological adaptations allowing a greater tolerance to saturated soil conditions including with limited or absence of oxygen.
kV	Symbol for kilovolt (1 kV equals 1,000 volts)
load	That portion of the entire electric power in a network consumed within a given area; also synonymous with “demand” in a given area
MOA	Memorandum of Agreement
n.d.	Indicates “no date” or unknown date of Web access
NEPA	National Environmental Policy Act
NERC	North American Electric Reliability Corporation
NRCS	National Resource Conservation Service
outage	An interruption of the electric power supply to a user
riparian	Related to or located on the banks of a river or stream
ROC	Regional Operations Center
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	Streamside management zone
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
SOC	System Operations Center
switch	A device used to complete or break an electrical connection
threatened species	A species likely to become endangered within the foreseeable future
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
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
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

CHAPTER 1

1.0 PURPOSE OF AND NEED FOR ACTION

1.1 Proposed Action – Improve Power Supply

The Tennessee Valley Authority (TVA) proposes to improve the existing power supply system in Cumberland and Putnam Counties, Tennessee and surrounding areas by constructing and operating a new 500-kilovolt (kV) substation near Monterey, Tennessee (Figure 1-1). The proposed substation would be called the Plateau 500-kV Substation. The proposed substation site encompasses approximately 73 acres, of which approximately 25 acres would be needed for the 500-kV substation and transmission line connections.

The proposed substation would be connected to the adjacent existing Roane-Wilson 500-kV and Monterey-Peavine 161-kV transmission lines. TVA would retire Structure 171 of the Monterey-Peavine 161-kV Transmission Line and Structure 296 of the Roane-Wilson 500-kV Transmission Line, and install new structures, conductors, and associated overhead ground wires to create a loop. The transmission line connections, all less than 800 feet in length, would be on the proposed site property boundary.

TVA would upgrade communications and replace relay equipment at the Peavine 161-kV Switching Station, as well as the Monterey 161-kV, Wilson 500-kV, and Roane 500-kV substations. The TVA map board displays would be updated to reflect the new transmission assets. The proposed substation and associated transmission line connections would be complete by December 2019.

1.2 Need for the Proposed Action

TVA plans its transmission system according to mandatory and enforceable North American Electric Reliability Corporation (NERC) Standards for Transmission Planning. These standards state that the Bulk Transmission System[1] must be planned to operate reliably over a broad spectrum of system conditions and following a wide range of probable conditions and circumstances with no loss of electric load.

TVA supplies bulk electric power to Cumberland and Putnam Counties and surrounding areas in central Tennessee through an existing infrastructure network of 26 161-kV substations and 28 161-kV transmission lines. Population in this area has grown at a rate of almost 1.8 percent per year since 2000. However, current load forecasts have shown that load growth has slowed somewhat in recent years. Based on these forecasts, TVA studies indicate that 19 of these substations will not meet acceptable voltage criteria by 2019, and the remaining seven substations will be unable to meet criteria by 2022. Five of the 161-kV transmission lines are expected to become overloaded by summer 2019, and 11 more lines are likely to be overloaded by summer 2022. Long-range studies indicate that either a 500-kV source or extensive upgrades to existing 161-kV facilities will be required in Cumberland and Putnam Counties and surrounding areas by 2019 to ensure the reliable transmission of electric power.

[1] As used here, the bulk transmission system or bulk power system refers to the facilities and control systems necessary for operating an interconnected electric energy transmission network, as well as the electric energy (i.e., bulk electric power) from generation facilities needed to maintain the reliability of that transmission system.

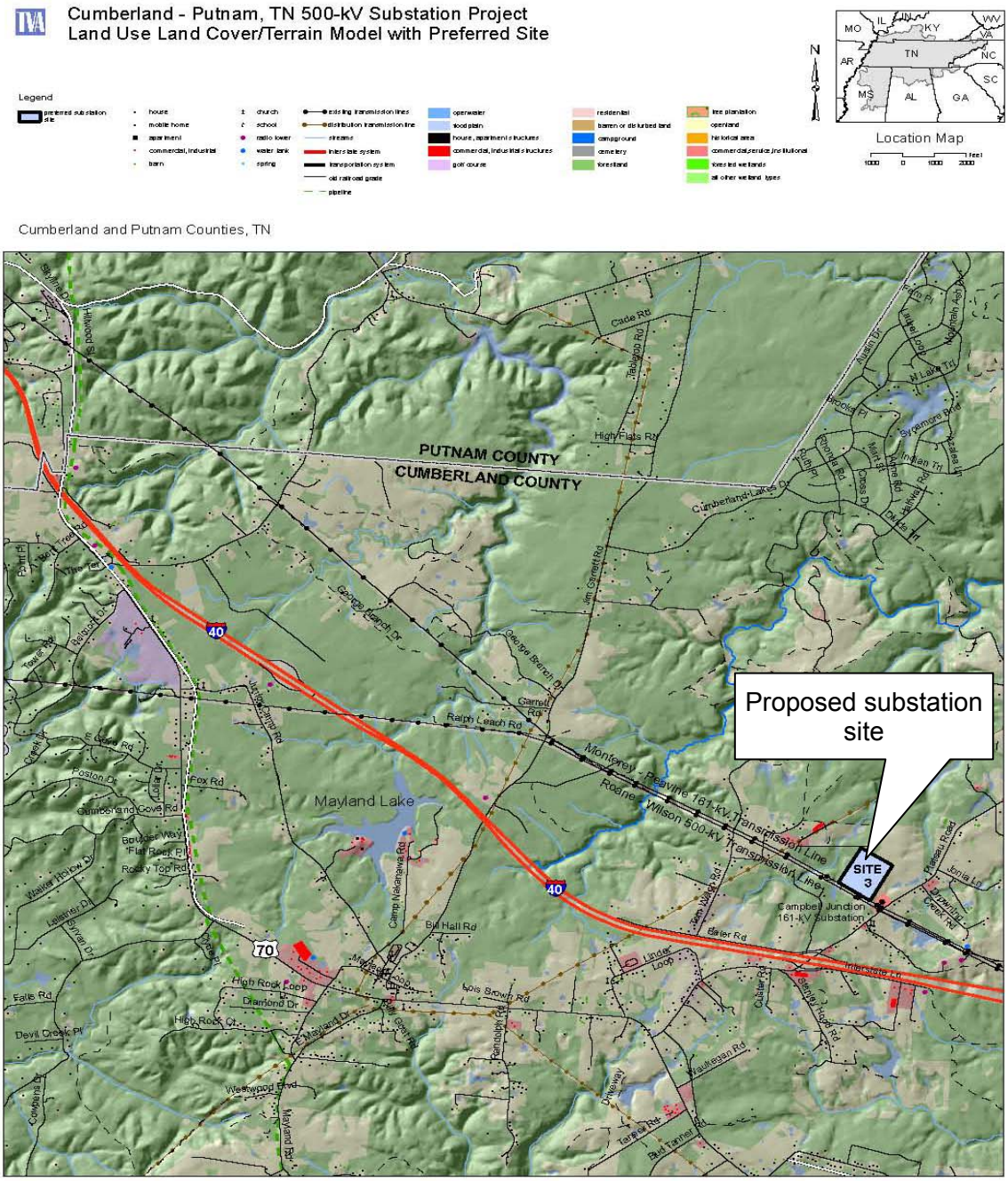

Figure 1-1. Proposed Plateau 500-kV Substation Location, Cumberland County, Tennessee

Unless action is taken, the increasing power loads caused mainly by commercial and residential growth in the area would result in overloaded transformers and other electrical equipment damage or failure. 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. If a transformer and/or transmission line fails, the result is a power outage.

To ensure that Cumberland and Putnam Counties and surrounding areas are supplied with a continuous, reliable source of electric power, TVA needs to provide additional electric service to the area. Additionally, TVA needs to plan for reasonably foreseeable load growth in the area. The construction of a new 500-kV substation and associated transmission line connections would meet these needs by:

- Relieving impending overloads on 26 161-kV substations within Cumberland and Putnam Counties and the surrounding area;
- Relieving existing and impending overloads on 16 161-kV transmission lines within the Cumberland and Putnam Counties and surrounding area;
- Allowing TVA to ensure this area is provided with a strong, reliable source of power for continued economic health and residential and commercial growth; and
- Allowing TVA to meet the reliability criteria established by the NERC.

1.3 The Decision

The primary decision before TVA is how to best address the projected lack of electrical transmission system capacity in the Cumberland and Putman Counties and surrounding area. Thus, the following three action options were developed.

- Upgrade Existing Facilities (Option 1) - Perform various line and equipment upgrades on approximately 169 miles of transmission lines and upgrade eleven 161-kV substations across eight east-central Tennessee counties.
- Cumberland County Substation (Option 2) - Develop a new 500-kV substation and associated transmission line connections in Cumberland County. Depending on the potential site, this would involve the construction of up to 2 miles of 500-kV transmission line and 1 mile of 161-kV transmission line.
- Putnam County Substation (Option 3) - Develop a new 500-kV substation and associated transmission line connections in Putnam County. This would involve constructing approximately 2 miles of 500-kV transmission line and 7 to 10 miles of new 161-kV transmission line connections.

If any of the proposed action alternatives are chosen, a combination of other secondary decisions is involved. These include the following considerations:

- Timing of the proposed improvements;
- Most suitable location for the proposed substation;
- Most suitable routes for the proposed transmission lines; and
- Determination of any necessary mitigation and/or monitoring 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 the *Integrated Resource Plan: TVA's Environmental & Energy Future* (TVA 2011) 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.

1.5 Scoping Process and Public Involvement

Public participation in determining the scope of this environmental review began in January 2011 when TVA published a notice of intent (NOI) in the *Federal Register*. Due to the initial uncertainties over the likely alternatives, the NOI (Appendix A) announced that TVA would prepare an environmental impact statement (EIS) or an environmental assessment (EA). TVA invited interested parties to comment on its scope, and copies of the NOI were sent to two federal agencies, five Tennessee state agencies, and 11 elected officials (Table 1-1).

Table 1-1. Agencies Sent the NOI Regarding the Putnam-Cumberland Power Supply Project

Agency	Submitted Comments
U.S. Army Corps of Engineers, Nashville District	No
U.S. Fish and Wildlife Service, Tennessee Field Office	Yes
Tennessee Division of Archaeology	No
Tennessee Department of Environment and Conservation, Department of Natural Heritage	No
Tennessee Department of Environment and Conservation, Deputy Commissioner	No
Tennessee Historic Commission	No
Tennessee Wildlife Resources Agency	No

TVA held a public scoping meeting on January 20, 2011 at the Willow Place Conference Center in Cookeville, Tennessee to present the three options listed in Section 1.3, i.e., Upgrade Existing Facilities (Option 1), Cumberland County Substation (Option 2), and Putnam County Substation (Option 3).

The meeting was publicized through notices in the local media, by TVA news releases, on the TVA website, and in letters to local elected officials. Thirteen individuals attended the public meeting. There was no public input provided as a result of the public scoping meeting that could be used to further refine the existing options. However, two written comments were submitted to TVA (Appendix B). One individual stated that the construction of a 500-kV substation in Putnam County may provide new jobs. The U.S. Fish and Wildlife Service (USFWS) raised concerns about potential effects to endangered species and associated critical habitat. These comments, included as Appendix B, were considered by TVA during the planning process.

Following the public scoping of the project and additional engineering, environmental, and financial studies, TVA determined that alternative solutions involving the Upgrade Existing Facilities (Option 1) and the new substation and associated transmission line work under the Putnam County Substation option (i.e., Option 3) listed in Section 1.3 above would not meet the identified need. The resulting reduction of overall project scope was so significant that an EA-level review was determined to be appropriate.

TVA held an open house on July 28, 2011 at the Super 8 Motel Conference Room in Monterey, Tennessee to present three potential alternative 500-kV substation sites and transmission connections, (Sites 1, 2, and 3 as shown in Figure 1-2 below) within the Cumberland County (Option 2) area.

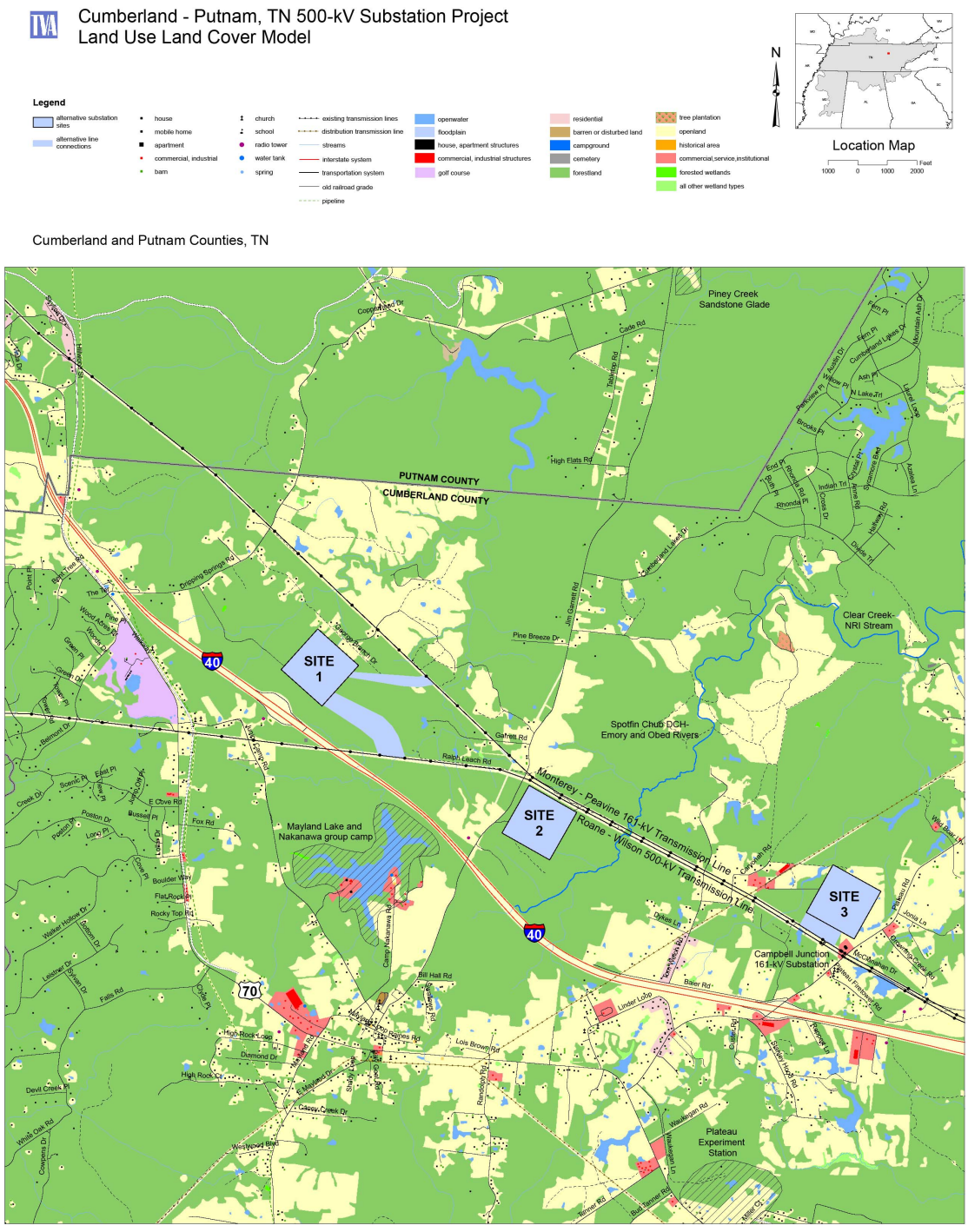

Figure 1-2. Potential Substation Sites in Cumberland County

TVA contacted the following federal and state officials, as well as federally recognized Native American tribes, concerning the proposed project.

- Cherokee Nation
- Eastern Band of Cherokee Indians
- United Keetoowah Band of Cherokee Indians in Oklahoma
- The Chickasaw Nation
- Muscogee (Creek) Nation of Oklahoma
- Alabama-Quassarte Tribal Town
- Kialegee Tribal Town
- Thlopthlocco Tribal Town
- Absentee Shawnee Tribe of Oklahoma
- Eastern Shawnee Tribe of Oklahoma
- Shawnee Tribe
- Seminole Tribe of Florida
- Tennessee Department of Environment and Conservation
- U.S. Army Corps of Engineers (USACE)
- U.S. Fish and Wildlife Service

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

For this project, TVA notified property owners affected by the alternative sites and located within 800 to 1,000 feet of any of the alternative sites in an effort to ensure that all stakeholders would have an opportunity to consider the project and submit comments. Each property owner was mailed information on the project. The information consisted of a letter explaining the project and notification of the open house. Owner comments were requested in writing in order to be included in the determination of a preferred site and associated transmission line connections. Public officials and 95 property owners were invited to the project open house held on July 28, 2011. TVA also invited other interested members of the public through newspaper advertisements and local news outlets. Total public attendance at the meeting was 46.

At the open house, TVA presented the three possible sites for the 500-kV substation and associated transmission line connections in Cumberland County. Landowners voiced concerns relative to health issues, property values, and impacts of the proposed substation and transmission line connections to businesses, visual quality, and natural resources.

A 30-day public review and comment period was held following the open house, where TVA accepted public comments on the alternative sites. A toll-free phone number and facsimile number were made available to facilitate comments. During the comment period, six 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 conducted field environmental surveys as well as analyses of local property ownership and infrastructure conditions of the three potential alternative sites for the 500-kV substation and associated transmission line

connections. After consideration of the results of the surveys and analyses, in conjunction with review of the potential required transmission line connections, in October 2012, TVA announced Site 3 as the most economically and environmentally feasible location for the proposed 500-kV substation and associated transmission line connections to the Monterey-Peavine 161-kV and Roane-Wilson 500-kV transmission lines (see Figure 1-1 and Figure 1-2). Thereafter, the proposed substation was referred to as the Plateau 500-kV Substation.

1.6 Issues to be Addressed

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

- Water quality
- Aquatic and terrestrial ecology
- Vegetation
- Endangered and threatened species and their critical habitats
- Floodplains
- Wetlands
- Aesthetic resources (including visual and noise)
- Archaeological and historic resources
- Land use and prime farmland
- Recreation and managed areas
- Socioeconomics

Potential effects related to air quality and to hazardous and nonhazardous wastes were also considered. However, because of the nature of the action, the potential for effects to these resources is extremely low. Thus, potential effects to these resources were not analyzed in detail.

1.7 Necessary Federal Permits or Licenses

A permit would be required from the state of Tennessee for the discharge of construction site stormwater associated with the construction of the substation and associated transmission line connections. TVA would prepare the required erosion and sedimentation control plans and coordinate them with the appropriate state and local authorities. A permit would be obtained from Cumberland County for the installation of a septic system at the substation. A permit may also be required for burning trees and other combustible materials removed during construction of the substation and associated transmission line connections.

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CHAPTER 2

2.0 ALTERNATIVES INCLUDING THE PROPOSED ACTION

As described in Chapter 1, TVA proposes to build a new 500-kV substation near Monterey, Tennessee. This construction would require transmission line connections to the existing Roane-Wilson 500-kV and Monterey-Peavine 161-kV transmission lines. Depending on the final design, the connections between these two lines and the substation would be between approximately 500 to 800 long. Additionally, TVA would upgrade communications and replace relay equipment at the Peavine 161-kV Switching Station, as well as the Monterey 161-kV, Wilson 500-kV, and Roane 500-kV substations. The TVA map board displays would be updated to reflect the new transmission assets.

This chapter contains seven major sections that provide the following information:

1. Description of Alternatives
2. Description of the Construction, Operation, and Maintenance of the Proposed Substation and Associated Transmission Line Connections
3. Description of the Siting Process
4. Comparison of the Alternatives
5. Identification of Mitigation Measures
6. Identification of the Preferred Alternative

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

2.1 Alternatives

Initially, four potential courses of action were considered. These included doing nothing (i.e., the No Action Alternative) and three action options. The following options for ensuring reliable transmission of electric power to meet anticipated power loads in the study area were considered potential action alternatives.

- Upgrade Existing Facilities (Option 1) - Replace the conductors (i.e., “wires”) on approximately 54 miles of transmission lines and upgrade approximately 115 miles of transmission line by resagging and retensioning the conductors and increasing structure heights. Upgrade equipment at eleven 161-kV substations across eight east-central Tennessee counties
- Cumberland County Substation (Option 2) - Construct a new 500-kV substation and associated transmission line connections in Cumberland County. Depending on the particular site chosen for the substation, this could involve construction of as much as 2 miles of 500-kV connector line and 1 mile of 161-kV connector line to link the proposed substation to existing 161-kV and 500-kV transmission lines.
- Putnam County Substation (Option 3) - Develop a new 500-kV substation and line connections in Putnam County. This would involve constructing approximately 2 miles of 500-kV transmission line and 7 to 10 miles of new 161-kV transmission line connections.

During the course of the study, TVA determined that Options 1 and Option would not meet project needs and were considered infeasible as action alternatives. These two options and the reason for their elimination for further consideration are described briefly below. Consequently, two alternatives, i.e., the No Action Alternative and the Action Alternative (construct the proposed substation in Cumberland County) were evaluated in detail. Descriptions of these two alternatives are provided in Sections 2.1.1 and 2.1.2.

Upgrade Existing Facilities (Option 1)

Under the Upgrading Existing Facilities Option, TVA would replace the conductors on approximately 54 miles of transmission lines and retension or resag the conductors and increase the structure heights on an additional 115 miles of transmission line. Also, TVA would upgrade eleven 161-kV substations/switchyards by replacing breakers and switches, upgrading meters, and installing capacitors. This work would occur across eight east-central Tennessee counties. Such wide-area system upgrades tend to be expensive and difficult to accomplish without multiple outages. However, this option would not likely require the acquisition of new property or easements.

This option represents the highest expenditure with the lowest long-term performance improvement. Although upgrades would be performed primarily on existing easements, construction-related effects to existing environmental resources (e.g., streams, wetlands, cultural resources, etc.) along the right-of-way (ROW) would be likely. Additionally, studies indicate that the outages required to complete this would likely stretch the project timetable past the needed improvement date. Therefore, the Upgrade Existing Facilities (Option 1) was eliminated for further study.

Putnam County Substation (Option 3)

Under this option, TVA would develop a new 500-kV substation and transmission line connections in Putnam County. This would involve the construction of approximately 2 miles of new 500-kV transmission line and 7 to 10 miles of new 161-kV transmission line connections. Other transmission line upgrades would be necessary as well as the installation of new capacitor banks at the Monterey 161-kV Substation.

Although this option was electrically viable, the proposed location for the substation was on the outer edge of the local area where the demand for additional power is anticipated. Furthermore, extensive amounts of transmission line work would be needed to connect the new substation to the TVA's transmission system. This would result in the need to purchase more easements for new transmission line connectors and in potentially greater impacts to the environment. Therefore, this option was eliminated for further study.

2.1.1 No Action Alternative – Do Not Construct a 500-kV Substation or Construct Additional/Perform Upgrades to Existing Transmission Facilities

Under the No Action Alternative, TVA would not complete any of the alternative options described in this document. As a result, the TVA power system in the project area would continue to operate under the current conditions, increasing the risk for substation and transmission line overloading, loss of service, and occurrence of violations of NERC reliability criteria. TVA's ability to provide a strong, reliable source of power for continued economic health and residential and commercial growth in the area would be jeopardized.

Considering TVA's obligation to serve this area and the need to continue to provide reliable electric service, the No Action Alternative is not a reasonable alternative. However, the potential environmental effects of adopting the No Action Alternative were considered in the

EA to provide a baseline for comparison with respect to the potential effects of implementing the proposed action.

2.1.2 Action Alternative – Cumberland County Substation (Option 2)

Action Option 2, i.e., the Cumberland County Substation, was determined to be the most feasible and practicable option and is considered the Action Alternative.

Under the Action Alternative, TVA would construct a new 500-kV substation and associated transmission line connections. The proposed project would include the purchase of an approximately 73-acre site for the Plateau 500-kV Substation and associated transmission line connections. TVA would prepare approximately 50 acres of this site for construction of the new facility; however, the substation and associated transmission connections would occupy approximately 25 acres of the site.

To connect the new substation to the transmission system, TVA would retire Structure 171 of the Monterey-Peavine 161-kV Transmission Line and Structure 296 of the Roane-Wilson 500-kV Transmission Line. New transmission line structures, conductor, and associated equipment would be installed to create a loop. The connections between the proposed substation and the 500-kV and 161-kV transmissions would be between approximately 650 and 800 feet, depending on the final design of the substation. Both connections would be located entirely within the boundaries of the property to be acquired for the substation site.

Additionally, under the Action Alternative, TVA would complete the following actions to facilitate the operation of the new substation and transmission line connections.

- Upgrade communications and replace relay equipment at the Peavine 161-kV Switching Station, as well as the Monterey 161-kV, Wilson 500-kV, and Roane 500-kV substations.
- Update TVA's map board displays to reflect the new transmission assets.

Implementation of this alternative would reduce the risk for future substation and transmission line overloading, loss of service, and occurrence of violations of the NERC reliability criteria, thus improving the reliability of the TVA bulk power system. This would allow TVA to ensure that the area is provided with a reliable source of power for continued economic health and residential and commercial growth in the area.

Additional information detailing how the most suitable substation site and transmission line connections were determined is provided in Section 2.3.

2.2 Construction, Operation, and Maintenance of the Proposed Substation and Transmission Line Connections

2.2.1 Property Acquisition, and Clearing

Property for the proposed 500-kV substation, access road, and associated transmission line connections at the identified preferred location would be purchased from landowners. Approximately 73 acres would be purchased, depending on final design, site soil conditions, and negotiations with landowners.

TVA would clear vegetation, remove topsoil, and grade approximately 50 acres of the property in accordance with TVA's *Site Clearing and Grading Specifications* (Appendix C). Equipment used during 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 project site to serve as sediment barriers. Implementation of *TVA ROW Clearing Specifications*, *Environmental Quality Protection Specifications for Transmission Line Construction*, *Transmission Construction Guidelines Near Streams* (Appendices D, E, and F), and *Best Management Practices for Tennessee Valley Authority Transmission Construction and Maintenance Activities* (Muncy 2012) provide further guidance for clearing and construction activities.

Following clearing and construction, disturbed areas on the property, excluding the substation, would be restored to approximate pre-construction conditions, to the extent practicable, utilizing appropriate seed mixtures as described in Muncy (2012). Erosion controls would remain in place site-wide until the plant communities become fully established.

2.2.1.1 Substation Site Preparation

The site would be leveled through a cut and fill process. The areas of the site that are too high (sloped) must be "cut" down to a level elevation, and other areas that are too low require "fill" to raise the elevation. Any additional fill required would be obtained from an approved/permitted borrow area. Two wetlands are located within the property boundary. One would be avoided, but the other would likely be filled (see Sections 3.8 and 4.8). One intermittent stream is located on the edge of the property boundary (see Section 3.3), but it would not need to be filled or rerouted. If the site design were to change and impact this stream, TVA would acquire all necessary permits prior to this action.

Once the substation site has been graded, spoil would be removed in preparation for foundations. Temporary spoil storage would be located onsite in several designated areas. Total disturbance, including grading and spoil material and any necessary detention basins would be approximately 50 acres. Silt fences, site drainage structures, and detention ponds would be installed during construction. The substation yard would be covered with crushed stone and enclosed with chain link fencing. A new gravel access road would be constructed from Plateau Road to the substation, a distance of approximately 700 feet. The unused portion of the approximately 73-acre site would be left undisturbed or would be restored, to the extent possible, to its condition prior to construction.

Major equipment would include 500/161-kV and 26.4-kV transformers, several circuit breakers, connecting bus work, a supporting steel superstructure, ground wire towers, switch house, and equipment storage building. Oil containment would include a subsurface oil catchment area and associated piping to an oil/water separator to capture any oil from the transformer bank area. The oil/water separator is designed to retain any oil. If the oil should build up, the oil would then be pumped and hauled to an approved waste receiving facility. The circuit breakers installed would utilize SF-6 as the electrical insulator and would contain no oil. The switch house would be equipped with water and septic tank drain field. A water line would be installed along the substation access road and connected to the local water supply system. A field line system would be installed to treat the generated sewage.

As described in TVA's *Substation Lighting Guidelines* (Appendix G), all lights at the substation would be fully shielded or would have internal low-glare optics, such that no light is emitted from the fixtures at angles above the horizontal plane. TVA's *Environmental*

Quality Protection Procedures for Transmission Substation or Communications Construction (Appendix H) would be utilized during the construction of the substation.

2.2.1.2 Right-of-Way Development

Typically, TVA purchases an easement for transmission line ROW. Because the site of the proposed substation is near the existing 500-kV and 161-kV transmission lines and the ROW for these lines would be within boundary of the 73-acre property to be acquired by TVA, no additional easements would be necessary for the transmission connection ROWs.

National Electrical Safety Code standards require minimum clearance distances between conductors and any grounded objects such as trees, buildings, vehicles, roads, and railroads. These minimum clearances vary with voltage. On the ROWs for the transmission line connectors, TVA would ensure that minimum clearances, including an additional safety margin, are maintained under all foreseeable conditions including high winds and icing.

2.2.1.3 Access Roads

A new gravel access road, approximately 700 feet long, would be constructed from Plateau Road to provide permanent access to the substation. Access roads to the transmission line work structures would be about 20 feet wide and are surfaced with dirt, mulch or gravel. Access to the substation and to the transmission line work structures would be located on TVA property.

Culverts and other drainage devices, fences, and gates would be installed as necessary. Culverts installed in any permanent streams would likely be removed following construction. However, if circumstances require leaving such culverts in the stream, TVA would secure all appropriate permits. In wet-weather conveyances (streams that run only following a rainfall), culverts would be left or removed, depending on any permit conditions that might apply. Additional applicable ROW clearing and environmental quality protection specifications are listed in Appendices D and I.

2.2.1.4 Construction Assembly Areas

A construction assembly area (or “laydown” area) would be required for worker assembly, vehicle parking, and material storage. This area may be on existing substation property or may be leased from a private landowner for the duration of the construction period. The property is typically leased by TVA about one month before construction begins. Properties such as existing parking lots or areas used previously as car lots are ideal laydown areas because site preparation is minimal. Selection criteria used for locating potential laydown areas include an area typically 5 acres in size; relatively flat; well drained; previously cleared; preferably graveled and fenced; preferably wide access points with appropriate culverts; sufficiently distant from streams, wetlands, or sensitive environmental features; and located adjacent to an existing paved road near the transmission line. TVA initially attempts to use or lease properties that require no site preparation. However, at times, the property may require some minor grading and installation of drainage structures such as culverts. Likewise, the area may require graveling and fencing. 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. Removal of TVA-installed fencing and site restoration would be performed by TVA at the discretion of the landowner.

2.2.1.5 500-kV Structures and Conductors

The proposed 500-kV transmission line connections would use a combination of self-supporting, galvanized, laced-steel structures, and H-frame steel-pole structures similar to those shown in Figure 2-1.

Figure 2-1. Examples of 500-kV Transmission Structures

The electrical conductors (the cables that carry the electrical current) would consist of three sets of three cables bundled in a triangular configuration, suspended under the structure crossarms by insulators. Two single ground wires would be placed on the two highest points of the structures to provide lightning protection. In some cases, these ground wires may carry fiber optic or other communication circuits. Tower height may vary depending on final grade but would normally range between 90 and 100 feet.

Tower foundations would vary with structure design. The laced-steel structures would be utilized where the line turns at an angle and would require foundations of reinforced concrete. The H-frame steel-pole structures would be directly imbedded into an augured hole and backfilled with concrete. After clearing, construction would generally progress in the following order:

- Excavation of foundation or grillage holes
- Installation of the foundations and grillages
- Assembly, on the ground, of large portions of steel structures
- Placement of the assembled structures on the foundations using cranes
- Hanging of insulators with “pulling blocks” or pulleys attached to allow the new conductors and ground wires to be pulled through
- Pulling the ground wires and conductors into place
- “Sagging” the conductor; that is, adjusting it to the proper tension and height to meet the required clearances

- Clipping the conductor into place on the end of the insulators
- Inspection and testing of the line
- ROW restoration and clean up

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 (such as areas with soft ground) to reduce the potential for environmental impacts.

After the transmission line is constructed, the ROW would be revegetated using appropriate seed mixtures as described in Muncy (2012). Additional applicable environmental quality protection specifications that would be used during ROW clearing and transmission line construction are listed in Appendices D and E and in Muncy (2012).

2.2.1.6 161-kV Structures and Conductor

The proposed 161-kV transmission line would use a combination of single and H-frame steel-poles similar to those shown in Figure 2-2. Structure heights would vary depending on final grade but normally range from 80 to 90 feet.

Figure 2-2. Examples of 161-kV Transmission Structures

Three conductors are required to make up a single-circuit in alternating-current transmission lines. For a 161-kV transmission line, each single-cable conductor is attached to 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. The proposed transmission line would be constructed with single-circuit structures.

Poles at angles (angle points) in the transmission line may require supporting screw, rock, or log-anchored guys. Some angle structures may be self-supporting 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 concrete-and-gravel mixture would be used.

2.2.1.7 Conductor and Ground Wire Installation

Reels of conductor and ground wire would be delivered to the construction assembly area. A rope would be pulled from structure to structure. A rope would be connected to the conductor and used to pull the conductor through pulleys suspended from the insulators of each structure. The same process would be completed for the ground wire. 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 500-kV and 161-kV transmission lines are performed by helicopter aerial surveillance after operation begins. Foot patrols or climbing inspections are performed 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 that 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

Although the ROWs for the transmission line connections between the proposed substation and the TVA transmission system would be within the property boundary, vegetation management would be necessary to ensure access to structures and to maintain an adequate distance between transmission line conductors and vegetation. For a 500-kV transmission line, TVA standards, based on National Electric Safety Code requirements, require a minimum vegetation clearance of 30 feet, while minimum clearance 161-kV transmission line is 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 2.2.1.2), and vegetation control within the cleared ROW. These activities occur on approximately 3- to 5-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 re-clearing plan would be developed for each transmission line connection, 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 selectively applied 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 I. 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 adjacent hole. Access to the structures would be via existing roads. 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 Siting Process

The process of siting the proposed substation and associated transmission line connections followed the basic steps used by TVA. These include the following steps:

- Define the study area.
- Determine existing transmission lines to connect to the substation.
- Collect data to minimize potential impacts to cultural and natural features.
- Determine potential substation options.
- Develop associated transmission line connection routes.
- Gather public input.
- Incorporate public input into the final selection of the preferred substation location and associated transmission line connections.

2.3.1 Definition of the Study Area

The boundaries of the detailed study area were entirely in Cumberland County and defined by the following:

- The northern boundary was described by an imaginary line roughly 2 miles north of the existing Roane-Wilson 500-kV Transmission Line.
- The eastern boundary was in the vicinity of U.S. Highway 127 near Fredonia, Tennessee.
- The southern boundary was defined by Interstate 40 (I-40), which runs through the study area.
- The western boundary of the study area was determined by the diverging routes of the Monterey-Peavine 161-kV Transmission Line and the Roane-Wilson 500-kV Transmission Line.

2.3.2 Characterization of the Study Area

2.3.2.1 Natural and Cultural Features

The study area is a part of the Cumberland Plateau ecoregion within the Clear Creek watershed of the Obed River system. This area consists primarily of forested areas and some open pasture and cultivated fields. Topography of the study area varies with elevations ranging from 1,800 to 2,000 feet. There are churches and cemeteries within the study area.

2.3.2.2 Land Use

Land uses in the study area include commercial, industrial, residential, and farming. The most concentrated residential and commercial development is located in areas south of I-40. A large golf course is also located south of I-40.

2.3.2.3 Transportation

I-40 runs in a general southeast-northwest direction throughout the study area, with U.S. Highway 70 to the south. U.S. Highway 127 runs in a north-south direction on the east side of the project area.

2.3.3 Data Collection

TVA first collected geographic data, such as topography, land use, transportation, environmental features, and cultural resources for the study areas. Information sources used in the substation siting 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.

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 for developing and evaluating numerous options and scenarios to select the site or sites that would best meet project needs, which included avoiding or reducing potential environmental impacts.

Review from aerial photographs, tax maps, and other sources included line length of proposed transmission line connections, amount of existing ROW, road/highway crossings, construction access, amount of ROW needed, forest clearing, wetlands, sensitive stream and/or stream crossings, number of parcel/property tracts, development (both commercial and residential), historical areas and structures, archaeological, and recreational areas. The aerial photography, GIS-based map, and other maps and drawings were supplemented by reconnaissance throughout the study area by TVA.

2.3.4 Develop Substation Site Options and Potential Transmission Line Connection Routes

The Cumberland County (Option 2) appeared to present the overall lowest amount of impact to inventoried constraints, the smallest overall project footprint, smallest amount of transmission line to connect all existing lines to new substation, as well as providing the best electrical solution to the latest TVA electrical load forecasting. Subsequently, three potential substation sites and associated transmission line connections were identified within Cumberland County near the Monterey-Peavine 161-kV and the Roane-Wilson 500-kV transmission lines (Figure 1-2). These locations, identified as Sites 1, 2, and 3, met

the general required design criteria. Some of these criteria include size, suitable topography for construction, sufficient access to allow delivery of substation equipment, and transmission line connections to existing transmission lines. One distinguishing factor between the three sites was the length of required new transmission lines and new ROW area to connect the substation to the existing transmission lines. Approximately a half-mile of both 161-kV and 500-kV transmission line construction on 100-foot and 300-foot wide ROWs, respectively, would be necessary for Site 1 as compared to no new ROW purchases associated with Sites 2 and 3.

2.3.5 Establishment and Application of Siting Criteria

TVA uses a set of evaluation criteria that represent opportunities and constraints for development of substation sites and 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 and construction considerations, materials, 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 substation sites and transmission line connections involves weighing and balancing these criteria and making adjustments to them as specific conditions dictate.

The three site options were evaluated according to the following criteria: engineering and construction feasibility, environmental effects, land use compatibility, and feasibility of transmission line connections.

- **Engineering and Construction Criteria** take into account the suitability of the size of the site for grading, total length of the transmission route and new ROW, fencing, and security needs, along with evidence that the site is not in a 100-year floodplain, which would require filling to a final grade above flood level. These criteria also require that locations be near public roads to minimize construction of a lengthy access road, have the ability to develop a safe driveway connection with good sight distance in each direction, and accommodate delivery of extremely large electrical equipment. Good site drainage, soils suitable for grading and foundation construction, minimal tree clearing needs, and availability of off-site utility services are also considered.

- **Environmental Criteria** include the presence of wetlands or rare species and/or their habitat. Other factors include the presence of historic structures or sites on or adjacent to the site, presence or proximity of the site to prime farmland, and aquatic features crossing or adjacent to the site.

- **Land Use Compatibility Criteria** consist of the number of individual property tracts required for the project, current land use practice of the tract(s), number of houses on or near the site, and the level of visual impact to surrounding area homes and the traveling public.

- **Cultural Criteria** include archaeological and historic sites, churches, and cemeteries.

Scores for each of the site options were calculated by adding individual criterion values for each potential substation site. The resulting sum values were evaluated using standard statistical techniques and were assigned a ranking from 1 to 4 for each site in each subcategory (engineering, environmental, land use, and cultural).

A weighted score was produced for each site in each subcategory. This made it possible to understand which sites would have the lowest and highest impacts on engineering, environmental, land use, and cultural resources. Finally, to determine total impacts, the scores from each category were combined for an overall score.

2.3.6 Site Evaluation and Identification

As described in Section 2.3.3, the collected data were analyzed to develop possible substation sites and transmission line connections that included best opportunities to meet the project needs while avoiding or reducing conflict with constraints (including sensitive environmental resources). The assessment of the opportunities and constraints for these alternative routes are summarized below by engineering, environmental, land use, and cultural criteria.

Engineering

Site 1 was determined to have the highest amount of new land rights required due to the need to purchase approximately 0.5-mile of both 100-foot and 300-foot wide ROWs for the respective 161-kV and 500-kV transmission line connections to the new substation. Additionally, access to the site was uncertain due to the possibility of reclaiming an old road from I-40 thru a future planned welcome center site. Accessing the site via the existing road system would likely require extensive coordination and considerable expense to provide adequate road infrastructure for the transport of the new transformers.

Site 2 had the advantage of being adjacent to the transmission lines and would likely require no new transmission line ROW. Access to this site, however, would require crossing a narrow highway overpass bridge across I-40. The use of this infrastructure to transport the transformers needed further evaluation. Further, Site 2 contained several areas of rock outcrop, indicating that this site would be a poor location for the necessary grading and foundation excavation required for this facility. The status of the mineral rights for this site was another issue making the site less attractive.

Site 3 had the advantage of being adjacent to the transmission lines and would likely require no new transmission line ROW. Access to the site is directly from I-40 and there was no identified transportation issue for moving a large piece of equipment to this site. No rock outcrops were observed in field inspections; the Volunteer Electric Cooperative's Campbell Junction 161-kV Substation is located adjacent to the site and appeared to have been constructed utilizing a significant cut and fill operation without major rock excavation.

Environmental

At the time of the August 2011 field surveys, the USFWS defined suitable potential habitat for the federally listed as endangered Indiana bat (*Myotis sodalis*) in its draft guidelines as live trees with exfoliated bark, such as shagbark hickory and white oaks. As per this definition at that time, no suitable potential habitat for Indiana bat was found at any of the three sites visited. Further, no federally listed or federal candidate plant species were located at any of the three sites during field surveys.

Site 1 contained moderate-quality upland hardwood forested habitat. The site contained approximately 10 acres of high-quality forested wetland that nearly bisected the property. Several intermittent streams were located on this site.

Foxtail clubmoss (*Lycododiella alopecuroides*), a state-listed plant, was observed in a portion of wetland along the southwestern portion of the site.

Site 2 contained moderate-quality upland hardwood forested habitat. The site contained approximately 2.4 acres of moderate-quality forested wetland. No active or substantial water sources were found on this site.

Site 3 contained fragmented, low-quality forested habitat. The site contained approximately 0.1 acre of poor-quality emergent wetland. One perennial stream, two intermittent streams, and three wet-weather conveyances were identified in the field survey. An additional environmental field survey of Site 3 was conducted in April 2013. Based on current USFWS criteria, TVA, in consultation with USFWS, determined that 17.80 acres of potential Indiana bat summer habitat on Site 3 would be affected by construction of the proposed substation.

Land Use

Site 1 is almost entirely forested with the exception of one road (Natures Way) that runs nearly the entire length of the southwestern side of the property. This site encompasses holdings of 23 property owners. There are no buildings or structures located on the site. However, a few residences and farm buildings are located to the north of the property, primarily along George Branch Drive.

Site 2 is predominately forested, although evidence of previous selective timber harvesting was evident. This site is held by a single property owner. There are no residences on the site or in the immediate area.

Site 3 is approximately 60 percent forested, and approximately 40 percent of the site is used for agriculture. Six property owners were originally associated with this parcel. However, through refinements to the site layout, the parcel would include four privately owned properties. No buildings are located on the site. However, residences are located in the vicinity, mainly along Plateau Road, which is adjacent to the site.

Cultural

Cultural resources include features such as archaeological sites, cemeteries, historical sites, historic structures, churches, and recreational areas. The GIS analysis identified few known archaeological or historical sites within any of the alternative sites. None of the sites are located within the buffer zones for churches, cemeteries, or recreational areas. The April 2011 environmental field survey confirmed the GIS analysis results.

2.3.7 Identification of a Preferred Substation Site

Based on analysis and the August 2011 environmental field review of the potential sites, TVA announced Site 3 as the preferred location for the Action Alternative in October 2012. Site 3 had the best overall environmental score and also scored favorably in the engineering category. The primary contributing factors to the environmental score were a low potential for impacts to streams and wetlands, and less clearing of forest would be required than at the alternate site locations. Site 3 received a strong engineering score because it has good access to potential heavy equipment haul routes, and has fewer geotechnical obstacles than the other locations. No additional ROW for the transmission

line connections would need to be acquired at Site 3. Based on analysis including above factors, Site 3 was selected as the preferred site.

2.4 Comparison of the Alternatives

A summary of the anticipated potential effects of implementing the No Action and the Action Alternative is provided in Table 2-1.

Table 2-1. Summary and Comparison of Alternatives by Resource Area

Resource Area	Impacts From Implementing the No Action Alternative	Impacts From Implementing the Action Alternative
Groundwater and Geology	No effects to local groundwater quality or quantity are expected.	No significant effects to groundwater quality or quantity are anticipated.
Surface Water	No changes in local surface water quality are anticipated.	Any effects to local surface waters would be minor.
Aquatic Ecology	Aquatic life in local streams would not be affected.	With the implementation of protective measures, effects to aquatic life in local surface waters are expected to be minor.
Vegetation	Local vegetation would not be affected.	Site preparation and clearing would disturb approximately 50 acres of forest/brushy areas. Approximately 25 acres of the 73-acre site would be hard-surfaced or graveled.
Wildlife	Local wildlife would not be affected.	Wildlife inhabiting onsite forest, early successional, and edge habitats would be displaced to adjacent local habitats.
Endangered and Threatened Species	No effects to endangered or threatened species or any designated critical habitats are anticipated.	No effects to any listed aquatic species or plants are anticipated. Implementing the Action Alternative would result in the removal of not more than 17.80 acres of roosting habitat for the endangered Indiana bat. In accordance with the Memorandum of Agreement between TVA and USFWS, TVA would limit clearing to winter periods and provide monetary compensation to offset the removal of suitable Indiana bat habitat. Implementing these measures would minimize any incidental take.
Floodplains	Local floodplain functions would not be affected.	The proposed substation and transmission line connections would not affect any floodplains or their functions.
Wetlands	No changes in local wetland extent or function are expected.	Substation construction would involve filling a 0.08-acre vernal pool wetland. Another onsite wetland would be avoided.
Aesthetics	Aesthetic character of the area is expected to remain virtually unchanged.	Minor visual discord and noise above ambient levels would be produced during construction. The proposed substation would be visually similar to existing transmission facilities in the area and would present a minor cumulative visual effect.

Resource Area	Impacts From Implementing the No Action Alternative	Impacts From Implementing the Action Alternative
Archaeological and Historic Resources	No effects to archaeological or historic resources are anticipated.	Implementing the proposed action would not affect archaeological or architectural resources listed in or eligible for listing in the National Register of Historic Places because no such resources are present.
Recreation, Parks, and Natural Areas	No changes in local recreation opportunities or natural areas are expected.	Because of the intervening distance, no local managed areas would be affected. No loss of local formal or informal recreational opportunities is expected.
Land use and Prime Farmlands	No land use changes would occur. No changes in local prime farmland are expected.	Approximately 4.4 acres of agricultural land considered prime farmland would be converted to non-agricultural use.
Socioeconomics and Environmental Justice	Over time, the lack of reliable power service could have adverse economic effects that would affect all populations in the region.	Continued reliability of service would benefit the area and help maintain economic stability and growth in the area. Any adverse social, economic or environmental justice effects would be minor and would diminish over time.

2.5 Identification of Mitigation Measures

The following routine measures would be applied during the construction, operation, and maintenance of the proposed substation, transmission lines, and access road to reduce the potential for adverse environmental effects.

- To minimize the introduction and spread of invasive species in the project area, consistent with EO 13112 (Invasive Species), TVA would follow standard operating procedures for revegetating with noninvasive plant species as defined in Muncy (2012).
- Wet-weather conveyances that could be affected by the proposed construction would be protected by implementing standard BMPs as identified in Muncy (2012).
- The two intermittent streams and one intermittent stream within the proposed substation site would be protected by the implementation of Standard Stream Protection (Category A) as defined in Muncy (2012) and Appendices E and F.
- TVA would utilize BMPs, as described by Muncy (2012), to minimize erosion during construction, operation, and maintenance activities.
- In areas requiring chemical treatment, only USEPA-registered herbicides would be used in accordance with BMPs and label directions designed in part to restrict applications near receiving waters and to prevent unacceptable aquatic and groundwater impacts.

During this environmental review and based on USFWS's draft guidelines as of April 2013, TVA determined that the proposed action would result in the direct loss of 17.80 acres of potential bat roosting trees, which involves potential habitat for the Indiana bat (*Myotis sodalis*), a federally listed endangered species. In accordance with the terms of the

Endangered Species Act, an Indiana Bat Conservation Memorandum of Agreement (MOA) was established between the USFWS and TVA (Appendix B). TVA would implement the proposed action in accordance with the stipulations of the MOA, including the following measures.

- TVA will selectively remove Indiana bat roosting habitat between the dates of October 15, 2014 and April 1, 2015. The remainder of standing trees will be cleared during summer 2016. Prior to final clearing, inspection of the site will be conducted to determine if suitable Indiana bat maternity roosting structure may have developed subsequent to the initial clearing and evening emergence observations will be conducted for any suitable maternity type roost structures present. If no bats are observed to emerge from the structures, then they will be felled within 24 hours. The observation of bat emergence would result in coordination between representatives of TVA and USFWS.

- TVA shall contribute $65,860 to the Indiana Bat Conservation Fund administered by the Kentucky Natural Lands Trust. That transaction was completed October 1, 2013 (see Appendix B).

2.6 The Preferred Alternative

The Action Alternative, i.e., the construction of the Plateau 500-kV Substation and transmission line connections near Monterey, Tennessee, is TVA's preferred alternative for this proposed project. TVA would build and operate new transmission line connections from the proposed substation to the existing Roane-Wilson 500-kV and Monterey-Peavine 161-kV transmission lines. The new substation, including the required 500-kV and 161-kV transmission line connections would occupy about 25 acres of an approximately 73-acre site near Plateau Road.

CHAPTER 3

3.0 AFFECTED ENVIRONMENT

3.1 Groundwater and Geology

The project area lies within the Cumberland Plateau section of the Appalachian Plateaus Physiographic Province. Aquifers of the project area are of Pennsylvanian Age and consist of alternating sandstone, shale, siltstone, coal, and clay. Water in this aquifer is primarily in fractures in sandstones and shales. Private groundwater wells and springs derived from perched aquifers are used throughout the Cumberland Plateau region (Lloyd and Lyke, 1995). Public drinking water for Cumberland County is supplied by surface water (USEPA 2013). The project area is not located within a State Designated Source Water Protection Zone.

3.2 Surface Water

Precipitation in the project area averages about 58 inches per year with the wettest month in March at 5.9 inches. The driest month is October, with 3.5 inches of precipitation. The median annual air temperature is 57 degrees Fahrenheit. Air temperature ranges from a monthly average of 36 degrees Fahrenheit in January to 77 degrees Fahrenheit in July. Stream flow varies with rainfall and averages about 27 inches of runoff per year or approximately 2.0 cubic feet per second per square mile of drainage area.

The project site and the immediate surrounding area drain primarily to the east and to the northwest. Local drainage is to Drowning Creek and an unnamed stream to the east, and to Panther Creek to the west. All three of these streams are tributaries to Clear Creek, the Obed River, and the Emory River in the Tennessee River Basin. Drowning Creek, Panther Creek, Clear Creek, and the Obed River are classified by the state for fish and aquatic life, recreation, livestock watering, and irrigation. Drowning Creek is on the state 303 (d) list as impaired (i.e., not fully supporting its designated uses) due to loss of biological integrity due to siltation and physical substrate habitat alterations from animal feeding operations (nonpoint). Clear Creek in Morgan County is listed due to oil from petroleum activities.

Panther Creek, a perennial stream, is located immediately west of the project site. Panther Creek flows northward, and a small reach of this creek crosses onto the proposed substation property. An impoundment of Panther Creek is located immediately west of the property within the ROW of the Roane-Wilson and Monterey-Peavine transmission lines. Immediately downstream of this impoundment, a complex of beaver dams has developed. A second impoundment of Panther Creek is located a short distance to the northwest of the property boundary. A series of farm-pond impoundments occur on the unnamed tributary of Clear Creek immediately east of the property. An aerial view of the site showing onsite features is provided as Figure 3-1.

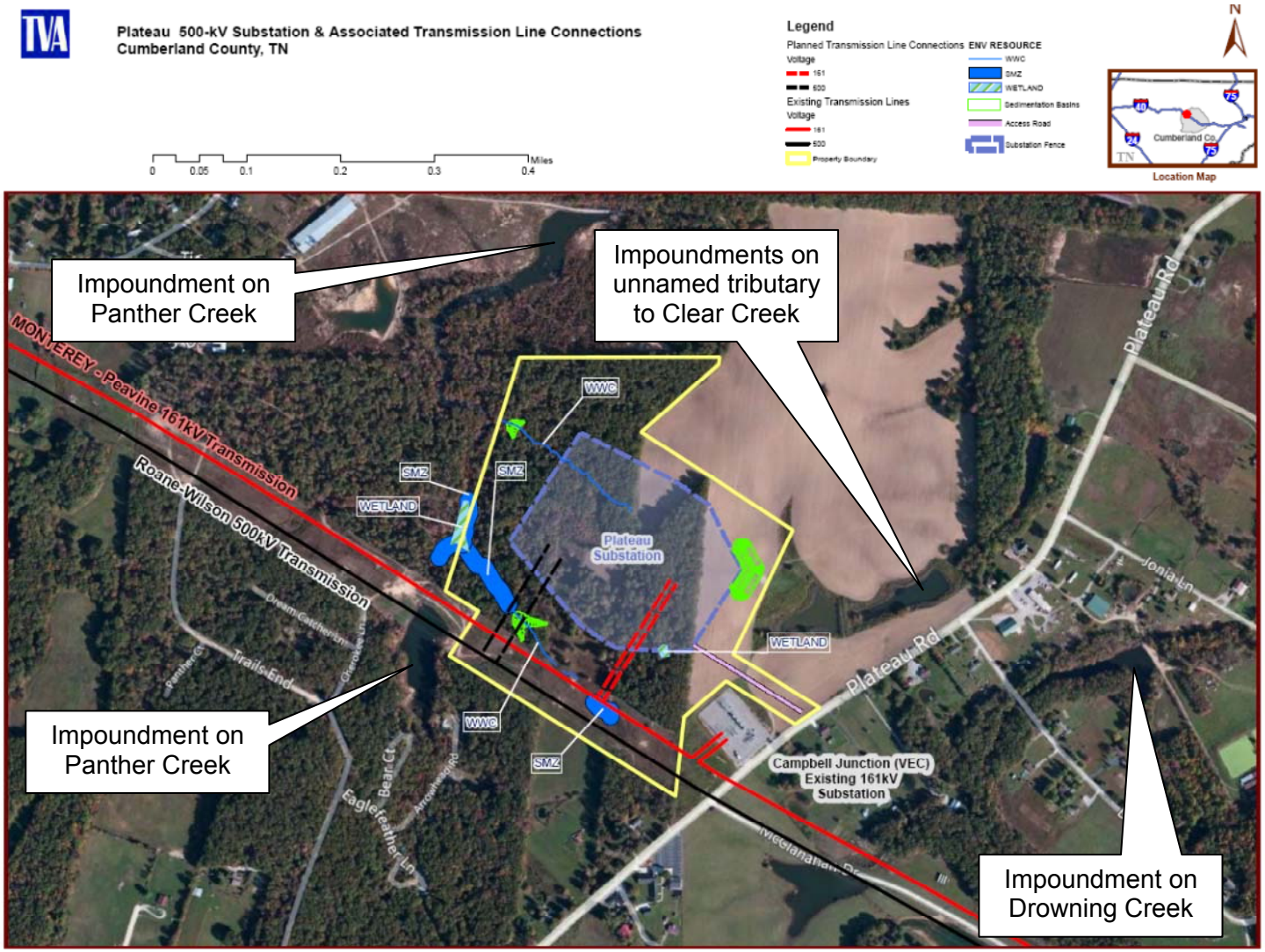

Figure 3-1. Site Plan of the Proposed Plateau Substation

The property on which the proposed substation would be sited is located on a low hill. Because of the topography, there are two main drainages on the property. Much of the northern portion of the property drains to an approximately 0.2-mile long wet-weather conveyance[2] that drains surface runoff to the northwest into Panther Creek. The other major drainage feature arises on the ROW of the Roane-Wilson and Monterey-Peavine transmission lines and drains northwest, where it joins Panther Creek. The stream channel in this drainage consists of segments of both wet-weather conveyances and intermittent streams[3]. A small vernal pool is also located on the property (see Section 3.8.)

3.3 Aquatic Ecology

A short segment of Panther Creek is the only perennial stream located within the project boundary. Although the remaining watercourses on the site are intermittent in nature, these streams were flowing at the time of the April 2013 field survey.

As stated in Section 3.2, a wet-weather conveyance (identified as "WWC" in Figure 3-1) drains the northern portion of the site. Because it is normally dry, this watercourse does not support resident aquatic life. The drainage feature at the southern edge of the project site is comprised of two segments of intermittent streams and two segments of wet-weather conveyances (see Figure 3-1). Most of these streams have gravel and cobble substrates. Because of their intermittent nature, these streams support scant aquatic life. In the vicinity of the project, Panther Creek is impounded by earthen dams or by beavers. Thus, it does not function as a typical free-running stream in the area of the project. However, in the vicinity of the project, Panther Creek provides suitable habitat for a variety of common reptiles and amphibians, as well as aquatic insects and fish that typically inhabit shallow-water habitats.

TVA evaluated the riparian conditions and in-stream habitat of each stream within the property boundary. Riparian condition was evaluated during a 2013 field survey using a TVA habitat assessment form, or Tennessee Department of Environmental and Conservation Hydrologic Determination Field Data Sheet. A listing of streams in the project property, excluding wet-weather conveyances, as well as observed stream substrate conditions, is provided in Table 3-1.

Table 3-1. Streams Located Within the Proposed Project Boundary

Stream ID	Stream Type	Streamside Management Zone Category	Stream Name	Notes
001	Intermittent	Category A (50 ft)	Unnamed tributary to Panther Creek	Spring fed stream enters a hole in the stream bed.
002	Intermittent	Category A (50 ft)	Unnamed tributary to Panther Creek	Channel is braided in sections with several upwellings of water observed. The area had received several inches of rain in the previous 7 days.

[2] A wet-weather conveyance is drainage that collects and carries surface runoff immediately following a precipitation event.
[3] An intermittent stream is a watercourse that does not flow constantly. Rather, stream flows typically occur for a period following precipitation events, but tend to stop during dry periods.

Stream ID	Stream Type	Streamside Management Zone Category	Stream Name	Notes
003	Perennial	Category A (50ft)	Panther Creek	Panther Creek. Water level may be elevated by beaver dam complex.

Two classes, as defined below, were used to indicate the current condition of streamside vegetation within the proposed substation site. Riparian conditions of all onsite watercourses are summarized in 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.

- 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 Project Boundary

Riparian Condition	Number of Perennial Streams	Number of Intermittent Streams[1]	Total
Forested	1	4	5
Non-forested	0	1	1
Total	1	5	6

[1]Includes three wet-weather conveyances

3.4 Vegetation

The proposed substation and the associated transmission line work are located in the Cumberland Plateau ecoregion (Griffith et al. 1998). This ecoregion is underlain by Pennsylvanian-age rock and generally has acidic soils with low fertility. The region is largely forested and supports less agriculture than the Eastern Highland Rim and the Ridge and Valley ecoregions, which abut the Cumberland Plateau to the west and east, respectively. Vegetation on the proposed substation site is characterized by forest (approximately 60 percent), while the remaining 40 percent of the site is herbaceous vegetation and agricultural crops. No forested areas on the proposed site had structural characteristics indicative of old growth forest (Leverett 1996). All plant communities observed on the site are common and well represented throughout the region.

All onsite forests are characterized by trees with overlapping crowns with deciduous species accounting for more than 75 percent of canopy cover. The majority of this forested area is situated on dry, upland sites. Common plant species in this forest type include blackgum, red maple, scarlet oak, and white oak in the overstory with American holly, blueberry, mountain laurel, and sourwood in the understory. The herbaceous layer has relatively few species, which is not uncommon for dry deciduous forests. Wetter sites associated with depressional areas, wet-weather conveyances, and streams had more herbaceous diversity. On these sites, species like American climbing fern, bulrush, jewelweed, Maryland meadow beauty, royal fern, and violets were common. Within most

forest stands in the project area, overstory trees had a diameter at breast height of about 12 to 18 inches, although larger trees were present sporadically across the site.

The property to be acquired for the proposed substation is located along the eastern edge of a relatively contiguous block of hardwood and conifer forest that extends for approximately 10 miles westward and 7 miles northward. Much of the area within a 5-mile radius south and east of the site tends to be mixture of forest and farmland.

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. Cultivated agricultural fields account for about half of the herbaceous vegetation on the site. The remainder is pasture, mowed areas adjacent to fields or roads, and existing transmission line ROW. Areas in the ROW possess a large percentage of native species adapted to dry environments. Typical herbaceous species found on the site include broom sedge, blazing star, dwarf iris, gray goldenrod, Maryland golden aster, narrow leaf silk grass, and poverty oat grass.

EO 13112 (Invasive Species) serves to prevent the introduction of invasive species and provides for their control to minimize the economic, ecological, and human health impacts that those species potentially cause. In this context, invasive species are nonnative species that invade natural areas, displace native species, and degrade ecological communities or ecosystem processes (Miller et al. 2010). No federal-noxious weeds were observed, and no substantial populations of plant species designated by the Tennessee Exotic Plant Pest Council as high priority invasive plants were observed in the project area. However, small populations of three invasive plants, i.e., tall fescue, Chinese lespedeza, and Japanese honeysuckle, were present on the site. During field surveys, invasive plants were more prevalent in areas of herbaceous vegetation. This likely reflects the greater frequency and magnitude of disturbance present in areas of herbaceous vegetation. Disturbances associated with agriculture, grazing, and mowing prevent tree species from becoming established, but can also encourage invasion and establishment of weedy plants.

3.5 Wildlife

The 73-acre site to be acquired includes mixed hardwoods with a small coniferous component, transmission line ROW, an area of open oaks, and agricultural crop fields. Onsite habitat assessments were conducted in April 2013. Approximately half of the forested area on the site is younger second growth upland forest dominated by white and scarlet oak. A wet-weather conveyance having a rocky streambed runs through this portion of the forest. The other half of the forested area is lowland second growth forest which supports a vernal pool. These pools are used by terrestrial amphibians such as American toad, gray treefrog, spotted salamander and southern leopard frog, as well as by reptiles that prey on these species such as black racer and eastern garter snake. The lowland forest area supported several large white oaks and snags. Breeding birds observed in these forested areas included blue-gray gnatcatcher, blue jay, Carolina chickadee, Carolina wren, downy woodpecker, red-bellied woodpecker, red-eyed vireo, and tufted titmouse.

The field survey of this site coincided with the spring bird migration. Over 40 species of migratory birds were seen using the forest habitat at the proposed substation site. As stated in Section 3.4, onsite forests are contiguous with other large forested areas located to the west and north of the property. At least 20 of these were warblers. This habitat offers suitable breeding grounds for many of the species observed here, including the black and white warbler, black-throated green warbler, hooded warbler, ovenbird, scarlet tanager,

and wood thrush. Other species observed, such as the Blackburnian warbler, blackpoll warbler and Cape May warbler, were likely using this area temporarily on their migration path further north.

Edge habitat between forests and open areas is used by many species of birds, as well as mammals. Mammals likely to use these areas include the coyote, eastern cottontail, short-tailed shrew, white-footed mouse, and white-tailed deer. The area within the existing ROW is comprised of grasses and brushy vegetation, some of which were indicative of wetland soils. Species composition of this habitat included black racer, common yellowthroat, and red-winged blackbird. A small white oak savannah divides the upland forest from the lowland forest and provides habitat for species such as American crow, eastern bluebird, red-tailed hawk and yellow-throated vireo. Open farm fields within the project footprint provide foraging habitat for hawks and sparrows.

There are no documented caves, raptor nests or wading bird colonies within three miles of the project area.

3.6 Endangered and Threatened Species

Endangered species are those determined to be in danger of extinction throughout all or a significant portion of their range. Threatened species are those determined to be likely to become endangered within the foreseeable future. Section 7 of the ESA requires federal agencies to consult with the USFWS when their proposed actions may affect endangered or threatened species or their critical habitats.

The state of Tennessee provides legal protection for species considered threatened, endangered, or deemed in need of management within the state other than those federally listed under the ESA. The legal listing is handled by the Tennessee Wildlife Resources Agency; however, the Tennessee Natural Heritage Program and TVA both maintain databases of plant and animal species that are considered protected or are tracked in Tennessee. These species, as well as species listed under the ESA, are discussed in this section. A listing of federally listed and state-listed endangered and threatened species is provided as Table 3-3.

Table 3-3. Federally Listed and State-listed Species Known to Occur in the Vicinity of the Proposed Plateau 500-kV Substation Site

Common Name	Scientific Name	Federal Status[1]	State Status[1]	State Rank[2]
Crayfish				
a crayfish[3]	*Cambarus pristinus*		END	S1
Obey crayfish[3]	*Cambarus obeyensis*		TRKD	S1S2
Fishes				
Spotfin chub	*Erimonax monachus*	THR	THR	S2
Tangerine darter	*Percina aurantiaca*		NMGT	S3
Tennessee dace	*Phoxinus tennesseensis*		NMGT	S3
Insects				
Allegheny snaketail[3]	*Ophiogomphus incurvatus alleghaniensis*		END	S1
Mussels				
Cumberland bean	*Villosa trabalis*	END	END	S1
Purple bean	*Villosa perpurpurea*	END	END	S1

Common Name	Scientific Name	Federal Status[1]	State Status[1]	State Rank[2]
Plants[4]				
Cumberland rosemary	*Conradina verticillata*	THR	THR	S3
Sundew	*Drosera capillaris*		THR	S1
Foxtail clubmoss	*Lycopodiella alopecuroides*		THR	S2
Monkey-face orchid	*Platanthera integrilabia*	CAND	END	S2S3
Rose pogonia	*Pogonia ophioglossoides*		END	S2
Beakrush	*Rhynchospora perplexa*		THR	S2
Ovate-leaved arrowhead	*Sagittaria platyphylla*		SPCO	S2S3
Narrow-leaved meadow-sweet	*Spiraea alba*		END	S1
Virginia spiraea	*Spiraea virginiana*	THR	END	S2
Birds				
Golden-winged warbler	*Vermivora chrysoptera*		NMGT	S3
Mammals				
Indiana bat[5]	*Myotis sodalis*	END	END	S1
Northern long-eared bat	*Myotis septentrionalis*	PE		

Source: TVA Natural Heritage Database

[1] Status Codes: CAND = Candidate for listing; END = Endangered; NMGT = In Need of Management; PE = Proposed Endangered; SPCO = Special Concern; THR = Threatened; TRKD = Tracked by state natural heritage program (no legal status).

[2] State Ranks: S1 = Critically Imperiled; S2 = Imperiled; S3 = Vulnerable; S#S# = Denotes a range of ranks because the exact rarity of the element is uncertain (e.g., S1S2)

[3] Species is known to occur within ten miles of the project area.

[4] Plant species listed are those of concern known from within 5 miles of the project area; however, federally listed plants are those known to occur within Cumberland County, but not necessarily within 5 miles from the project area.

[5] USFWS has determined that the Indiana bat may occur statewide, but this species has not been documented in Cumberland County.

3.6.1 Aquatic Animals

Two state-listed aquatic species and 3 state-tracked aquatic species are known to occur within a ten mile radius of the proposed 500-kV substation. Additionally, three federally listed aquatic species are known to occur in Cumberland County, but not within a 10 mile radius of the proposed site.

Habitat requirements for listed insects and crayfish species in the area are described in NatureServe (2013), for fishes in Etnier and Starnes (1993), and for mussels in Parmalee and Bogan (1998). The following provides a brief description of federally listed aquatic species known from Cumberland County, Tennessee.

The spotfin chub inhabits clear upland rivers in swift currents and is associated with sand, gravel, boulder, and bedrock substrates. Adults have been collected in swift currents over boulder substrates and juveniles in moderate current over gravel substrates. The species is known from five locations in the lower Clear Creek drainage, part of which has been designated as critical habitat for the Spotfin chub. The nearest known documented occurrence of the chub is more than 5 miles downstream of the project site, and the upper limit of the critical habitat in Clear Creek is approximately 2.5 miles downstream of the project site. Current threats to this species include impoundment, sedimentation, channelization, and changes in temperature regimes in the streams it inhabits.

The Cumberland bean occurs in small rivers and streams in clean gravel or sand substrate with fast current in stable riffle and run areas of less than about 3 feet in depth. It is

restricted to streams and rivers in the upper Cumberland River and its tributaries in Kentucky and the Hiawassee River of the Tennessee River system. Current impacts to the species are impoundments, siltation, channelization, and poor land use practices (Parmalee and Bogan 1998). The Cumberland bean does not occur on the property to be acquired for the proposed substation or in the immediate vicinity of the property.

The purple bean commonly inhabits small headwater streams to medium sized rivers. It is found in moderate to fast flowing rivers and streams in sand, gravel, and cobble substrates. Current impacts to the species are impoundments, sedimentation, channelization, and contaminants from point and non-point sources (Parmalee and Bogan 1998). This mussel does not inhabit the subject property or streams in the vicinity of the property.

3.6.2 Plants

Six state-listed plants and one plant candidate for federal listing have been reported from within a five-mile radius of the project area. Two additional federally listed plant species have been documented elsewhere in Cumberland County (Table 3-3). No federal or state-listed plant species or any habitat capable of supporting such listed species was observed during field surveys of the proposed site. No designated critical habitat for plant species occurs on the proposed site.

3.6.3 Terrestrial Animals

One state-listed terrestrial animal species (the golden-winged warbler) has been documented within three miles of the proposed project area. The golden-winged warbler is a migratory song bird that winters in the neotropics and whose summer range extends from the northern tier of the United States and the southern provinces of Canada, down the Appalachian Mountains into the Blue Ridge Mountains and Cumberland Plateau. This species nests in disturbed, shrubby, early successional areas, especially those with younger trees or saplings (Nicholson 1997; Palmer-Ball 1996). This species was observed in an area immediately adjacent to the project footprint in early successional habitat that includes sweetgum saplings and shrub/grassland. These birds likely use the area within the project footprint for foraging. However, breeding habitat does not exist for this species within the boundaries of the property to be acquired for the proposed substation.

The entire state of Tennessee falls within the summer range of the Indiana bat, and all suitable woodlands throughout the state are considered potential Indiana bat habitat by the USFWS (2012). Although this species has not been documented as occurring in Cumberland County, records for Indiana bats are known from Fentress and White counties within 20 miles of the project site.

Indiana bats roost together in caves in large numbers during winter months, throughout central and mid-southern U.S. In the summer they migrate to woodlands throughout the eastern half of the U.S. Their range during summer months extends from northern New York to northern Alabama and Mississippi. In these woodlands, males and groups of breeding females roost under exfoliating bark found on snags or live trees. In the lowland wooded portion of the proposed site, field surveys located 26 dead snags and eleven live trees having diameters greater than 5 inches, with exfoliating bark that could potentially be used by summer roosting bats, including the federally listed as endangered Indiana bat. The areal extent of this habitat was determined to be 17.80 acres.

The northern long-eared bat is a small bat associated with mature, interior forest habitats. This species is susceptible to white-nose syndrome, and the USFWS recently proposed to

list the northern long-eared bat as endangered. Currently northern long-eared bat is thought to occupy habitat similar to Indiana bat. Northern long-eared bats utilize caves and mines during winter months, and roost in live and dead trees with exfoliating bark, crevices and cracks during summer months. Suitable summer roosting habitat for this species exists in the project area; however, no wintering habitat is known within the project footprint. Known records of this species exist from mist nest surveys in 2011 and 2013 approximately 44 and 54 miles away in Roane County, Tennessee. The nearest records of caves are greater than seven miles away. Contiguous mature mixed hardwood forest is plentiful surrounding the proposed project area.

3.7 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. Executive Order 11988 (Floodplain Management) requires federal agencies to avoid to the extent possible the adverse impacts associated with modifications of the 100-year floodplain. The proposed site is not located within the 100-year floodplain.

3.8 Wetlands

Wetlands are those areas inundated by surface water or groundwater such that vegetation adapted to saturated soil conditions is prevalent. Examples include swamps, marshes, bogs, and wet meadows. Wetland fringe areas also are found along the edges of most watercourses and impounded waters (both natural and man-made). Field surveys were conducted in April 2013 to delineate wetland areas within the proposed substation footprint.

Wetland determinations were performed according to the USACE standards, which require documentation of hydrophytic (wet-site) vegetation, hydric soil, and wetland hydrology (USACE 2010; Environmental Laboratory 1987; Lichvar and Kartesz 2009; U.S. Department of Defense and USEPA 2003). Broader definitions of wetlands, such as those used by the USFWS (Cowardin et al. 1979), the Tennessee definition (Tennessee Code 11-14-401), and the TVA Environmental Review Procedures definition (TVA 1983), were also considered in this review. Using a TVA-developed modification of the Ohio Rapid Assessment Method (Mack 2001) specific to the TVA region (TVA Rapid Assessment Method or “TVARAM“) was used to categorize wetlands by their functions, sensitivity to disturbance, rarity, and ability to be replaced.

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/statewide concern, such as wetlands that provide habitat for threatened or endangered species.

The proposed site consists of agricultural fields, fallow transmission line ROW, and forest land dissected by drainages. Two wetlands were identified within the proposed site (Table 3-4).

Table 3-4. Wetlands Located Within the Proposed Project Boundary

Wetland Identifier	Type[1]	Acreage Within Property Boundary	Acreage Within Substation Footprint	TVARAM Category (score)
W001	PEM1E/PSS1E/PFO5/PUBH	0.10	0.00	2 (54)
W002	PFO1E	0.08	0.08	2 (53)
	Total Acres	**0.18**	**0.08**	

[1]Classification codes as defined in Cowardin et al. (1979): E = Seasonally flooded/saturated; PEM1 = Palustrine emergent, persistent vegetation; PFO1=Palustrine forested, broadleaf deciduous vegetation; PSS1=Palustrine, scrub-shrub, broadleaf deciduous; PFO6=Palustrine, forested, dead; PUB=Palustrine, unconsolidated bottom; H=Permanently Flooded.

W001 is an approximately 0.1-acre portion of a larger wetland complex located at the confluence of two drainages forming Panther Creek. W001 exhibited hydric soils and ponded hydrology due to beaver activity within the creek basin. W001 is dominated by hydrophytic vegetation that includes purple chokecherry, jewelweed, soft path rush, beggar's tickseed, and panic grass.

W002 is a vernal pool wetland comprised of 0.08 acre forested wetland habitat within a small depression surrounded by upland. This wetland exhibits hydric soil due to extended periods of inundation during rainy periods. However, no hydrologic connectivity is evident, with water escaping via evapotranspiration or seeping into the groundwater. Dominant hydrophytic vegetation consisted of red maple, black tupelo gum, and purple chokecherry.

3.9 Aesthetics

3.9.1 Visual Resources

The physical, biological, and cultural features of an area combine to make the visual landscape character both identifiable and unique. Scenic integrity indicates the degree of unity or wholeness of the visual character. Scenic attractiveness is the evaluation of outstanding or unique natural features, scenic variety, seasonal change, and strategic location. Where and how the landscape is viewed affects 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 a mile and four 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 proposed site is located adjacent to two existing transmission lines (the Monterey-Peavine 161-kV and the Roane-Wilson 500-kV transmission lines), which are located on a common ROW (see Figure 1-1). The Volunteer Electric Cooperative's existing 161-kV Campbell Junction Substation adjoins the proposed site. The site is approximately 0.5 mile north of I-40. Much of the proposed substation site is wooded, and the site is bordered by wooded areas to the west, north, and east. The site is visible from Plateau Road, which borders the site to the southeast. The ROW adjoining the proposed substation site is

mainly open and can be seen from local roads to the south and east. However, because of intervening vegetation and distance, the proposed site is not visible from I-40. Scenic attractiveness is common due to ordinary visual quality. Scenic integrity is moderate.

3.9.2 Noise

Major sources of ambient noise on the site of the proposed substation and in the immediate area include traffic from I-40 and Plateau Road, the adjacent Campbell Junction Substation, and local farming operations. Several residences are located near the site on Plateau Road, which borders the site to the southeast.

3.9.3 Odors

There are no known major sources of objectionable odors in the vicinity of the proposed substation site.

3.10 Archaeological and Historic Resources

Federal agencies are required by the Section 106 of the National Historic Preservation Act and by NEPA to consider the possible effects of their undertakings on historic properties. The term “historic property” includes any historic or prehistoric site, district, building, structure or object included in, or eligible for inclusion in, the National Register of Historic Places (NRHP). “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. To determine an undertaking’s possible effects on historic properties, a four-step review process is conducted. These steps are: (1) initiation (defining the undertaking and the APE and identifying the parties to be consulted in the process); (2) identification of historic properties within the APE; (3) assessment of effects to historic properties; and (4) resolution of adverse effects by avoidance, minimization, or mitigation. During the Section 106 process, the agency must consult with the appropriate State Historic Preservation Officer (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 an historic property within the APE would diminish any of the qualities that make the property eligible for the NRHP, the effect would be considered adverse. Examples of adverse effects include 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.

The archaeological Area of Potential Effect (APE) for the undertaking was determined, in consultation with the Tennessee SHPO, to be all areas in which land-disturbing activities would take place, which consists of the approximately 73-acre proposed site. The APE for historic architectural resources was determined to be that area within a 0.5 mile radius surrounding the boundary of the project area, as well as any areas where the project would alter existing topography or vegetation in view of a historic resource.

A records search conducted at the Tennessee Division of Archaeology and the Tennessee Historic Commission in Nashville prior to the fieldwork indicated no previously-recorded archaeological sites or architectural properties within the respective APEs. The archaeological survey, completed in early May 2013, identified no archaeological resources

within the APE. The architectural survey, completed in late April 2013, identified four architectural properties, all of which were determined by TVA to be ineligible for listing in the National Register of Historic Places due to their lack of architectural distinction and to a loss of integrity due to modern alterations and/or additions.

3.11 Recreation, Parks, and Natural Areas

This section describes recreational and natural areas that are within, immediately adjacent to, or within 3 miles of the proposed project. Natural Areas include ecologically significant sites; federal, state, or local park lands; national or state forests; wilderness areas; scenic areas; wildlife management areas; recreational areas; greenways; trails; Nationwide Rivers Inventory streams; and Wild and Scenic Rivers.

The subject property is likely used for informal recreation such as occasional camping and hunting. An old deer hunting stand was observed on the property. Camp Nakanawa, a privately-owned summer camp for girls, is located at Mayland Lake, approximately three miles to the west of the property.

The National Wild and Scenic Rivers System was created by the federal Wild and Scenic Rivers Act of 1968 to preserve certain rivers with outstanding natural, cultural, and recreational values in a free-flowing conditions. Portions of the Obed River are listed in the Wild and Scenic Rivers System. The listed portion of the Obed River is approximately 10.5 miles from the site of the proposed substation.

The Nationwide Rivers Inventory is a listing of more than 3,400 free-flowing river segments in the United States that are believed to possess one or more “outstandingly remarkable” natural or cultural values of more than local or regional significance. Portions of Clear Creek and the Caney Fork Rivers are on the Nationwide Rivers Inventory. Clear Creek is approximately 2 miles from the proposed substation; the Caney Fork River is approximately 4 miles distant.

The Plateau Experimental Station occurs 1.4 miles south of the proposed project. Founded in 1943, this 2,100-acre experimental station operated by the University of Tennessee is used to research fruits, vegetables, beef, and swine.

3.12 Land Use and Prime Farmland

Approximately 73 acres of property would be acquired for the substation. Of this property, forested and brushy areas occupy approximately 48 acres, and approximately 12 acres lie within the ROW for the Roane-Wilson and Monterey-Peavine transmission lines, which forms the southwestern edge of the property. Approximately 13 acres of the site is currently used for agriculture. There are no residences on the site; however, several homes are located in the vicinity along Plateau Road, which lies to the southeast of the property. The general area is rural in character with farms and pasture lands interspersed among forested areas. Residences tend to be along roads; however, some planned residential development within larger forested blocks has occurred in the area.

Prime farmland is defined by the U.S. Department of Agriculture (USDA) as land that has the best combination of chemical and physical characteristics for producing food, feed, forage, fiber, and oilseed crops. To be considered prime farmland it cannot be urban, built-up or covered by water. Concern regarding the conversion of prime farmland to urban or industrial use prompted the creation of the 1981 Farmland Protection Policy Act. This

act requires federal agencies to evaluate impacts to farmland prior to permanently converting the land to non-agricultural use. Form AD 1006, *Farmland Conversion Impact Rating*, must be completed by federal agencies with assistance from the Natural Resource Conservation Service (NRCS) before an action is taken.

The proposed site covers about 73 acres of which about 6 percent is considered prime farmland. Soil identifications based on NRCS (2013) data for the site are presented in Table 3-5. Soils considered prime farmlands are shown as green polygons on the soil map (NRCS 2013) for the site, which is provided as Figure 3-2.

Table 3-5. Farmland Classification Within the Proposed Project Boundary

Soil Symbol	Soil Description	Rating	Acres	Percent
GpC	Gilpin loam, 5-12% slopes	Not prime farmland	35.5	48.7
LIB	Lily loam, 2-5% slopes	All areas are prime farmland	4.4	6.0
LIC	Lily loam, 5-12% slopes	Not prime farmland	21.1	29.0
RaC	Ramsey loam, 5-12% slopes	Not prime farmland	0.1	0.1
RaD	Ramsey loam, 12-20% slopes	Not prime farmland	11.8	16.2
		Total	**72.9**	**100.0**

The Gilpin and Lily loam soils consist of moderately deep, well-drained, moderately permeable soils. These sloping soils occur on hillsides and ridge tops. The Ramsey loam soils consist of shallow, somewhat excessively drained, rapid permeable soils. These strongly sloping soils are on hillsides and the upper side slopes on the Cumberland Plateau.

3.13 Socioeconomics and Environmental Justice

The proposed substation site is located in Cumberland County, Tennessee, Census Tract 9703.01, Block Group 2. According to U.S. Census Bureau (2013) data, the total population of this Block Group is 2,201. Of this, 3.5 percent are minorities (nonwhite or Hispanic origin). This minority share is smaller than in both Census Tract 9703.01 as a whole (3.9 percent) and Cumberland County (4.2 percent), and well below the state and national shares of 24.4 and 36.3 percent, respectively.

The poverty level in Census Tract 9703.01 is about 15.4 percent, according to the American Community Survey 5-Year Estimates 2007-2011. This poverty level is similar to that of Cumberland County (16.0 percent) and the state of Tennessee (16.9 percent). The national poverty level is slightly lower, at 14.3 percent, than the local level as well as the county and state levels (U.S. Census Bureau 2013). Median household income in the tract is $33,299, somewhat lower than the county median of $36,955 and lower than the state level of $43,989 and the national level of $52,762.

Figure 3-2. NRCS Farmland Classification Map (green indicates prime farmland)

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 in the same order as in Chapter 3.

As stated in Section 2.1.1, under the No Action Alternative, TVA would not construct the proposed 500-kV substation or associated transmission line connections. In the event that TVA chooses not to construct the proposed substation and associated transmission line connections, the transmission system in the project area would continue to progress towards equipment and line overloading. Because the proposed construction, operation, and maintenance of the proposed facilities would not occur under the No Action Alternative, no direct effects to those environmental resources listed in Chapter 3 are anticipated. Over time changes to current conditions could occur; however, these changes are not expected to be the result of implementing the No Action Alternative.

4.1 Groundwater and Geology

4.1.1 No Action Alternative

Under the No Action Alternative, the substation would not be built, and construction activities would not occur that could have possible impacts on groundwater resources or local geological characteristics. Thus, no effects to groundwater resources or the local geological character are expected from adopting the No Action Alternative.

4.1.2 Action Alternative

Under the Action Alternative, BMPs as described in Muncy (2012) would be used to avoid contamination of groundwater in the project area. Transfer of sediments to groundwater would be avoided by using BMPs during construction activities. As a standard practice, USEPA-registered herbicides would be used in accordance with label directions in areas requiring chemical treatment (see Section 2.5). As stated in Section 2.2.1.1, the proposed substation would have oil containment facilities consisting of a subsurface oil catchment area and an oil/water separator to capture any oil from the transformer banks. With the implementation of these practices, any potential impacts on groundwater resulting from the construction and operation of the proposed substation would be minor. Similarly, no changes in geological characteristics, such as the creation of sinkholes, are anticipated under the Action Alternative.

4.2 Surface Water

4.2.1 No Action Alternative

Under the No Action Alternative, the construction activities and operations of the proposed substation that could affect local surface water quality would not occur.

4.2.2 Action Alternative

Soil disturbances associated with site clearing and construction activities can potentially result in adverse effects to surface water quality. Soil erosion and sedimentation can clog small streams and threaten aquatic life. Removal of the tree canopy along streams can increase water temperatures, promote algal growth, and deplete dissolved oxygen, thereby

causing adverse impacts to aquatic biota. Improper use of herbicides to control vegetation could result in runoff to streams and subsequent aquatic impacts.

However, TVA routinely includes precautions in the design, construction, and maintenance of its transmission line and substation projects to minimize these potential impacts. Construction of the proposed substation and transmission line connectors would not require the crossing of any perennial streams. However, approximately 525 feet of the wet-weather conveyance that drains the northwestern portion of the property lies within the “footprint “ of the proposed substation and would be removed by construction. The remainder of the watercourses mentioned in Section 3-3 lie outside the substation footprint. Construction and maintenance activities would comply with appropriate state permit requirements and TVA requirements as described in Muncy (2012).

To protect intermittent streams, SMZs would be established in the drainage along the southwestern side of the property (Figure 3-1). Tree canopies in all SMZs would be left undisturbed unless there were no practicable alternative. ROW maintenance for the transmission line connections 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 in the vicinity of receiving waters and to prevent unacceptable aquatic impacts. Likewise, the substation would be equipped with a containment system and an oil/water separation system to manage potential oil spills from transformers (see Section 2.2.1.1). Proper implementation of these controls is expected to result in only minor temporary impacts to surface waters. No cumulative impacts to the quality of local surface waters are anticipated.

4.3 Aquatic Ecology

4.3.1 No Action Alternative

Under the No Action Alternative, the substation and associated transmission line connections would not be built. Thus, no changes to aquatic resources within these areas would result from TVA’s actions.

4.3.2 Action Alternative

Aquatic life could be affected by the proposed action. Impacts could occur either directly from the alteration of onsite stream or stream habitat conditions or indirectly from modifications of the riparian zone and from storm water runoff due to construction and maintenance activities of the substation.

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 that could result from 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 and mussel species (Sutherland et al. 2002; Brim Box and Mossa 1999).

Construction of the proposed substation would result in the filling of the small vernal pool (see Section 4.8.2). Additionally, approximately 525 feet of the wet-weather conveyance

that drains the northwestern portion of the property lies within the footprint of the proposed substation and would be removed by construction. A sediment catchment basin (shown as green polygons in Figure 3-1) is planned further down-gradient on this watercourse to prevent the off-site movement of sediment into Panther Creek. Plans call for another catchment basin to be placed at the eastern edge of the substation to prevent sediment movement eastward into receiving waters. A third basin would likely be installed in the wet-weather conveyance portion of the watercourse along the southwest side of the property to prevent sedimentation of the downstream wetland.

TVA assigns appropriate streamside management zones (SMZs) and best management practices (BMPs) based on field evaluations and other considerations (such as State 303(d) impaired waters listing and presence of endangered or threatened aquatic species). Appropriate application of the BMPs can reduce the potential for impacts to water quality and in-stream habitat for aquatic organisms. 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 streams, as well as the state and federal requirements to avoid harming certain species (Appendix F). The width of the SMZs is determined by the type of watercourse, primary use of the water resource, topography, or other physical barriers (Muncy 2012).

Consequently, 50-foot SMZs (i.e., Category A) would be established along the two segments of intermittent stream and along that reach of Panther Creek within the property boundary (see Figure x-x). 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. Because catchment basins would be installed to prevent offsite movement of sediment and because appropriate BMPs and SMZs would be implemented during construction, operation, and maintenance of the proposed Plateau 500-kV Substation and associated transmission line connections, any direct, indirect, or cumulative impacts to aquatic animals resulting from the proposed action are expected to be minor.

4.4 Vegetation

4.4.1 No Action Alternative

Adoption of the No Action Alternative would not affect plant life directly because no project-related work would occur. 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. All invasive species found in the project area are common throughout the region, and implementation of the No Action Alternative would not change this situation.

4.4.2 Action Alternative

Adoption of the Action Alternative would not significantly affect the vegetative terrestrial ecology of the region. Project-related work would result in a long-term adverse effect to herbaceous plant communities, particularly in areas where substation construction would occur. However, areas of herbaceous vegetation located in the project area possess little if any conservation value, and any project-related effects would be minimal.

Conversion of forest land for construction of the proposed substation and transmission infrastructure would be long-term in duration, but locally minor. As of 2011, there were at

least 1,800,000 acres of forested land in Cumberland and the adjacent Tennessee counties, and this figure has remained relatively unchanged over the last 15 years (U.S. Forest Service 2013). Completion of the project, as currently proposed, would result in clearing of about 40 acres of forest. Cumulatively, project-related effects to forest resources would be negligible when compared to the total amount of forestland occurring in the region.

The entire project area currently has a relatively small 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. The use of TVA standard operating procedure of revegetating with noninvasive species (Muncy 2012) would serve to minimize the potential introduction and spread of invasive species in the project area.

4.5 Wildlife

4.5.1 No Action Alternative

Under the No Action Alternative, TVA would not construct the new substation or associated transmission line connections, and the terrestrial wildlife habitat present would remain intact. Any changes to the habitat would be natural and would not be the result of TVA action.

4.5.2 Action Alternative

Under the Action Alternative, TVA would clear about 40 acres of forest to construct the proposed substation and associated transmission line connections. Mobile woodland vertebrate species that use these woodlands would be displaced. However, some less mobile species (e.g., moles) would likely be killed by construction activities.

The 0.08-acre vernal pool supporting local amphibian populations would be filled, and direct impacts to the individuals associated with this habitat would likely occur. Although the planned sediment catchment basins would not have a forested canopy, they would provide habitat similar to that provided by the natural vernal pool. Because several farm ponds, as well as intermittently ponded and shallow-water habitats are available in the local area, such displacements would likely have minor effects on local wildlife populations.

Construction of the substation would displace species typical of early successional, open woodland, and edge habitats. However, some of these species would likely return to the similar habitat that would serve as the buffer around the substation, provided some of these areas are left in a state that can still be used by these species. Because such habitats are common in the immediate area, potential effects to populations of species inhabiting these areas would be minor.

4.6 Endangered and Threatened Species

4.6.1 No Action Alternative

Under the No Action Alternative, TVA would not construct the proposed substation and the associated transmission line connections. Thus, there would be no change from current conditions, and no direct effects to any local endangered or threatened species. However, changes to the area would nonetheless occur over time, as 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. The status and conservation of any potentially affected listed species would continue to be determined by

the actions of others. Thus, there would be no direct, indirect, or cumulative effects to federally listed or state-listed endangered or threatened species and their habitats by TVA project-related actions under the No Action Alternative.

4.6.2 Action Alternative

4.6.2.1 Aquatic Animals

An impoundment of Panther Creek is located downstream of the proposed substation site and physically separates drainage from the substation site and the designated critical habitat for the spotfin chub within the Clear Creek system (see Section 3.6.1). The federally listed Cumberland bean and the purple bean mussels do not occur within the vicinity of the project area and would not be affected.

As indicated in Section 4.2.2, adverse water quality impacts can result from the implementation of the proposed project, which could have direct and indirect impacts to aquatic biota within watercourses in the project area. However, as described in Sections 4.2.2 and 4.3.2, watercourses that could be affected by the proposed project would be protected by implementing standard BMPs and additional protection measures as identified in Muncy (2012) and in Appendices D and F. These BMPs are designed in part to minimize disturbance of riparian areas and the 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 substation, no direct, indirect, or cumulative impacts to federally or state-listed aquatic species are anticipated to occur.

4.6.2.2 Plants

Adoption of the Action Alternative would not affect federally or state-listed plant species because no individual plants or habitat capable of supporting listed species occurs in the project area.

4.6.2.3 Terrestrial Animals

Under the Action Alternative, TVA would clear about 40 acres of forest and modify other habitats to construct the proposed substation and associated transmission line connections. Forested areas would be permanently removed, including 17.80 acres snags and live trees that could be utilized by summer roosting Indiana bats (see Section 3.6.3). There is sufficient wooded habitat within five miles of the proposed project area, suggesting that the loss of this habitat would not impact populations of this species. Although suitable Indiana bat habitat would be removed as part of this project, direct effects to Indiana bat would be avoided by limiting clearing to the period between October 15, 2014 and April 1, 2015 (see Section 2.5), when bats are wintering in caves and are not utilizing summer roosting habitat.

Additionally, TVA entered into an MOA with USFWS to provide funding to the Indiana Bat Conservation Fund to offset the removal of not more than 17.80 acres of potential Indiana bat roosting habitat and any indirect or cumulative effects on the species. The Indiana Bat Conservation Fund is administered by the Kentucky Natural Lands Trust, which has partnered with the USFWS to protect the Indiana bat and restore its habitat. The Indiana Bat Conservation Fund provides funding to conserve and restore summer and winter bat habitat and funds bat research and monitoring. TVA's contributions would be used to fund such actions in Tennessee. The implementation of these measures as stipulated in the MOA would minimize any incidental take of Indiana bats.

A recovery plan identifying specific habitat components for the northern long-eared bat has not yet been prepared by the USFWS. The northern long-eared bat is much more common in Tennessee than the Indiana bat, and although the northern long-eared bat shares some similar habitat requirements with the Indiana bat, the northern long-eared bat tends to have less specific habitat requirements than the Indiana bat. Therefore, the preventive measures taken to avoid direct effects to the Indiana bat (i.e., limiting clearing to winter months when the bats are not using this habitat) are expected to afford protection to the northern long-eared bat. Abundant suitable habitat for the northern long-eared bat is expected to remain in the vicinity of the project and across the region. Therefore, TVA has determined that implementing the proposed action would have no effect on this species.

Golden-winged warblers are potentially breeding in shrub/sapling early successional habitat adjacent to the north end of the project footprint. Any disturbance to this area or the wooded area proximal to it between the period April 15 and August 1 could potentially disturb breeding birds of this species. However, because the breeding grounds themselves would not be directly affected by vegetation removal, this disturbance is expected to be minor and temporary. No long term significant direct, indirect, or cumulative impacts to this species are anticipated as a result of substation construction and operation.

4.7 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" (U.S. 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 practicable alternative.

4.7.1 No Action Alternative

Under the No Action Alternative, the proposed substation and associated transmission line connection would not be constructed. Therefore, there would be no direct, indirect, or cumulative impacts to floodplains because there would be no physical changes to the current conditions found within the local floodplains.

4.7.2 Action Alternative

The proposed site would be located outside of the 100-year floodplain. Therefore the proposed project would be consistent with EO 11988 (Floodplain Management).

4.8 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). Activities resulting in the discharge of dredge or fill into waters of the United States require authorization through a Nationwide General Permit or Individual Permit issued by the USACE under Section 404 of the Clean Water Act. 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.

4.8.1 No Action Alternative

Under the No Action Alternative, no project-related disturbance to wetlands within the project footprint would occur. Therefore, no wetlands would be affected. 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.

4.8.2 Action Alternative

During site preparation and the construction of the proposed 500-kV substation, wetland W001 would be avoided, and a 50-foot buffer would be maintained. No disturbance would be allowed within this wetland or its buffer during substation construction or maintenance activities. W002 would be permanently filled, resulting in a loss of this vernal pool habitat. However, this wetland area totals 0.08 acre and would be a minor loss of wetland area and the habitat it provides within this watershed. Because less than one tenth of an acre of wetlands would be affected, a Nationwide Permit (i.e. Nationwide Permit 12) from the USACE is not required. In addition, all local, state, and federal wetland regulations would be followed to reduce the potential for adverse wetland impacts. Because potential wetland effects have been minimized, the proposed action is consistent with the requirements of EO 11990.

Cumulative impact analysis of wetland effects takes into account wetland loss and conversion at a watershed-level scale. Proposed wetland impacts are considered minor on a cumulative scale due to the avoidance measures and minimal fill proposed. Therefore, no major cumulative wetland impacts are anticipated as a result of the proposed construction project.

Potential indirect wetland impacts would be reduced to minor levels during the substation and transmission line construction and ROW maintenance activities through implementation of best management practices as described by Muncy (2012). As a result of these measures, the proposed project would cause only minor direct, indirect, and/or cumulative impacts to wetland areas and the associated wetland functions and values within the project area and general watershed.

4.9 Aesthetics

Visual consequences were examined in terms of visual changes between the existing landscape and proposed actions, sensitivity of viewing points available to the general public, their viewing distances, and visibility of proposed changes. 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.

4.9.1 No Action Alternative

Under this alternative, the proposed substation and associated transmission line connections would not be constructed. Thus, the visual character of the proposed substation site and the immediate area would likely remain virtually unchanged, at least for the foreseeable future. However, some visual changes could occur over the long term due to residential or commercial development. Likewise, no changes in local ambient noise levels or new sources of odors are likely to occur within the foreseeable future under the No Action Alternative.

4.9.2 Action Alternative

4.9.2.1 Visual Resources

Under the Action Alternative, the new substation and the associated transmission line connection would be built. 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 substation is completed and the ROW and laydown areas have been restored through the use of TVA's standard BMPs. Because of their temporary nature, construction-related effects to local visual character are expected to be minor.

The completed substation would be visible to some of the neighboring residents along Plateau Road and briefly to vehicular traffic on Plateau Road. The new substation facilities would be visually similar to, but somewhat more prominent than, other structures and transmission lines currently seen in the local landscape. Although the proposed substation would present a visual contrast in the short term, local residents and motorists would become accustomed to the new facilities as part of the local landscape. Overall, visual effects are expected to be minor.

Necessary security lighting of the proposed substation would generate some additional local light during nighttime hours, which would cause a slight loss of dark sky conditions in the local area. Such lighting is designed to cast light downward and to minimize emissions above the horizontal plane. As described in Appendix G, TVA routinely designs substation lighting to accommodate the concerns of nearby residents. Although illumination from the proposed substation would contribute to the loss of dark sky conditions, this cumulative effect would be localized and minor.

4.9.2.2 Noise and Odors

During construction of the proposed substation and associated transmission line connections, equipment would generate noise above ambient levels. Because of the short construction period, noise-related effects are expected to be temporary and insignificant. For similar reasons, noise related to periodic line maintenance is also expected to be insignificant. As described in Section 4.14.1, transmission lines may also produce noise during operation under certain atmospheric conditions. Off the ROW, this noise is below the level that would interfere with speech. Construction and operation of the substation and the transmission connector lines are not expected to produce any noticeable odors.

No significant long-term impacts related to noise are expected as a result of the operation or maintenance of the substation (see Appendix J). Noise from cooling fans for the transformers would be infrequent and would be approximately the same as ambient levels at nearby residences. Circuit breakers at the substation could occasionally open to disconnect part of the transmission system during incidents such as excessive current or voltage fluctuations. The resulting noise could startle people nearby; however, because of the infrequent occurrences, it would not result in a significant impact.

4.10 Archaeological and Historic 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

The four identified architectural properties identified within the APE were determined by TVA to be ineligible for listing in the National Register of Historic Places due to their lack of architectural distinction and to a loss of integrity due to modern alterations and/or additions. Based on these findings, TVA has determined that the project would not affect any historic properties. TVA consulted with the Tennessee SHPO and with federally recognized Indian tribes regarding historic properties within the proposed project's APE. The SHPO agreed with TVA's determination that the project would not affect any historic properties in a letter of June 12, 2013 (see Appendix B). Therefore, implementing the proposed project would have no effects on archaeological or architectural resources listed in or eligible for listing in the National Register of Historic Places due to the absence of such resources within the respective APEs.

4.11 Recreation, Parks, and Natural Areas

4.11.1 No Action Alternative

No adverse effects to local recreation opportunities, parks or natural areas are anticipated under the No Action Alternative because there would be no change from current conditions.

4.11.2 Action Alternative

Installation of the proposed substation would preclude informal recreational use of the site. Because similar areas are abundant in the area, this loss would be minor. The Plateau Experimental Station is located over one mile from the proposed substation. Because the distance from the project site to this feature is sufficient, no direct, indirect or cumulative impacts to this natural area are anticipated as a result of implementing the proposed action. No loss of local formal or informal recreational opportunities is expected under the Action Alternative.

Because of the intervening distance and the fact that downstream water quality would not be affected by construction and operation of the proposed substation, there would be no effects to any streams on the Nationwide Rivers Inventory or listed on the Wild and Scenic Rivers System.

4.12 Land Use and Prime Farmland

4.12.1 No Action Alternative

No changes in current land uses are anticipated on the proposed substation site within the foreseeable future under the No Action Alternative. Thus, implementation of this alternative would not affect any prime farmlands.

4.12.2 Action Alternative

Under the Action Alternative, the current land use on the 73-acre site (primarily forest and agriculture) would be converted mostly to industrial use in the form of a substation.

Consistent with the requirements of the Farmland Protection Policy Act, a *Farmland Conversion Impact Rating* was completed using input from local USDA NRCS staff. The NRCS "Relative Value of Farmland to be Converted" in the area was given a score of 64 out of a possible maximum of 100. The "Site Assessment Criteria" rating, which must be completed by the federal agency involved in the action, yielded a score of 52 out of a

possible maximum of 160 points. The site assessment score was low due to the size of the area, amount of area that is wooded, the lack of barns or farm structures on the site, the lack of impact on existing farming operations, and the small percentage classified as prime farmland. The sum of the two scores is the Farmland Conversion Impact Rating. A score of 160 or higher implies that the land's value for farming is high enough to recommend that it not be converted to non-farm use.

The overall Farmland Conversion Impact Rating for the site was 116. Because this score is less than the threshold score of 160, loss of this site for agricultural uses would constitute a minor loss of farmland resources.

4.13 Socioeconomics and Environmental Justice

4.13.1 No Action Alternative

Under the No Action Alternative, no land would be purchased by TVA, and the proposed substation would not be built. Over time, increasing power loads caused by commercial and industrial growth in the area would eventually result in overloaded transformers and other electrical equipment. This could cause a loss of reliability of the local electrical power transmission system and possible power outages. Businesses and residences in the area would be negatively affected by the lack of a reliable power supply.

4.13.2 Action Alternative

Approximately 73 acres of privately-owned property would be purchased for the project. Current landowners would be compensated for the value of such properties. Nevertheless, the direct local economic effect from this purchase would be minor. Implementing the proposed actions would accommodate anticipated increases in power loads in the area. Therefore there would be some long-term indirect economic benefits to the area. Because of local demographic conditions, construction and operation of the proposed substation and connectors would not disproportionally affect any economically disadvantaged or minority populations.

Studies (Chalmers and Voorvaart 2009; Electric Power Research Institute 2003) indicate that transmission lines and related facilities can affect local residential property values. However, these effects can vary greatly depending on local conditions such as distance between residences and the facilities, demand for local real estate, and the extent of encumbrance (e.g., ROW imposition) that the facilities cause to local landowners. Siting of the proposed substation and the associated connections would not impose encumbrances on any local residential properties. Most residences in the area tend to be located along Plateau Road. The proposed substation site is not immediately adjacent to any residences. Because most homes in the local area are located far enough from the proposed substation site, any effects to local property values are expected to be minor.

4.14 Postconstruction Effects

4.14.1 Electric and Magnetic Fields

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: (1) the strength of the electric or magnetic field, (2) the size and shape of the conducting object, and (3) 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 connections, like other transmission lines, have 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.

Under certain weather conditions, high-voltage transmission lines, such as the proposed 500-kV and 161-kV line connections, may produce an audible low-volume hissing or crackling noise (Appendix J). 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 speech. Corona is not associated with any adverse health effects in humans or livestock.

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 power line insulators or poor alignment of the radio or television antenna and the signal source. Both conditions are readily correctable.

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, older devices and designs (i.e., those beyond five 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 (Journal of the 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 objects' 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 EMF. 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 power line 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 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 recent 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 transmission 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 are 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; U.S. Department of Energy 1996; National Institute of Environmental Health Sciences 1998).

Although no federal standards exist for maximum EMF field 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 milligauss (mG) at the edge of the ROW for lines of 230 kV and less. The expected magnetic field strengths at the edge of the proposed ROW would fall well within these standards. Consequently, the

construction and operation of the proposed transmission line connectors are not anticipated to cause any significant impacts related to EMF.

4.14.1.1 Alternative 1 – No Action

Under the No Action Alternative, no new EMF would be created from the construction of the proposed transmission line connectors. The electrical loading on portions of TVA's existing transmission system would likely be increased, resulting in increases in EMFs. However, this increase would not result in any significant impacts.

4.14.1.2 Alternative 2 – The Action Alternative

EMFs would be produced along the length of the proposed transmission line connections. The strength of the fields within and near the ROW varies with the electric load on the line and with the terrain. Nevertheless, EMF strength attenuates rapidly with distance from the line and is usually equal to local ambient levels at the edge of the ROW. The proposed substation would also generate EMFs. However, these EMFs would occur within the substation site and would tend to decrease to ambient levels at the boundary of the site. Thus, public exposure to EMFs would be minimal, and no significant impacts from EMFs are anticipated.

4.14.2 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 National Electrical Safety Code is strictly followed when installing, repairing, or upgrading TVA lines or equipment. Transmission line 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.

4.14.3 Transmission Structure Stability

The laced-steel tower structures, similar to those shown in Figure 2-1, that would be used on the proposed 500-kV transmission line connection are the result of detailed engineering design and have been used by TVA for over 70 years with an exceptional safety record. Many structures of this type have been in service for more than 60 years with little maintenance necessary other than painting or minor repair of some of the steel members.

The pole structures (Figure 2-2) that would be used on the proposed 161-kV transmission line connection 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 to their low cross-section in the wind.

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

4.14.4 Other Impacts

No significant impacts as air quality and solid waste are expected to result from the relatively short-term activities of construction. Appendices D and H contain procedures for dealing with these issues.

Transmission line structures are well grounded, and the conductors are insulated from the ground. Therefore, touching a structure supporting a transmission line poses no inherent

shock hazard. Additionally, TVA transmission lines are built with overhead ground wires that would 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 a line, for at least the width of the ROW. The National Electrical Safety Code is strictly followed when installing, repairing, or upgrading TVA lines or equipment.

4.15 Long-term and Cumulative Impacts

Currently, that section of Plateau Road in the vicinity of the proposed substation is experiencing minor commercial and residential development. Because the proposed substation would be located adjacent to the existing Campbell Junction Substation, the new substation would cause the visual character of the immediate area to be more industrial in nature and contribute to a minor loss of rural character.

Construction of the proposed substation would result in the disturbance of approximately 50 acres of woodland and early successional habitat. However, both of these types of habitat are plentiful in this region.

4.16 Unavoidable Adverse Environmental Impacts

As previously stated, clearing for the 500-kV substation and the associated transmission line connections would result in the removal of approximately 40 acres of forest. After completion of the substation and transmission line connections:

- Construction of the proposed substation and transmission line connections could result in a small amount of localized siltation.
- The substation location would be graveled. Trees would not be permitted to grow within the transmission line connection ROW or to a determined height adjacent to the ROW that would endanger the transmission line connections.
- Clearing and construction would result in the disruption and/or loss of some wildlife, and the permanent loss of about 40 acres of forested wildlife habitats.
- The proposed project would result in the incidental take of Indiana bats in the form of habitat loss totaling not more than 17.80 acres of potential Indiana bat summer roosting structures (i.e., snags and trees). Direct effects to Indiana bats would be avoided by limiting clearing to the period between October 15, 2014 and April 1, 2015. TVA's provision of funds to the Indiana Bat Conservation Fund, in accordance with the terms of the MOA between TVA and the USFWS would offset this loss of summer roosting habitat.
- Any burning of cleared material would result in some short-term air pollution.
- Construction of the proposed substation would result in the filling of 0.08 acres of vernal pool wetlands.
- The proposed substation and transmission line connections would result in some degree of visual effect on the landscape in the immediate local area.
- The proposed substation would result in the loss of approximately 4.4 acres of farmland considered prime farmland for agricultural purposes.

4.17 Relationship of Local Short-Term Uses and Long-Term Productivity

The substation site would be committed to use for electrical system needs for the foreseeable future. The land occupied by substation facilities would be converted from its current use for agriculture and as forested land. Any agricultural production or wildlife uses would be foregone for the life of the substation. These losses of long-term productivity with respect to agriculture and timber production, and as wildlife habitat are minor both locally and regionally.

4.18 Irreversible and Irretrievable Commitments of Resources

Irreversible commitments of resources are those uses of resources that cannot be reversed. An example of an irreversible commitment is the mining and use of an ore, which once mined, cannot be replaced. Irretrievable commitments of resources are those that may occur over a period of time but that may be recovered. For example, filling a wetland area for a parking lot would irretrievably commit the property for as long as the parking lot remains.

The materials used for construction of the proposed facilities would be committed for the life of the facilities. Some materials, such as ceramic insulators and concrete foundations, may be irrevocably committed, but the metals used in equipment, conductors, and supporting steel structures could be recycled. The useful life of steel-pole transmission structures is expected to be at least 60 years. Thus, recyclable materials would be irretrievably committed until they are eventually recycled.

The substation site and the ROW used for the transmission line connections would constitute an irretrievable commitment of onsite resources, such as wildlife habitat, forest resources, vernal pool wetlands, and prime farmland in that the approximate previous land use and land cover could be returned upon retirement of these facilities. In the interim, compatible uses of the ROW for the transmission line connections could continue.

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CHAPTER 5

5.0 LIST OF PREPARERS

5.1 NEPA Project Management

Anita E. Masters

Position:	Program Manager
Education:	M.S., Biology/Fisheries; B.S., Wildlife Management
Experience:	26 years in Project Management, NEPA Compliance, and Community and Watershed Biological Assessments
Involvement:	NEPA Compliance and Document Preparation

James F. Williamson Jr.

Position:	Contract Senior NEPA Specialist
Education:	Ph.D., Fisheries and Wildlife Sciences; M.S., Wildlife Ecology; B.S., General Science/Zoology
Experience:	10 years in Forest Management, Inventory, and Software Development; 22 years in NEPA Compliance
Involvement:	Document Preparation

5.2 Other Contributors

Jacqueline G. Broder

Position:	Manager, Environmental Services
Education:	M.S., Agriculture
Experience:	30 years in Project Management, Environmental Evaluations, Technical Report Writing and Editing, and Proposal Preparation
Involvement:	Prime Farmlands

W. Nannette Brodie, CPG

Position	Senior Environmental Scientist
Education	B.S., Environmental Science; B.S., Geology
Experience	16 years in Environmental Analyses, Surface Water Quality, and Groundwater/Surface Water
Involvement:	Groundwater

Kimberly D. Choate

Position	Manager, Transmission System Siting
Education	B.S. and M.S. Civil Engineering
Experience	26 years in Civil Engineering, Environmental Engineering, NEPA Preparation, Project Management, and Manager of Siting Engineers
Involvement:	Document Review

Stephen C. Cole
Position: Contract Archaeologist
Education: Ph.D., Archaeology; M.A. and B.A., Anthropology
Experience: 10 years in Cultural Resources; 4 years university teaching
Involvement: Cultural Resources Compliance

Patricia B. Cox
Position: Botanist, Specialist
Education: Ph.D., Botany (Plant Taxonomy and Anatomy); M.S. and B.S., Biology
Experience: 31 years in Plant Taxonomy; 9 years in Rare Species Monitoring, Environmental Assessment, and NEPA Compliance
Involvement: Threatened and Endangered Species Compliance, Invasive Plant Species, and Terrestrial Ecology

James H. Eblen
Position: Contract Economist
Education: Ph.D., Economics; B.S., Business Administration
Experience: 46 years in Economic Analysis and Research
Involvement: Socioeconomics and Environmental Justice

Patricia Bernard Ezzell
Position: Specialist, Native American Liaison
Education: M.A., History emphasis in Historic Preservation; B.A., Honors History
Experience: 26 years in History, Historic Preservation, and Cultural Resource Management; 11 years in Tribal Relations
Involvement: Tribal Liaison

Andrew R. Henderson
Position: Aquatic Endangered Species Biologist
Education: M.S. Fisheries; B.S. Fisheries
Experience: 10 years in Imperiled Aquatic Species; 5 years in Aquatic Threatened and Endangered Species
Involvement: Aquatic Threatened and Endangered Species

John M. Higgins, P.E.
Position: Water Quality Specialist
Education: Ph.D., Environmental Engineering; M.S., B.S., Civil Engineering
Experience: 41 years in Environmental Engineering and Water Resources Management
Involvement: Surface Water

Britta P. Lees
Position: Wetlands Biologist
Education: M.S., Botany-Wetlands Ecology Emphasis; B.A., Biology
Experience: 13 years in Wetlands Assessments, Botanical Surveys, Wetlands Regulations, and/or NEPA Compliance
Involvement: Wetlands

Carrie C. Mays, P.E.

Position:	Civil Engineer, Flood Risk
Education:	M.S., Civil Engineering; B.S., Civil Engineering
Experience:	10 years in Compliance Monitoring and Reservoir Water Quality; 4 years in River Hydraulics
Involvement:	Floodplains

Paul J. Pearman, P.E., CPESC

Position:	Manager, Energy Delivery Projects Environmental Support
Education:	M.S., Environmental Engineering; B.S., Environmental Engineering
Experience:	9 years in Transmission Line and Substation Environmental Compliance Support
Involvement:	Document Review

W. Chett Peebles, RLA; ASLA

Position:	Specialist, Landscape Architect
Education:	Bachelor of Landscape Architecture
Experience:	23 years in Site Planning, Design, and Scenic Resource Management; 6 years in Architectural History and Historic Preservation
Involvement:	Visual Resources and Historic Architectural Resources

Craig L. Phillips

Position:	Aquatic Biologist
Education:	M.S. and B.S., Wildlife and Fisheries Science
Experience:	5 years Sampling and Hydrologic Determinations for Streams and Wet-Weather Conveyances; 5 years in Environmental Reviews
Involvement:	Aquatic Ecology/Threatened and Endangered Species

Kim Pilarski

Position:	Senior Wetlands Biologist
Education:	M.S., Geography, Minor Ecology
Experience:	17 years in Wetlands Assessment and Delineation
Involvement:	Natural Areas

Aurora Moldovanyi Pulliam

Position:	Recreation Planner
Education:	M.S., Recreation, Tourism, Park Planning and Management; B.S., Wildlife and Fisheries Biology and Management
Experience:	9 years in NEPA and recreational project planning
Involvement:	Recreational Resources

Emily P. Willard

Position:	Siting Specialist
Education:	B.S., Environmental Science
Experience:	8 years in Environmental Compliance; Preparation of Environmental Review Documents
Involvement:	Project Coordination, Document Preparation

David B. Wilson

Position:	Contract Biologist
Education:	M.S. Environmental Science; B.S. Biology
Experience:	8 years in Biological Resources and Compliance; 4 years in Natural Areas Review
Involvement:	Natural Areas

CHAPTER 6

6.0 ENVIRONMENTAL ASSESSMENT RECIPIENTS

The following federal agencies, federally recognized tribes, and state agencies were notified of the availability of the document.

6.1 Federal Agencies

United States Fish and Wildlife Service
Cookeville, Tennessee

6.2 Federally Recognized Tribes

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

6.3 State Agencies

Tennessee Historical Commission
Nashville, Tennessee

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CHAPTER 7

7.0 LITERATURE CITED

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Appendix A – Notice of Intent

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8120-08-P

TENNESSEE VALLEY AUTHORITY

Putnam-Cumberland, Tennessee - Improve Power Supply

AGENCY: Tennessee Valley Authority.

ACTION: Notice of intent.

SUMMARY: This notice is provided in accordance with the Council on Environmental Quality's regulations (40 CFR Parts 1500-1508) and the Tennessee Valley Authority's (TVA) procedures for implementing the National Environmental Policy Act (NEPA). TVA will prepare an environmental assessment (EA) or an environmental impact statement (EIS) to address the potential environmental effects of proposed electrical power supply improvements in the Putnam and Cumberland region of east-central Tennessee. The purpose of the proposed project is to ensure the reliable transmission of electric power to meet increasing power demands in the project area.

In its environmental review, TVA will evaluate the potential environmental impacts of the construction, operation, and maintenance of proposed new and upgraded power transmission facilities. TVA will develop and evaluate various alternatives, including the No Action Alternative, in the environmental review. Public comments are invited concerning both the scope of the review and environmental issues that should be addressed.

DATES: To ensure consideration, comments on the scope and environmental issues must be postmarked or e-mailed no later than February 22, 2011. If TVA decides to

prepare an EIS, a notice of availability of the draft document will be published in the Federal Register, and announcements will be placed in local news media.

ADDRESSES: Written comments should be sent to Anita Masters, NEPA Compliance Manager, Tennessee Valley Authority, 1101 Market Street (LP 5U), Chattanooga, Tennessee 37402-2801. Comments may be e-mailed to newtransline@tva.gov or entered online at http://www.tva.gov/environment/reports/putnam/index.htm.

FOR FURTHER INFORMATION, CONTACT: Christopher A. Austin, Civil Engineer, Tennessee Valley Authority, 1101 Market Street (MR 4G), Chattanooga, Tennessee 37402-2801; telephone: 800-362-4355; e-mail: newtransline@tva.gov. Project information is available online at http://www.tva.gov/power/projects/putnam_cumb/index.htm.

SUPPLEMENTARY INFORMATION:

Background

TVA is an agency and instrumentality of the United States, established by an act of Congress in 1933, to foster the social and economic welfare of the people of the Tennessee Valley region and to promote the proper use and conservation of the region's natural resources. One component of this mission is the generation, transmission, and sale of reliable and affordable electric energy. TVA provides electric power to most of Tennessee and to parts of Virginia, North Carolina, Georgia, Alabama, Mississippi, and Kentucky. TVA transmits this power over approximately 16,000 miles of transmission lines.

TVA supplies bulk electric power to Cumberland and Putnam counties and the immediately surrounding areas in east-central Tennessee through an existing network of 26 161-kilovolt (kV) substations and 28 161-kV transmission lines. Population in this area has grown at a rate of almost 1.8 percent per year since 2000. TVA studies indicate that 19 of these substations will not meet acceptable voltage criteria by 2016, and the remaining seven substations will be unable to meet criteria by 2019. Five of the 161-kV transmission lines are expected to become overloaded by summer 2016, and 11 more lines are likely to be overloaded by summer 2019. Long-range studies indicate that either the provision of a 500-kV source or extensive upgrades to existing 161-kV facilities will be required in the Putnam County and Cumberland County area by 2016 to meet anticipated power loads.

Proposed Alternatives

TVA has identified three potential alternatives to meet the identified power supply needs. The first involves upgrading existing transmission lines in the area. This would require replacing conductors (i.e., "wires") on approximately 54 miles of transmission lines and performing other upgrades (e.g., resagging and retensioning conductors and increasing structure heights) on about 115 miles of transmission lines. Extensive equipment upgrades would be required at 11 161-kV substations.

The second potential alternative involves the construction and operation of a new 500-kV substation in western Cumberland County near the existing Campbell Junction 161-kV Substation. The new substation would require an area of 60 to 80 acres. Under this option, TVA would acquire a 300-foot-wide right-of-way, then construct, operate, and maintain two new parallel 500-kV transmission line connections from the new substation

to the TVA Roane-Wilson 500-kV Transmission Line. The length of the new lines would likely be less than 2 miles. In addition, following acquisition of a 100-foot-wide right-of-way,TVA would construct, operate, and maintain two new 161-kV transmission line connections on a double-circuit line (i.e., a line consisting of two sets of conductors located on common structures) from the new 500-kV substation to the existing TVA Monterey-Peavine 161-kV Transmission Line. The new connections would likely be less than a mile long. New substation equipment would be installed in the Jamestown, Tennessee, area under this option.

The third alternative involves construction of a new 500-kV substation in Putnam County southwest of Cookeville on a 60- to 80-acre site. As part of this alternative, TVA would acquire a 300-foot-wide right-of-way and construct, operate, and maintain two new parallel 500-kV transmission lines from the proposed substation to the TVA Roane-Wilson 500-kV Transmission Line. These new lines are expected to be less than 2 miles in length. TVA would also acquire right-of-way in order to construct, operate, and maintain four new 161-kV transmission line connections. Two of these would be a double-circuit line located on a 100-foot-wide right-of-way from the new 500-kV substation to the existing TVA Cordell Hull-West Cookeville 161-kV Transmission Line. The other two connections would also be a double-circuit line located on a 100-foot-wide right-of-way from the new 500-kV substation to the Gallatin-West Cookeville 161-kV Transmission Line. About 7 to 10 miles of new right-of-way would be needed for these connections. Additionally, the West Cookeville-South Cookeville 161-kV Transmission Line would be upgraded. New equipment would be installed at the Jamestown 161-kV Substation in Fentress County, Tennessee, and at the Monterey 161-kV Substation in Putnam County under this alternative.

New 500-kV transmission lines would likely utilize self-supporting, laced-steel towers, while new 161-kV lines would probably be mounted on single- and double-pole steel structures. Line construction would require removal of trees within the right-of-way as well as any other nearby tall trees that could endanger safe operation of the line. Construction of the 500-kV support structures would require the excavation of foundations for each of the tower legs. Cranes and other heavy equipment would be used to construct the towers and pull the electrical conductor into place. After construction, the disturbed areas would be revegetated, and the right-of-way would be maintained periodically to control the growth of tall vegetation.

After the completion of scoping, TVA will begin detailed studies for siting the substation and routing the transmission lines using maps, aerial photography, and other relevant data. When the studies have progressed sufficiently, potentially affected landowners will be contacted directly, and additional field surveys will be conducted.

The results of evaluating the potential environmental impacts and other important issues identified in the scoping process, as well as engineering and economic considerations, will be used by TVA in identifying a Preferred Alternative. At this time, the range of alternatives TVA has identified for detailed evaluation includes the No Action Alternative and the three potential Action Alternatives described above. As analyses proceed, one or more alternatives may be eliminated due to technical infeasibility, unacceptable environmental impacts, or unreasonably high economic costs. TVA expects to evaluate multiple sites for the new substation and various routing options for new transmission lines.

Proposed Issues to be Addressed

The EA or EIS will contain descriptions of the existing environmental and socioeconomic resources within the area that would be affected by construction, operation, and maintenance of the proposed substation, transmission lines, and associated upgrades. Evaluation of potential environmental impacts to these resources will include, but will not necessarily be limited to, the potential impacts on water quality, aquatic and terrestrial ecology, endangered and threatened species, wetlands, aesthetics and visual resources, land use, historic and archaeological resources, and socioeconomic resources. The need and purpose of the project will be described. The range of issues to be addressed in the environmental review will be determined, in part, from scoping comments. The preliminary identification of reasonable alternatives and environmental issues in this notice is not meant to be exhaustive or final.

Public and Agency Participation

The EA or EIS is being prepared to inform decision makers and the public about the potential environmental effects of TVA's options for meeting anticipated electric power demands in central Tennessee. The draft EA or EIS is anticipated to be available in late 2011. Any changes to this schedule will be posted on the TVA Web site: http://www.tva.gov/power/projects/putnam_cumb/index.htm. The environmental review process will also serve to inform the public and the decision makers of the reasonable measures that would be implemented to minimize adverse impacts. Other federal, state, and local agencies and governmental entities are invited to provide scoping comments. These agencies include, but are not limited to, the U.S. Army Corps of Engineers, U.S.

Fish and Wildlife Service, Tennessee Department of Environment and Conservation, and the Tennessee State Historic Preservation Officer.

The public is invited to submit comments on the scope of the environmental review no later than the date given under the DATES section of this notice. TVA will conduct a public scoping meeting on January 20, 2011. This open house meeting will begin at 3:00 p.m. and end at 7:00 p.m. CST. The meeting will be held at the Willow Place Conference Center, Cascade Hall, located at 225 North Willow Avenue, Cookeville, Tennessee. At the meeting, TVA will present overviews of the proposed project and the environmental review process, answer questions, and solicit comments on the issues of interest to the public. The meeting will be publicized through notices in local newspapers, TVA press releases, on the TVA Web site at http://www.tva.gov/environment/reports/putnam/index.htm and in letters to local elected officials.

Dated: January 13, 2010

Anda A. Ray, Jan. 13, 2011

Anda A. Ray,
Senior Vice President, Environment and Technology.

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Appendix B – Correspondence

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United States Department of the Interior

FISH AND WILDLIFE SERVICE
446 Neal Street
Cookeville, TN 38501

February 18, 2011

Ms. Anita Masters
NEPA Compliance Manager
Tennessee Valley Authority
1101 Market Street (LP 5U)
Chattanooga, Tennessee 37402-2801

Re: CPA-2011-0236. Scoping Comments for Tennessee Valley Authority's Proposed Electrical Power Supply Improvements in the Putnam and Cumberland Regions of East-Central Tennessee

Dear Ms. Masters:

Personnel of the U.S. Fish and Wildlife Service (Service) have had the opportunity to review the January 18, 2011 letter from the Tennessee Valley Authority (TVA), encouraging us to submit comments on the scope of the environmental review for your Proposed Electrical Power Supply Improvements Project in the Putnam and Cumberland Regions of East-Central Tennessee. We have also reviewed materials associated with this proposed project on your website. The NOI indicates that TVA will prepare an environmental assessment (EA) or an environmental impact statement (EIS) to address the potential environmental effects of proposed electrical supply improvements in Putnam and Cumberland counties, Tennessee, due to population increases in these two counties and that existing facilities will be unable to meet power demands by 2016. The purpose of the proposed project is to ensure the reliable transmission of electric power to meet increasing power demands in the project area.

We reviewed recent and historical endangered species collection records within the locality of the proposed project. Records indicate that the federally endangered gray bat (*Myotis grisescens*) occurs within the general vicinity of proposed Putnam County project activities, the third potential action alternative indicated by TVA. Critical habitat for the federally threatened spotfin chub (*Erimonax monachus*) occurs in Clear Creek within the immediate vicinity of the proposed Cumberland County project activities, the second action alternative indicated by TVA. Due to the potential presence of these federally listed species and critical habitat within the action area of the proposed project and no apparent recent surveys on the subject parcels, we believe there is a possibility that these species could be adversely affected or critical habitat modified. We recommend that qualified biologists conduct a survey(s) to determine presence of

We also are concerned that the federally endangered Indiana bat (*Myotis sodalis)* may occur within the vicinity of the proposed project activities. Although endangered species collection records available to the Service do not indicate that the Indiana bat occurs within the project's action area, collection records available to the Service may not be all-inclusive and to the best of our knowledge, recent bat surveys have not been conducted in this area. TVA has indicated that line construction would require removal of trees within the right-of-way, as well as any other nearby tall trees that could endanger safe operation of the line. These trees may potentially provide roosting habitat for Indiana bats and have additional impacts on foraging areas and foraging production (insects) for this species. Therefore, we recommend that a qualified biologist(s) should conduct a survey to determine presence of the Indiana bat and whether the proposed project may affect the species. In addition, we are presently investigating the possibility of establishing an Indian Bat Conservation Fund for mitigating unavoidable impacts. This fund could potentially be established during the timeline for the proposed project.

Due to a number of unknowns (i.e., the Preferred Alternative has not yet been identified, the specific impact area is unclear at this juncture, detailed construction methods have not yet been provided, etc.), we have limited our comments to concerns regarding potential impacts to known and suspected endangered species within the proposed action area. We further recommend that TVA address and include known locations of migratory birds and wetlands during their analysis with determinations of potential future effects to these resources. As TVA proceeds with their analysis and after selection of the Preferred Alternative, please keep us informed, and we shall provide additional comments specific to the action and project area chosen.

Please contact Todd Shaw of my staff at (931) 528-6481, extension 215, if we can provide further assistance.

Sincerely,

Mary E. Jennings

Mary E. Jennings,
Field Supervisor

xc: Robert Todd, TWRA, Nashville, TN

Comment submitted via the TVA online comment system:

```
Construct a new 500-kV substation in Putnam County
This would create jobs for this area.
Thank you,
William Welch
```

Comment submitted via U.S. Postal Service:

~~Diane Moore~~ STEVE MOORE

From: "Diane Moore" <dianemoore@frontiernet.net>
To: <info@ucdailynews.com>
Cc: <wardnorris@gmail.com>; <newtransline@tva.com>
Sent: Wednesday, February 02, 2011 5:13 PM
Subject: MOORE TO THE POINT

PLEASE POST FEBRUARY 3, 2011 COOKEVILLE TIMES, COM

GROWTH
DEMANDS MORE ELECRICITY (LAW OF SUPPLY AND DEMAND)

Remember several years ago when TVA warned that a new electrical line would be needed to serve the growing community of Algood. They warned that Algood could experience brownouts or even blackouts if more electricity were not delivered. The NIMBYs went ballistic. TVA had informational meetings and advanced several routes that a new transmission line might take. The current line that ties into TVA's high tension line off Poplar Grove Road and goes over Buck Mountain was fiercely opposed by environmentalists along the proposed route. These people actually expected Algood to go dark as they championed their cause of no power line across my property! No, sir. Put it someplace else--anywhere else.

The case dragged on for several years at a tremendous cost to both sides and finally resulted, via Court order, in TVA's building the current line. Algood now has an abundance of electricity, at least for the foreseeable future.

Now, here we go again. TVA is projecting that Putnam County will require more juice in the coming years until 2019. The project is being based on the fact that Putnam and Cumberland Counties have been growing at about a 2% rate of growth since 2000. That's a lot of people for the past ten years! Don't forget that each year's calculations are based on the rate of growth for each previous year. It's like calculating compound interest.

Look for these NIMBYs to come out of the woodwork by the date of the next meeting sometime this summer.

A total of 26 TVA substations will be overloaded by 2019, and 16 of the smaller feeder lines will be overloaded by 2019. This expansion will be met by howls of protest by the environmentalists. There will be lawsuits by property owners upon which substations will be projected to be constructed or connecting lines will be projected to be run.

Meanwhile populations in the area will continue to grow. The Upper Cumberland area, especially Cumberland County, is a mecca for retirees. It's a fact of life, hated by some, that electricity demand will increase with growth. But, selfish NIMBYs never seem to learn or care.

2/2/2011

Masters, Anita E

From: Ezzell, Patricia Bernard
Sent: Tuesday, October 22, 2013 12:09 PM
To: Masters, Anita E
Cc: Williamson, James F Jr
Subject: FW: TVA, PLATEAU ROAD 500-kV SUBSTATION, PHASE I ARCHAEOLOGICAL SURVEY, MONTEREY, CAMPBELL COUNTY, TENNESSEE

We received this response; that is all I show.—Thanks, Pat

From: Lisa LaRue-Baker - UKB THPO [mailto:ukbthpo-larue@yahoo.com]
Sent: Wednesday, June 05, 2013 2:04 PM
To: Ezzell, Patricia Bernard
Cc: lstapleton@unitedkeetoowahband.org
Subject: Re: TVA, PLATEAU ROAD 500-kV SUBSTATION, PHASE I ARCHAEOLOGICAL SURVEY, MONTEREY, CAMPBELL COUNTY, TENNESSEE

The United Keetoowah Band of Cherokee Indians in Oklahoma has reviewed your project under Section 106 of the NHPA, and at this time, have no comments or objections. However, if any inadvertent discovery of human remains are discovered, please cease all work and contact us immediately.

Lisa C. Baker
Acting THPO
United Keetoowah Band of Cherokee Indians in Oklahoma
P O Box 746
Tahlequah, OK 74465

c 918.822.1952
ukbthpo-larue@yahoo.com

Please FOLLOW our historic preservation page and LIKE us on FACEBOOK

--- On **Thu, 5/30/13, Ezzell, Patricia Bernard <pbezzell@tva.gov>** wrote:

From: Ezzell, Patricia Bernard <pbezzell@tva.gov>
Subject: TVA, PLATEAU ROAD 500-kV SUBSTATION, PHASE I ARCHAEOLOGICAL SURVEY, MONTEREY, CAMPBELL COUNTY, TENNESSEE
To: rallen@cherokee.org, "Tyler B. Howe" <tylehowe@nc-cherokee.com>, ukbthpo-larue@yahoo.com, "Emman Spain" <ESpain@mcn-nsn.gov>, "Terry Cole" <tdcole@mcn-nsn.gov>, aberryhill@muscogeenation-nsn.gov, "Augustine Asbury" <aqttcultural@yahoo.com>, hlharjo@yahoo.com, "Charles Coleman" <chascoleman75@yahoo.com>, "Joseph Blanchard" <joseph.blanchard@astribe.com>, "Robin Dushane" <RDushane@estoo.net>, "Steve Daugherty" <sdaugherty@estoo.net>, "Kim Jumper" <kjumper_shawneetribe@hotmail.com>, PaulBackhouse@semtribe.com
Cc: "Russell Townsend" <RussellT@nc-cherokee.com>, jfife@muscogeenation-nsn.gov, "Odette Freeman" <odette_freeman@mcn-nsn.gov>, AnneMullins@semtribe.com, AlisonSwing@semtribe.com
Date: Thursday, May 30, 2013, 11:01 AM

Good Afternoon,

I hope this email message finds you well. By this email, I am transmitting the attached letter regarding TVA's proposal to build a new 500-kV substation and perform associated transmission line (TL)

work in Monterey, Tennessee, in order to meet increasing demand for electricity.

The referenced report can be found on the TRC website. The file is listed as "Plateau Rd Substation

report draft.pdf". Directions for accessing the report are attached.

As always, should you have any questions, or if you have trouble accessing the report, please do not hesitate to contact me. Please respond by June 29, 2013, if you have any comments on the undertaking.

Thank you.

Sincerely,

Pat

Pat Bernard Ezzell

Tribal Liaison and Corporate Historian

Public Relations and Corporate Information

Communications

Tennessee Valley Authority

400 W. Summit Hill Drive

460 WT 11D-K

Knoxville, Tennessee 37902

Phone: (865) 632-6461

TENNESSEE HISTORICAL COMMISSION
2941 LEBANON ROAD
NASHVILLE, TENNESSEE 37243-0442
OFFICE: (615) 532-1550
www.tnhistoricalcommission.org

June 12, 2013

Mr. Clinton Jones
Tennessee Valley Authority
400 West Summit Hill Drive
WT11D
Knoxville, Tennessee 37902-1499

RE: TVA, CULTURAL RESOURCES ASSESSMENT, PLATEAU ROAD SUBSTATION, UNINCORPORATED, CUMBERLAND COUNTY, TN

Dear Mr. Jones:

At your request, our office has reviewed the above-referenced cultural resources survey report in accordance with regulations codified at 36 CFR 800 (Federal Register, December 12, 2000, 77698-77739). Based on the information provided, we concur that the project area contains no historic properties eligible for listing in the National Register of Historic Places.

If project plans are changed or archaeological remains are discovered during construction, please contact this office to determine what further action, if any, will be necessary to comply with Section 106 of the National Historic Preservation Act.

Your cooperation is appreciated.

Sincerely,

E. Patrick McIntyre, Jr.
Executive Director and
State Historic Preservation Officer

EPM/jmb

Tennessee Valley Authority
1101 Market Street
Chattanooga, Tennessee 37402-2801

Clayton L. Clem, P.E.
Vice President
Electric System Projects
Power System Operations

September 23, 2013

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

Dear Mr. Archer:

TENNESSEE VALLEY AUTHORITY (TVA) – PLATEAU ROAD 500-KV SUBSTATION – REVISED MITIGATION FOR IMPACTS TO INDIANA BAT HABITAT

On September 13, 2013 TVA submitted a cover letter and signed Memorandum of Agreement (MOA) to you agreeing to pay the amount of $65,800.00 to the Indiana Bat Conservation Fund (IBCF) administered by the Kentucky Natural Lands Trust (KNLT). The actual mitigation amount required by the MOA is $65,860.00. By way of this letter, TVA agrees to pay the amount of $65,860.00 to mitigate impacts to Indiana bat habitat associated with TVA's Plateau Road 500-kV Substation project in Cumberland County, Tennessee. Payment will be made by electronic transfer. Lindsey Parker of our Financial 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 Emily Willard at (423) 751-3320 or by e-mail at *epwillard@tva.gov*.

Sincerely,

Clayton L. Clem

Clayton L. Clem, P.E.

Enclosure

INDIANA BAT CONSERVATION
MEMORANDUM OF AGREEMENT
BETWEEN THE
U.S. FISH AND WILDLIFE SERVICE
AND
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 Tennessee Valley Authority to promote the survival and recovery of the Indiana bat (*Myotis sodalis*), a federally listed endangered species. Together, the Service and 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 State of Tennessee. 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 Tennessee Field Office of the Service's Interim Indiana Bat Mitigation Guidance for the State of Tennessee, 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 benefits resulting from this MOA 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 Fish and Wildlife Coordination Act (16 U.S.C. 661 *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 Fish and Wildlife Coordination Act states that the Secretary is authorized "to provide assistance to, and cooperate with, Federal,

State, and public or private agencies and organizations in the development, protection, rearing, and stocking of all species of wildlife, resources thereof, and their habitat..."

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, as defined in section 4 of this MOA, is provided through the Service's incidental take statement and August 29, 2013, intra-Service biological opinion, which is incorporated herein by this reference. This biological opinion covers the Service's development of this MOA for the Indiana bat, which is based on implementation of the "Interim Indiana Bat Mitigation Guidance for the State of Tennessee" and provides incidental take of Indiana bats in the form of potential roosting structures (i.e., trees or snags) on 17.80 acres.

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 and 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 that the collaboration for this MOA is voluntary.

Section 4: PROJECT DESCRIPTION

The site of the proposed Tennessee Valley Authority project is located approximately one-half mile north-northeast of the Plateau Road exit of Interstate Highway 40 in Cumberland County, Tennessee. The project involves construction of a new 500-kilovolt electric substation and installation of associated transmission lines. Suitable Indiana bat roosting habitat would be removed at this site to facilitate construction. The following information was derived and calculated in accordance with correspondence from the Tennessee Valley Authority on June 7, 2013; August 20, 2013; August 23, 2013; and August 26, 2013.

The proposed project would result in the direct loss of 17.80 acres of potential bat roosting structures, which involve one Indiana bat habitat type as depicted in Table 1 below.

Table 1

Habitat Type	Forested Acreage Removed
Potential Habitat	17.80 acres

These Indiana bat habitat impacts are the impacts that are covered by this agreement and that were evaluated 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 Tennessee Valley Authority consideration for 90 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. Tennessee Valley Authority has determined that all Indiana bat roosting habitat will be selectively removed between the dates of October 15, 2014 and April 1, 2015.

The remainder of standing trees will be cleared during summer 2016. Prior to the final clearing, inspection of the site will be conducted to determine if suitable Indiana bat maternity roosting structure may have developed subsequent to the initial clearing; and evening emergence observations will be conducted for any suitable maternity type roost structures present. If no bats are observed to emerge from the structures, then they will be felled within 24 hours. The observation of bat emergence would result in coordination between representatives of the Tennessee Valley Authority and the Service.

If the timeframe or other aspects of the project are to be revised, then Tennessee Valley Authority must coordinate with the Service to determine if additional modification of this agreement is necessary; and, if found necessary, Tennessee Valley Authority will seek such modification.

Section 6: SPECIFIC OBLIGATIONS OF THE COOPERATORS

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 Tennessee Valley Authority has NEPA requirements beyond the scope of this MOA, 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. Tennessee Valley

Authority acknowledges that any divergence from these measures and conditions may result in a violation of section 9 of the ESA.

6.2 Tennessee Valley Authority will take any 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 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 17.80 acres of potential Indiana bat roosting structures. Tennessee Valley Authority will remove this habitat during the unoccupied time frame and may remove suitable roosting structures as stated in Section 5.

6.4 Tennessee Valley Authority shall contribute $65,860.00 to the Indiana Bat Conservation Fund (IBCF) administered by the Kentucky Natural Lands Trust (KNLT). This contribution is based on 17.80 acres of potential Indiana bat summer habitat using the process identified in the Service's "Interim Indiana Bat Mitigation Guidance for the State of Tennessee". Funds shall be provided to KNLT within thirty (30) days of the last signature of this MOA. Within seven (7) business days, Tennessee Valley Authority shall provide the Service with a copy of the check or transaction receipt 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 contributions to the IBCF which, in turn, will fund Indiana bat habitat protection, conservation, restoration and/or priority monitoring and research projects for the Indiana bat.

Section 7: COOPERATION

Representatives of 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 at any time representatives of Tennessee Valley Authority have 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. 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 hereto 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 application of 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 expressed and evidenced in writing.

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

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/s.

U.S. Fish and Wildlife Service
Mary E. Jennings
Field Office Supervisor
446 Neal Street
Cookeville, Tennessee 38501
931-525-4973 (telephone)
931-528-7075 (fax)

John Baxter
Tennessee Valley Authority
LP5 N411, 1101 Market Street
Chattanooga, Tennessee 37402-2801
865-632-3360 (telephone)
Email: jtbaxter@tva.gov

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: Mary E Jennings

TITLE: Field Supervisor, Tennessee ES Field Office

DATE: 8/29/2013

TENNESSEE VALLEY AUTHORITY

BY: Clayton L. Clem

TITLE: Vice President, Electric System Projects

DATE: 9-5-13

Kentucky Natural Lands Trust

October 1, 2013

John Baxter
Tennessee Valley Authority
LP5 N411, 1101 Market Street
Chattanooga, TN 37402-2801

Dear Mr. Baxter:

KNLT received the wire transfer of $65,860.00 for the Indiana Bat Conservation Fund as part of the Memorandum of Agreement between the U.S. Fish and Wildlife Service and the Tennessee Valley Authority. Please call me at (859) 986-0744 if you have any questions.

Sincerely,

Donna Alexander

Donna Alexander
Program Manager

Cc: Lee Andrews
Phil DeGarmo
Mary E. Jennings
Clayton L. Clem
Emily Willard

Office Location: 213A Short Street • Berea
Mailing Address: 433 Chestnut Street • Berea, Kentucky 40403
Toll-free: 877-367-5658 • Fax: 859-986-1299 • KNLT.org

Appendix C – TVA Site Clearing and Grading Specifications

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Tennessee Valley Authority Site Clearing and Grading Specifications

1. General - The project manager with the clearing and/or grading contractor(s) shall review the environmental evaluation documents for the project or proposed activity (categorical exclusion checklist, environmental assessment, or environmental impact statement) along with all clearing and construction appendices, conditions in applicable general and/or site-specific permits, the storm water pollution prevention plan, open burning or demolition notification requirements, 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 storm water management practices as outlined in TVA's best management practices (BMPs) manual. 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. BMPs shall be installed before general site clearing or grading, with progressive stabilization BMPs applied from the perimeter toward the interior work areas as grading is completed. Any stabilized area that must be disturbed in subsequent steps shall have temporary BMPs installed until work is completed and the area is restabilized.

   If the contractor fails to use BMPs or to follow environmental expectations discussed in the prebid, 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. He or she shall secure, or ensure that TVA has **secured, all necessary permits and authorizations and made all appropriate notifications** 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 employees knowledgeable of environmental requirements shall be documented** with copies submitted to TVA's project manager or environmental specialist before work begins. The **contractor and subcontractors will be responsible for meeting all** conditions **specified in permits.** Permit conditions shall be reviewed in prework discussions.

3. Land and Landscape Preservation - The contractor shall exercise care to preserve the condition of cleared soils by avoiding as much compacting and deep scarring as possible in areas not to be developed for buildings, structures, or foundations. 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. The placement of erosion/sediment controls shall begin at the perimeter and work progressively to the interior of the site. Repeated work in an area will require establishment of a ground cover immediately after each disturbance is completed. In areas outside the clearing, borrow, fill, or use and access areas, the natural vegetation shall be protected from damage. The contractor and his or her employees and subcontractors must not deviate from delineated access routes or use areas and must enter the site(s) 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 by modifying the methods of clearing or reclearing, grading, borrow, or fill so that the buffer and sensitive area are protected. Some areas may require planting native low-growing plants or grasses to meet the criteria of regulatory agencies, executive orders, or commitments to special program interests.

4. Streamside Management Zones - The clearing and/or grading contractor(s) 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 (SMZs), 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 the 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 the 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 access or site 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 prevented from falling into water bodies or immediately removed from streams, ditches, ponds, 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 and 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 quickly grow to "electrical clearance problem" heights. In many circumstances, herbicides labeled for water and wetland use may be used in reclearing.

At substation, switching stations, and communications sites, wetlands are avoided unless there is no feasible alternative.

6. Sensitive Area Preservation - If prehistoric or historic artifacts or features that might be of archaeological or historical significance are discovered during clearing, grading, borrow, or fill operations, the activity shall immediately cease within a 100-foot radius, and a TVA project manager, an environmental specialist, and the TVA 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, grading, borrow and fill, and/or disposal activities shall be performed using BMPs that will prevent erosion and entrance of spillage, contaminants, debris, and other pollutants or objectionable materials into drainageways, surface waters, 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 shall be kept away from streams and ditches and shall be incorporated into the soil. Only materials allowed to be burned under an open burning permit may be incorporated into the soil.

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

8. Turbidity and Blocking of Streams - If temporary clearing, grading, borrow, or fill 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. In Tennessee, conditions of an Aquatic Resource Alteration Permit shall be met. 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, borrow, fill, or right-of-way disturbance and after sequential disturbance of stabilized areas due to stepwise construction requirement in accordance with applicable permit or regulatory requirements.

   On rights-of-way, 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 design or construction access road standards. At any construction site, 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 immediately. Appropriate U.S. Army Corps of Engineers and state permits shall be obtained for stream or wetland crossings.

9. Air Quality Control - The clearing or grading contractor shall take appropriate actions to limit the amount of air emissions created by clearing and disposal operations to be 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. If building renovation or demolition is involved, the required air quality organization shall be notified the minimum 10 days in advance, and if the start date is delayed, renotified to start the clock again.

10. Dust and Mud Control - Clearing, grading, borrow, fill, or transport 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 manufacturer's 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 vehicles will not be performed on the site, right-of-way, or access route. However, if emergency or “have to” situations arise, minimal/temporary maintenance to vehicles will occur in order to mobilize the vehicle to an off-site maintenance shop. Some heavy equipment may have to be serviced on the right-of-way, site, or access route, except in designated sensitive areas. The clearing, grading, borrow, or fill 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 Program Administration or project manager 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, grading, borrow, fill, or construction contractor shall contract a sanitary contractor who will provide sanitary chemical toilets convenient to all principal points of operation for every working party and at each construction step. 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, grading, borrow, fill, or construction contractor and subcontractor(s) shall be responsible for daily cleanup and proper labeling, storage, and disposal of all refuse and debris on the site produced by his or her 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. Records of waste generation shall be maintained for a site and shall be provided to the project manager and environmental specialist assigned to the project.

19. 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. On rights-of-way, 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, site, or access.

    Trees that have been cut may not be left on a substation, switching station, or communications site.

20. 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, site, or communications facilities 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 with emphasis on using landscaping materials provided in guidelines for low maintenance native vegetation use.

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.

E. Vegetation designated by the Federal Invasive Species Council must be eliminated at the work site, and equipment being transported from location to location must be inspected to ensure removal and destruction of live material.

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Appendix D – TVA Right-of-Way Clearing Specifications

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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.

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Appendix E – TVA Environmental Quality Protection Specifications for Transmission Line Construction

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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 F – TVA Transmission Construction Guidelines Near Streams

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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, the TVA Environmental Biological Compliance staff will have studied each possible stream impact site and will have identified it as falling into one of three categories: (A) standard streamside management protection, (B) protection of important permanent streams, springs, and sinkholes, 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 federal requirements to avoid harming certain species.

As early as possible after field surveys are completed by the TVA Biological Compliance Staff, any streams that have been designated as either Category B or C will be discussed with the TVA Environmental Energy Delivery staff. The purpose of these discussions will be to minimize the number of crossings and their impact on the important resources in the streams during design and construction. The category designation for each stream site will then be marked on the transmission line 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, springs, sinkholes, 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, springs, and sinkholes 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 5, “Structural Controls Standards and Specifications” (Muncy 2012).

2. All equipment crossings of streams and shorelines 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 as a result of clearing operations by the actions of plowing, disking, blading, or other tillage or grading equipment will be minimized in SMZs. Shorelines that have to be disturbed must be stabilized as soon as feasible.

(B) Protection of Important Permanent Streams, Springs, and Sinkholes

This category will be used when there is one or more specific reason(s) why a permanent (always-flowing) stream, spring, or sinkhole requires protection beyond that provided by standard BMPs. Reasons for requiring this additional protection include high potential for occupancy by federally listed or significant state-listed species, federally designated critical habitat, or areas designated as special use classification (e.g., trout waters). 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 5, “Structural Controls Standards and Specifications” (Muncy 2012).

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. Category B designations will be discussed with the TVA Environmental Energy Delivery staff as early as possible in the process, to allow time to discuss possible avoidance or minimization of impacts with design and construction.

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 be minimized in SMZs. 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 requiring special protection is present (for example, the spawning area of a rare species), the stream is known to be occupied by a federally listed or significant state-listed species, or when required as a special condition resulting from consultation with the U.S. Fish and Wildlife Service to avoid project effects on a listed species or designated critical habitat. 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 5, "Structural Controls Standards and Specifications" (Muncy 2012).

2. Category C designations would be discussed with the TVA Environmental Energy Delivery staff as early as possible following field surveys to allow time to discuss possible avoidance or minimization of impacts with design and construction. Environmental Energy Delivery staff would discuss construction activities to take place in the SMZ with the Environmental Biological Compliance staff. On-site planning sessions would be conducted as needed. All crossings of streams also must comply with appropriate state (and, at times, federal) permitting requirements.

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 should be limited to those required to meet National Electrical Safety Code, Federal Energy Regulatory Commission standards, and danger tree requirements. Stumps can be cut close to ground level, but must not be removed or uprooted.

4. Other vegetation near the unique habitat must be disturbed as little as possible during construction. Soil disturbance by plowing, disking, blading, or grading must be kept at a minimum. Areas that have to be disturbed must be stabilized as soon as possible and revegetated as soon as feasible.

5. Special SMZ requirements will be coordinated with Environmental Biological Compliance staff.

Maintenance

During ongoing operations, SMZs will be inspected frequently; and during inactive periods, occasionally. Damaging or failing situations that may cause unacceptable water quality impacts will be corrected as soon as practical.

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

Guidelines	A: Standard Stream Protection	B: Important Permanent Streams, Springs, and Sinkholes	C: Protection of Unique Habitats
1. Reference	• All TVA construction work around streams, springs, and sinkholes 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 5, "Structural Controls Standards and Specifications."	• Except as modified by Guidelines 2-4, 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 5, "Structural Controls Standards and Specifications."	• Except as modified by Guidelines 2-4, 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 5, "Structural Controls Standards and Specifications."
2. Equipment Crossings	• All equipment crossings of streams and shorelines 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.	• All equipment crossings of streams also 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. • ll construction activity would be discussed with the TVA Environmental Energy Delivery staff as early as possible in the process to allow time to discuss possible avoidance or minimization of impacts with design and construction.	• All crossings of streams also must comply with appropriate state (and, at times federal) permitting requirements. • All construction activity would be discussed with the TVA Environmental Energy Delivery staff as early as possible following field surveys to allow time to discuss possible avoidance or minimization of impacts with design and construction. • Special SMZ requirements will be coordinated with Environmental Biological Compliance staff.

[1]Source: *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Construction and Maintenance Activities* (Muncy 2012)

Comparison of Guidelines Under the Three Stream and Water Body Protection Categories[1] (page 2)

Guidelines	A: Standard Stream Protection	B: Important Permanent Streams, Springs, and Sinkholes	C: Protection of Unique Habitats
3. Cutting Trees	• Cutting of trees within streamside management zones (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 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 meeting National Electrical Safety Code (NESC) and danger tree requirements. • Stumps can be cut close to ground level, but must not be removed or uprooted.	• 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 meeting NESC, Federal Energy Regulatory Commission standards, and danger tree requirements. • Stumps can be cut close to ground level, but must not be removed or uprooted.
4. Other Vegetation	• Other vegetation near streams must be disturbed as little as possible during construction. • Soil displacement as a result of clearing operations by the actions of plowing, disking, blading, or other tillage or grading equipment will be minimized in SMZs. • 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 be minimized in SMZs. • 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 disturbance by plowing, disking, blading, or grading must be kept at a minimum. • Areas that have to be disturbed must be stabilized as soon as possible and revegetated as soon as feasible. Special SMZ requirements will be coordinated with Environmental Biological Compliance staff.

[1]Source: *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Construction and Maintenance Activities* (Muncy 2012)

Appendix G – TVA Substation Lighting Guidelines

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Tennessee Valley Authority Substation Lighting Guidelines

For Greenfield Sites
Permanent substation lighting should be a two-stage design. Stage 1 is operated dusk to dawn for fixtures at higher mounting heights, more than 12 feet above the ground, and Stage 2 is switch-controlled for low mounting heights at 12 feet and below.

Stage 1 will be continuous nighttime lighting turned on with a photocell and designed to meet minimum requirements for safety and security. The general purpose of Stage 1 lighting is to light the ground and general area to the fence. Designing Stage 1 continuous lighting should follow Illuminating Engineering Society of North America (IESNA) RP-33-99 recommended practices for maximum lighting at the fence and past the fence, except where National Electrical Safety Code (NESC) requirements supersede these guidelines for safety reasons or *Federal Register* requirements supersede these guidelines for spill-containment facilities. Stage 1 lighting fixtures mounted at an elevation above 12 feet should be the cutoff or full-cutoff type to reduce off-site glare.

The Stage 2 lighting will be provided for temporary operational needs and will only be turned on when required. Stage 2 lighting is intended to provide visibility of substation structures and devices, to operate switches, and to perform tasks. Design of Stage 2 lighting should follow NESC and IESNA RP-7-01 recommended practices for task lighting.

Substation structures should be utilized for mounting Stage 1 and Stage 2 lighting fixtures wherever feasible. Lighting fixtures should be mounted at the minimum elevation required to provide coverage dictated by the required vertical and horizontal light levels and uniformity. Lights may be mounted above an elevation of 40 feet when required for security reasons, such as cameras, or lighting of objects taller than 40 feet.

For Minor Modifications to Existing Facilities
Additional lighting required for substation modifications will follow the basic existing lighting design. To the degree possible, substation structures should be utilized to mount light fixtures. Lighting fixtures may be mounted at an elevation above 40 feet when required for site coverage, security reasons, such as cameras, or lighting of objects taller than 40 feet. All substation lights mounted at an elevation above 12 feet should be cutoff or full-cutoff type, such that no light is emitted from the fixture at lateral angles above 90 degrees (above the horizontal plane) to reduce off-site glare, unless the light is required for operational needs, such as the operation of a disconnect switch mounted at a higher elevation. To the extent possible, lighting additions should follow *Federal Register*, NESC, IESNA RP-7-01, and IESNA RP-33-99 recommended practices for lighting.

The Stage 1 and Stage 2 lighting approach will not be considered for minor modifications because of the difficulty in rearranging wiring circuits for lighting power supply and control. These changes are more appropriately addressed when major modifications are made.

(For major modifications to existing substations, consideration should be given to implement lighting policies for greenfield sites. This can be determined during site visits and project scoping.)

General Design Issues and Design Principle Definitions

- A Good Neighbor. Most of the design constraints are summed up by this principle. Thoughtful consideration of the neighbors is critical to the success of the design.

- Luminaire Optical Properties. Four designations are used for the light control of outdoor lighting fixtures: Full Cutoff (0 percent, <10 percent), Cutoff (<2.5 percent, <10 percent), Semicutoff (<5 percent, < 20 percent), and Noncutoff. These are in terms of a percentage of the lamp's intensity lateral to the fixture and at an angle 10 degrees below the horizontal plane.

- Light Levels. Light levels are determined for both horizontal and vertical surfaces by the appropriate standards. Principally American National Standards Institute (ANSI)/IESNA RP-7-01, IESNA RP-33-99, IESNA *Lighting Handbook,* 9th Edition, 2000, blue pages Safety/Security-1, IESNA G-1-03, and the NESC, Section 111.A, should be considered.

- Neighboring Property Uses. The lighting design shall consider ways to reduce light trespass in directions where neighbors are known to exist through light fixture placement and control of the fixture light output.

- Design Standards. Design standards are general engineering guides to proper application of lighting equipment to achieve lighting levels consistent with their recommended standards. Primary design standards are listed under the "Light Levels" definition.

- Physical Security Survey. If warranted, specific lighting needs can be determined through the process outlined in IESNA G-1-03, Annex B, with measurements according to Annex C.

- Television Surveillance. If required, television surveillance provides lighting compatible with the needs of camera visibility, which may or may not enhance human visibility.

- Mounting Heights. Mounting height is a key factor in determining the uniformity or evenness of the light level. For substations, mounting heights are defined as Stage 1 or Stage 2 for high and low under "Mounting Locations." Generally, mounting heights provide good uniformity on the ground or structure when lights are spaced a distance two times the mounting height or lateral distance. Aboveground structures will have decreased uniformity by the same ratio unless this design geometry is considered. For example, lights at a 12-foot mounting height typically provide uniform coverage on the ground 24 feet wide. Spacing between fixtures of 48 feet would provide good uniformity on the ground. When lighting vertical structures, the distance to the light affects the uniformity in the same way.

- Mounting Locations. Low mounting heights are defined as 12 feet and below and high mounting heights are above 12 feet.

- Terrain. Nuisance glare and light trespass are also a function of the substation height above or below the average local terrain, including land contours and vegetation height. Terrain can shield fixtures and reduce lighting control requirements.

- Temporary Lighting Systems. Systems designed for outages and limited to portable systems should have no restrictions due to their temporary nature.

- Permanent Lighting Systems. These systems require the most care due to their persistent effect on the neighbors.

- New Construction Greenfield Sites. These sites have a higher level of care due to the clean slate available to accommodate good lighting design.

- Minor Substation Modifications. Small modifications include substation component replacement and expansions of less than 50 percent of the substation capacity. Following the existing lighting design pattern in these cases is acceptable practice to expand the lighting system coverage.

- Extensive Substation Modifications. Extensive modifications involve site voltages or expansions of more than 50 percent capacity. Lighting should be evaluated by design engineers to determine feasibility of using the design approaches of new construction greenfield sites.

- Safety. Wherever unsafe conditions are present, in the judgment of design engineers, additional lighting is warranted.

References

IESNA G-1-03, *Guideline on Security Lighting for People, Property, and Public Spaces*

IESNA *Lighting Handbook,* 9th Edition, 2000, blue pages Safety/Security-1

IESNA RP-7-01, *Recommended Practice for Lighting Industrial Facilities*

IESNA RP-33-99, *Recommended Practice for Lighting for Exterior Environments*

NESC, Institute of Electrical and Electronic Engineers (IEEE), *ANSI/IEEE C2-2007*, 2007 Edition

May 2008 Revision

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Appendix H – TVA Quality Protection Specifications for Transmission, Substation or Communications Construction

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Tennessee Valley Authority Environmental Quality Protection Specifications for Transmission, Substation or Communications Construction

1. General – Tennessee Valley Authority (TVA) and/or the assigned contractor and subcontractors shall plan, coordinate, and conduct his or her operations in a manner that protects the quality of the environment and complies with TVA's environmental expectations discussed in the preconstruction meeting (including clearing and grading or reclearing and removal or dismantling). This specification contains provisions that shall be considered in all TVA and contract construction, dismantling, or forensic operations. If the contractor and his or her subcontractors fail 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 site perimeters, structure, foundation, conduit, grounding, fence, drainage ways, etc., appropriate protective measures to prevent erosion or release of contaminants will be taken immediately upon the end of each step in a construction, dismantling, or forensic sequence, and those protective measures will be inspected and maintained throughout the construction and site stabilization and rehabilitation period.

2. Regulations - TVA and/or the assigned contractor and subcontractor(s) 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 and/or subcontractor(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 and subcontractor(s) 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, site, 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 or communication facility. 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 and best management practices (BMPs).

   No subsurface ground-disturbing equipment or stump-removal equipment will be used by construction forces except on access roads or at the actual site, 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, access, and site(s) 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 site or around structures 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 anchor, foundation, or its structure.

5. Sanitation - A designated TVA or contractor and/or subcontractor(s) representative shall contract 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 and subcontractor(s) personnel shall be responsible for daily inspection, cleanup, and proper labeling, storage, and disposal of all refuse and debris produced by his or her operations and by his or her 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 wastes. Records of the amounts generated shall be provided to the site's or project's designated environmental specialist. Contractor(s) and subcontractor(s) must meet similar provisions on any project contracted by TVA. Final debris, refuse, product, and material removal is the responsibility of the contractor unless special written agreement is made with the ultimate TVA owner of the site.

7. Landscape Preservation - TVA and its contractor(s) and subcontractor(s) shall exercise care to preserve the natural landscape in the entire construction, dismantling, or forensic 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 access and/or 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,

endangered species' habitat, water supply watersheds, and public recreational areas such as parks and monuments. Contractors, their subcontractor(s), 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, grading, borrow, fill, construction, dismantling, or forensic operations, the operations shall immediately cease for at least 100 feet in each direction, and TVA's construction superintendent, project manager, or area environmental program administrator and TVA 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, dismantling, or forensic 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 erected erosion and/or sedimentation control shall be maintained and (when TVA or contract construction personnel are unable) the construction crew(s) shall maintain 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 and at sequential steps of construction at the same location on site. BMPs will be inspected by the TVA field engineer or other designated TVA or contractor and/or subcontractor(s) personnel routinely and during periods of high runoff, and any necessary repairs will be made as soon as practicable. BMP inspections and any required sampling will be conducted in accordance with permit requirements. Records of all inspections and sampling results will be maintained on site, and copies of inspection forms and sampling results will be forwarded to the TVA project manager or supporting environmental specialist. Acceptable measures for disposal of waste oil from vehicles and equipment shall be followed. No waste oil shall be disposed of within the site, access, or right-of-way, on a related construction site or its access roads.
10. Turbidity and Blocking of Streams - Construction, dismantling, or forensic activities in or near streamside management zones 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, dismantling, or forensic 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.*
    On rights-of-way, mechanized equipment shall not be operated in flowing or standing water bodies 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, their adjacent wetlands, 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.

Mechanized equipment shall not be operated in flowing or standing water on substation, switching station, or telecommunication sites.

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

11. Floodplain Evaluation - During the planning and design phase of the substation or communications facility, floodplain information should be obtained to avoid locating flood-damageable facilities in the 100-year floodplain. If the preferred site is located within a floodplain area, alternative sites must be evaluated and documentation prepared to support a determination of "no practicable alternative" to siting in the floodplain. In addition, steps taken to minimize adverse floodplain impacts should also be documented.

12. Clearing - No construction, dismantling, or forensic activities may clear additional site or right-of-way vegetation or disturb remaining retained vegetation, stumps, or regrowth at locations other than the structure, substation, or communication site or access thereto. TVA and the construction, dismantling, or forensic contractor(s) must provide appropriate erosion or sediment controls for areas they have disturbed after each disturbance 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.

13. Restoration of Site - All construction, dismantling, or forensic-related 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. Rehabilitation species shall use species designated by federal guidance that are low–maintenance, native species appropriate for the site conditions that prevail at that location.

E. 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.

F. The site must be protected from species designated by the federal Invasive Species Council and must not be the source of species that can be transported to other locations via equipment contaminated with viable materials; thus, the equipment must be inspected, and any such species' material found must be removed and destroyed prior to transport to another location.

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

15. Burning - Before conducting any open burning operations, the contractor and subcontractor(s) 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 on rights-of-way or project manager for TVA sites.

16. RENOVATION OR DEMOLITION DEBRIS MAY NOT BE BURNED.

17. Dust and Mud Control - Construction, dismantling, or forensic 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.

18. Vehicle Exhaust Emissions - TVA and/or the contractor(s) and subcontractor(s) 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.

19. Vehicle Servicing - Routine maintenance of personal vehicles will not be performed on the right-of-way or access route to the site. 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 site except adjacent to or in designated sensitive areas. The Heavy Equipment Department within TVA or the construction, dismantling, or forensic 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. Records of amounts generated shall be provided to TVA. Equipment shall not be temporarily stored in stream floodplains whether overnight or on weekends or holidays.

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

21. Noise Control - TVA and/or the contractor and subcontractor(s) 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, dismantling, or forensic 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.

22. 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.

23. Damages - The movement of construction, dismantling, or forensic 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 and subcontractor(s) will be responsible for erosion damage caused by his or her actions and employees 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 project to be handled shall be documented with an implementation schedule and a property owner signature obtained.

24. Final Site Cleanup and Inspection - The contractor’s designated person shall ensure that all construction, dismantling, or forensic-related debris, products, materials, and wastes are properly handled, labeled as required, and removed from the site. Upon completion of those activities, that person and a TVA-designated person shall walk down the site and complete an approval inspection.

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Appendix I – TVA Energy Delivery Environmental Protection Procedures Right-of-Way Vegetation Management Guidelines

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Tennessee Valley Authority Environmental Energy Delivery 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 Methods

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).

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D. TVA does not encourage tree re-clearing 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 re-clear the right-of-way with trained re-clearing 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 re-sprout from the root crown and shattered stumps can produce a multi-stem dense stand in the immediate area. Repeated use of mowers on short cycle re-clearing with many original stumps re-growing 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 re-growth 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, 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 TVA rights-of-way. Table 2 identifies pre-emergent herbicides currently being 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, e.g., restrictions on complete removal. The rates of application utilized are those listed on the U.S. Environmental Protection Agency (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
Accord	Glyphosate/Liquid	Caution
Arsenal	Imazapyr/Liquid/Granule	Caution
Chopper	Imazapyr/RTU	Caution
Clearstand	Imazapyr/Metsulfuron/Methyl/Liquid	Caution
Escort	Metsulfuron Methyl/Dry Flowable	Caution
Garlon	Triclopyr/Liquid	Caution
Garlon 3A	Triclopyr/Liquid	Danger
Habitat	Imazapyr/Liquid	Caution
Krenite S	Fosamine Ammonium	Caution
Milestone VM	Aminopyralid/Liquid	Caution
Pathfinder II	Triclopyr/RTU	Caution
Rodeo	Glyphosate/Liquid	Caution
Roundup	Glyphosate/Liquid	Caution
Roundup Pro	Glyphosate	Caution
Streamline	Aminocyclopyrachlor/Metsulfuron/Liquid	Caution
Transline	Clopyralid/Liquid	Caution

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

Trade Name	Active Ingredients	Label Signal Word
Arsenal 5G	Imazapyr/Granule	Caution
Sahara	Diuron/Imazapyr	Caution
SpraKil SK-26	Tebuthiuron/Diuron/Granules	Caution
SpraKil S-5	Tebuthiuron/Granules	Caution
Topsite	Diuron/Imazapyr	Caution

Table 3 - Tree Growth Regulators 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 around 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, 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) 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 uses primarily low-volume applications of foliar and basal applications, e.g., Accord (Glyphosate), Arsenal (Imazapyr), Clearstand (Imazapyr / Metsulfuron Methyl), Milestone VM (Aminopyralid) and Streamline (Aminocyclopyrachlor / Metsulfuron Methyl).

4.0 References

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Appendix J – Noise During Transmission Line and Substation Construction and Operation

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Noise During Transmission Line and Substation Construction and Operation

At high levels, noise can cause hearing loss; at moderate levels, noise can interfere with communication, disrupt sleep, and cause stress; and at low levels, noise can cause annoyance. 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.

Both the U.S. Environmental Protection Agency (USEPA) and the Department of Housing and Urban Development (HUD) have established noise guidelines. USEPA guidelines are based on an equivalent day/night average sound level (DNL), which 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 Federal Interagency Committee on Noise (FICON) 1992 recommendation that a 3-dB increase indicates possible impact, requiring further analysis when the existing DNL is 65 dBA or less.

Annoyance from noise is highly subjective. The FICON used population surveys to correlate annoyance and noise exposure (FICON 1992). Table J-1 gives estimates of the percentage of typical residential populations that would be highly annoyed from a range of background noise and the average community reaction description that would be expected.

Table J-1. Estimated Annoyance From Background Noise (FICON 1992)

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 DNLs 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.

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 construction activities for a substation and a transmission line are described in Section 2.2. Maximum noise levels generated by the various pieces of

construction equipment typically range from about 70 to 85 dBA at 50 feet (Bolt et al. 1971). An exception would be the use of track drills for building roads and installing foundations in rocky areas; track drills have a typical maximum noise level of 98 dBA at 50 feet. Use of track drills is not expected to be widespread.

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. These distances are without the use of track drills; drilling activities could increase the distances by an additional 500 feet. 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.

Construction activities would be limited to daylight hours. Because of the sequence of construction activities, construction noise at a given point along the transmission line connections would be limited to a few periods of a few days each. Construction of the substation would take longer, although it would still be limited in duration. The temporary nature of construction would reduce the duration of noise impacts on nearby residents.

Operational Noise

Transmission lines and substations can produce noise from corona discharge, which 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 collecting on the conductors can cause louder corona discharges.

For 500-kV transmission lines, this corona noise when present, is usually about 40-55 dBA. The maximum recorded corona noise has been 60-61 dBA (TVA unpublished data). During rain showers, the corona noise would likely not be readily distinguishable from background noise. 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. The substation would also produce similar levels of noise from corona discharge, although it is not expected to cause annoyance to nearby residents.

Transformers at the substation would generally operate in self-cooled mode; although a few days a year during extreme temperatures, transformers would operate in fan-cooled mode. When fans are used, they would generate approximately 85 dB at 3 feet. This is not expected to be audible over background noise at nearby residences.

The substation would produce a loud impulse noise when a breaker is tripped due to excessive current, high voltage, low voltage, low frequency, or other less common problems. When such problems occur, the circuit breaker opens to disconnect part of the system, and the flow of current is interrupted. The noise from the breaker is expected to last 1/20 of a second and range from 96 to 105 dB at 50 feet. Breaker noise would be quite loud, although it is only expected to occur about 18 times each year. Breaker noise may be audible to nearby residents. However, because of the infrequent occurrence, it would not result in a significant impact.

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. It would, however, be of very short duration and very infrequent occurrence.

Literature Cited

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