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RUGBY – SUNBRIGHT POWER SUPPLY IMPROVEMENTS

ENVIRONMENTAL ASSESSMENT

Morgan County, Tennessee

Prepared by:
TENNESSEE VALLEY AUTHORITY
Chattanooga, Tennessee

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Direct questions to:

Anita E. Masters
NEPA Program and Valley Projects
Tennessee Valley Authority
1101 Market Street
Chattanooga, Tennessee 37402

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ACRONYMS, ABBREVIATIONS, AND GLOSSARY OF TERMS USED

acre	A unit measure of land area equal to 43,560 square feet
access road	A dirt, gravel, or paved road that is either temporary or permanent, and is used to access the right-of-way and transmission line structures for construction, maintenance, or decommissioning activities
APE	Area of potential effect
ARAP	Aquatic resource alteration permit
BMP	Best management practice or accepted construction practice designed to reduce environmental effects
bus	A conductor, which may be a solid bar or pipe, normally made of aluminum or copper, used to connect one or more circuits to a common interface. An example would be the bus used to connect a substation transformer to the outgoing circuits.
CAA	Clean Air Act
circuit	A section of conductors (three conductors per circuit) capable of carrying electricity to various points
conductors	Cables that carry electrical current
CWA	Clean Water Act
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
dbh	Diameter at breast height
DCH	Designated critical habitat
DSNA	Designated State Natural Area
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
EMF	Electromagnetic field
endangered species	A species in danger of extinction throughout all or a significant part of its range
EO	Executive Order
ephemeral stream	Watercourses or ditches that only have water flowing after a rain event; also called a wet-weather conveyance
ESA	Endangered Species Act
extant	In existence; still existing; not destroyed or lost
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
HUC	Hydrologic unit code
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
NEPA	National Environmental Policy Act
NESC	National Electric Safety Code
NHPA	National Historic Preservation Act
NPS	National Park Service
NRI	Nationwide Rivers Inventory
NRRA	National River and Recreation Area
NRHP	National Register of Historic Places
outage	An interruption of the electric power supply to a user
Plateau EC	Plateau Electric Cooperative
riparian	Related to or located on the banks of a river or stream
RM	River mile
ROW	Right-of-way, a corridor containing a transmission line
runoff	That portion of total precipitation that eventually enters a stream or river
SEIS	Supplemental Environmental Impact Statement
SHPO	State Historic Preservation Office
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
switch	A device used to complete or break an electrical connection
SWPPP	Storm Water Pollution Prevention Plan
threatened species	A species likely to become endangered within the foreseeable future
TDEC	Tennessee Department of Environment and Conservation
TL	Transmission line

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
TWRA	Tennessee Wildlife Resources Agency
US	U. S. highway
USACE	U. S. Army Corps of Engineers
USEPA	U. S. Environmental Protection Agency
USFS	U. S. Forest Service
USFWS	U. S. Fish and Wildlife Service
USGS	U. S. Geological Survey
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
WHO	World Health Organization

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CHAPTER 1

1.0 PURPOSE OF AND NEED FOR ACTION

1.1 Proposed Action – Improve Power Supply

Plateau Electric Cooperative (Plateau EC), a local power company and distributor of Tennessee Valley Authority (TVA) power, has requested a new power source to improve reliability within the Sunbright, Tennessee, service area. TVA proposes to improve reliability of the existing power supply system within the Plateau EC's service area by constructing and operating a new 161-kilovolt (kV) substation and 69-kV transmission line (TL) (Figure 1-1). The proposed substation and TL would occupy approximately 103 acres.

The proposed Rugby, Tennessee 161-kV Substation would occupy approximately 10 acres and be located at a tap point south of TVA's existing Livingston-Huntsville 161-kV TL. The proposed 7.5 mile TL would be constructed on a new 100-foot-wide right-of-way (ROW) and utilize single, steel-pole structures. The TL would originate at TVA's existing Livingston-Huntsville 161-kV TL on the east side of Brewstertown Road in Rugby, Tennessee, and would tie into the proposed new substation. From the Rugby 161-kV Substation, a new 69-kV TL would extend southeast crossing Nydeck Road and U.S. Route (U.S.) 27 before turning south and terminating at Plateau EC's existing Sunbright, Tennessee 69-kV substation. The proposed substation and TL would be completed by September 2018, or as soon as possible after that date.

Additionally, to facilitate the operation of the new substation and TL, TVA would undertake the following actions:

- Modify communications equipment and add electrical equipment at the existing Huntsville, Monroe, New Jamestown, and Livingston, Tennessee, substations.
- Install line switches outside Plateau EC's 69-kV Sunbright substation for TL protection.
- Modify the TVA system map boards to include the names and numbers of the new substation and TL.

1.2 Need for the Proposed Action

The Sunbright area, located in Morgan County, is served power from Plateau EC's Sunbright, Wartburg, and Flatfork 69-kV substations. The 69-kV TLs that serve these substations contain many of the original vintage 1940s wooden-pole structures and original conductors. The increased load growth in the Sunbright area, coupled with aging infrastructure, have resulted in these TLs overloading during summer peak conditions, causing outage durations at the Sunbright substation that exceed TVA's transmission planning criteria.

To ensure the Sunbright area is supplied with a continuous, reliable source of electric power for its future load growth, TVA needs to provide a new electric service to Plateau EC's existing Sunbright 69-kV substation. The construction of a new substation and TL would meet these needs by:

- Providing an additional electrical source to power Plateau EC's existing Sunbright 69-kV substation and help alleviate the voltage overloading and reliability issues.
- Providing a mechanism for TVA to meet internal electrical planning criteria.

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

1.3 Decisions to be Made

The primary decision before TVA is whether to provide more reliable electric power and accommodate the load growth within the Sunbright area by constructing a new 69-kV TL and 161-kV substation. If the proposed assets are to be built, other secondary decisions are involved. These include the following considerations:

- The timing of the proposed improvements;
- The most suitable location for the substation;
- The most suitable route for a proposed 69-kV TL; and
- Determination of any necessary mitigation and/or monitoring necessary to meet TVA standards and to minimize the potential for damage to environmental resources

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

1.4 Related Environmental Reviews or Documentation

In 2015, TVA completed the Integrated Resource Plan (TVA 2015a) that provides a direction for how TVA will meet the long-term energy needs of the Tennessee Valley region. This document and the associated Supplemental Environmental Impact Statement (SEIS) evaluate scenarios that could unfold over the next 20 years. It discusses ways that TVA can meet future electricity demand economically while supporting TVA's equally important mandates for environmental stewardship and economic development across the valley. This report indicated that a diverse portfolio of energy resources is the best way to deliver low-cost, reliable electricity. TVA released the accompanying final SEIS for TVA's Integrated Resource Plan in July 2015 (TVA 2015b) and its Record of Decision in October 2015 (80 FR 65282).

1.5 Scoping Process and Public Involvement

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

- Eastern Band of Cherokee Indians
- Cherokee Nation of Oklahoma
- United Keetoowah Band of Cherokee Indians of Oklahoma

- Coushatta Tribe of Louisiana
- Kialegee Tribal Town
- Thlopthlocco Tribal Town
- Muscogee Creek Nation
- Absentee Shawnee Tribe of Oklahoma
- Eastern Shawnee Tribe of Oklahoma
- Shawnee Tribe
- United States Army Corps of Engineers (USACE)
- United States Fish and Wildlife Service (USFWS)
- Tennessee State Historic Preservation Office (SHPO)

TVA developed a public communication plan that included a website with information about the project, a map of the alternative routes and substation sites, and numerous feedback mechanisms. TVA held an open house on April 3, 2014, at the Sunbright School in Sunbright. The 329 property owners potentially affected by, or near to, any of the proposed route alternative segments and substation sites and elected officials were invited to the open house. TVA used local news outlets and notices placed in the local newspapers to notify other interested members of the public of the open house. A total of 80 people attended the open house.

At the open house, TVA presented maps with a network of proposed alternative TL routes, comprised of 16 different line segments and three alternative substation sites, to the public for comment (see Figure 1-2).

The interest of those who attended the open house pertained to the effects of the proposed TL to the individual landowners, including impacts on development and/or property values. Some individuals also questioned the need for the project. Landowners also voiced concerns relative to impacts of the proposed TL on public health, visual quality, natural, and cultural resources.

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

At the conclusion of the scoping comment period, TVA considered the additional information it had received and developed a preferred route. TVA announced the proposed preferred route to the public in Spring 2015 (Figure 1-1). Letters were sent to affected property owners and information was provided to the public through TVA’s website.

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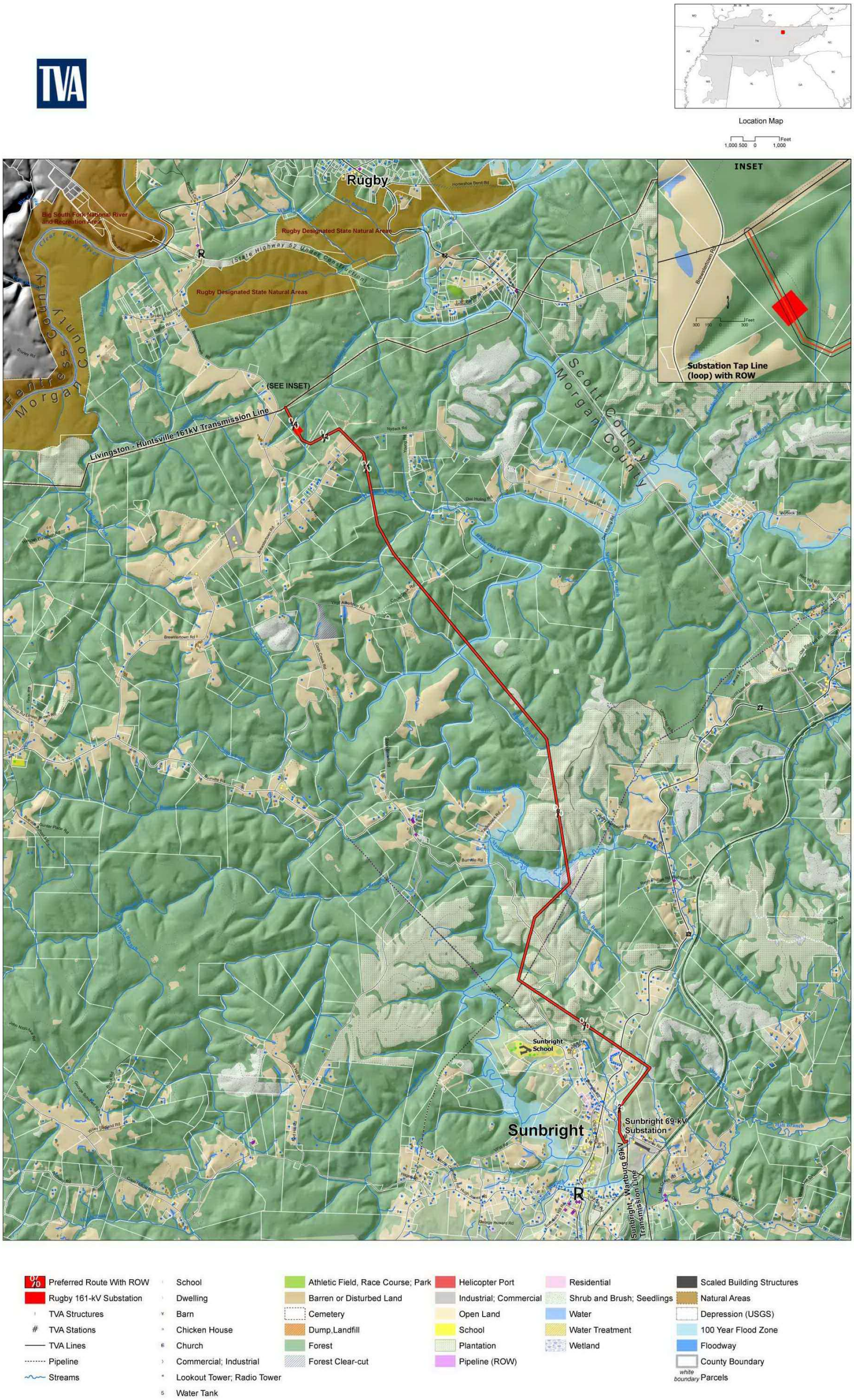

Figure 1-1 Proposed Rugby 161-kV Substation and Rugby-Sunbright 69-kV Transmission Line

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1.6 Issues to be Addressed

TVA prepared this environmental assessment (EA) to comply with the National Environmental Policy Act (NEPA) and regulations promulgated by the Council of Environmental Quality and TVA to implement NEPA (TVA 1983). The EA investigates the construction, operation, and maintenance of a substation and TL as well as the purchase of land easements for the 100-foot TL ROW, or taking no action.

TVA has determined the resources listed below are potentially affected by the alternatives considered. These resources were identified based on internal scoping as well as comments received during the public scoping period.

- Water quality (surface waters and groundwater)
- Aquatic ecology
- Vegetation
- Wildlife
- Endangered and threatened species and their critical habitats
- Floodplains
- Wetlands
- Aesthetic resources (including visual, noise, and odors)
- Archaeological and historic resources
- Land use
- Recreation, parks, and managed areas
- Socioeconomics and environmental justice

TVA's action would satisfy the requirements of Executive Order (EO) 11988 (Floodplain Management), EO 11990 (Protection of Wetlands), EO 12372 (Intergovernmental Review), EO 12898 (Environmental Justice), EO 13112 (Invasive Species), EO 13653 (Preparing the U. S. for the Impacts of Climate Change), and applicable laws including the Farmland Protection Policy Act, the National Historic Preservation Act (NHPA), the Endangered Species Act (ESA), the Clean Air Act (CAA), and the Clean Water Act (CWA). Correspondence received from agencies related to this review and coordination is included in Appendix A.

Potential effects related to air quality and global climate change, solid and hazardous waste, and health and safety were considered. Because of the nature of the action, any potential effects to these resources would be minor and insignificant. Thus, any further analysis for effects to these resources was not deemed necessary.

1.7 Necessary Federal Permits and Licenses

A permit would be required from the State of Tennessee and/or the local municipality for the discharge of construction site storm water associated with the construction of the TL and substation. TVA would prepare the required erosion and sedimentation control plans and coordinate them with the appropriate state and local authorities. A permit may also be required if removed trees or other vegetation are disposed of through burning and for other combustible materials removed during construction of the proposed TL and substation. Aquatic resource alteration permits (ARAPs) would be obtained for any stream alterations located within the proposed ROW that may be necessary. A Section 404 nationwide permit would be obtained from the USACE if construction activities result in the discharge of dredge or fill into waters of the United States. A permit would be obtained from the Tennessee Department of Transportation for crossing state highways during TL construction.

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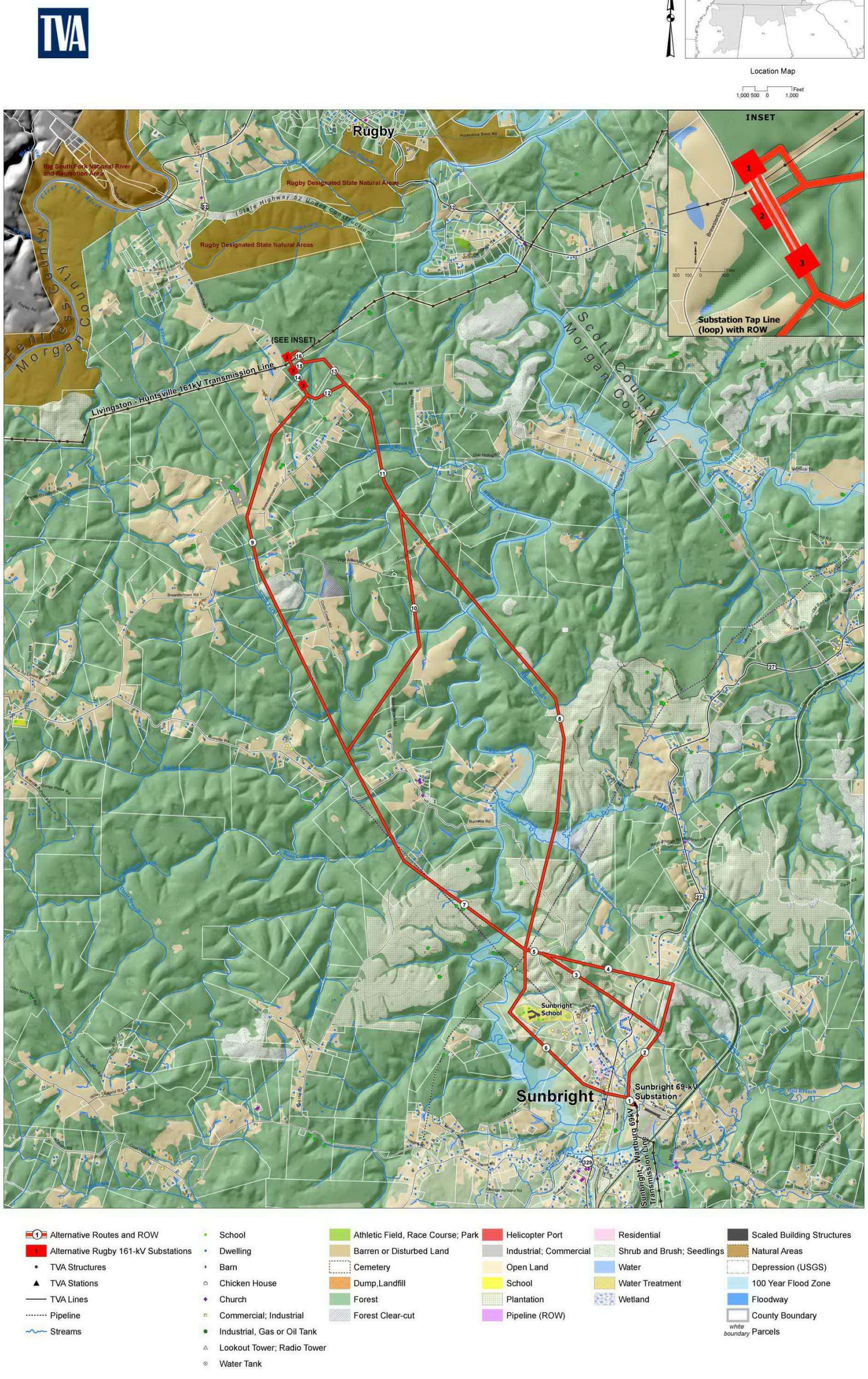

Figure 1-2 Alternative Route Segments for the Proposed Rugby 161-kV Substation and Rugby-Sunbright 69-kV Transmission Line

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CHAPTER 2

2.0 ALTERNATIVES INCLUDING THE PROPOSED ACTION

As described in Chapter 1, TVA proposes to improve power reliability in the Sunbright area by constructing and operating a new substation and 7.5 miles of TL. A description of the proposed action is provided below in Section 2.1.2. Additional background information about construction, operation, and maintenance of a substation and TL is also provided and would be applicable regardless of the location of the proposed facilities.

This chapter has six major sections:

1. A description of alternatives;
2. A description of the construction, operation, and maintenance of the proposed TL and substation;
3. An explanation of the TL siting process;
4. A comparison of anticipated environmental effects by alternative;
5. Identification of mitigation measures; and
6. Identification of the preferred alternative.

2.1 Alternatives

Two alternatives (i.e., the No Action Alternative and the Action Alternative) are addressed in this EA. Under the No Action Alternative, TVA would not implement the proposed action. The Action Alternative involves the purchase of easements for the ROW and the construction, operation, and maintenance of the proposed TL assets.

2.1.1 The No Action Alternative – TVA Does Not Construct, Operate, and Maintain a 161-kV Substation and 69-kV Transmission Line

Under the No Action Alternative, TVA would not construct the proposed substation and TL. As a result, the TVA power system in the Sunbright service area would continue to operate under current conditions, increasing the risk of substation and TL overloading, loss of service, and occurrence of violations of TVA's reliability criteria. TVA's ability to continue to provide reliable service to address economic development and future residential and commercial growth in the area would be jeopardized, which would not support TVA's overall mission.

Considering TVA's obligation 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 – TVA Constructs, Operates, and Maintains a 161-kV Substation and 69-kV Transmission Line

Under the Action Alternative, TVA proposes to construct, operate, and maintain a new 161-kV substation and 69-kV TL, and upgrade various transmission assets. The proposed substation would occupy approximately 10 acres and would connect to TVA's existing

Livingston–Huntsville 161-kV TL to serve as a tap point to provide a 69-kV electric power feed to the Sunbright 69-kV Substation. The proposed TL would be approximately 7.5 miles in length and would originate at TVA's existing Livingston-Huntsville 161-kV TL on the east side of Brewstertown Road. The proposed TL would tie into the proposed Rugby 161-kV Substation. From the Rugby 161-kV Substation, the new 69-kV TL would extend south, crossing Nydeck Road and U.S. 27 before terminating at Plateau EC's existing Sunbright 69-kV substation. The TL would consist of single, steel-pole structures centered on a new 100-foot-wide ROW.

Additionally, to facilitate the operation of the new TL and substation, TVA would modify communications equipment and add electrical equipment at the existing Huntsville, Monroe, New Jamestown, and Livingston, Tennessee substations. TVA would install line switches for TL protection. The TVA map board display at TVA's System Operations Center and Regional Operations Center would be updated to reflect the new facilities. Temporary access roads would be required for construction and maintenance of the proposed TL.

Additional information describing implementation of the proposed Action Alternative and how the most suitable TL route was determined is provided below in Sections 2.2 through 2.4.

2.1.3 Alternatives Considered but Eliminated From Further Discussion

During the development of this proposal, other alternatives were considered. However, upon further study, TVA determined that these alternatives were not feasible for the reasons provided below.

2.1.3.1 Rebuild Approximately 16 Miles of 69-kV Transmission Line and Upgrade Existing Facilities

Under this alternative, TVA would rebuild approximately 16 miles of 69-kV TL from the NE Harriman substation to the Flat Fork substation. Additionally, three capacitor banks would be installed at each of the Flat Fork and Deer Lodge substations, along with one capacitor bank added at the Rosedale substation.

Implementation of this alternative would upgrade the existing backup power supply to the Sunbright, Wartburg, and Flat Fork substations. However, it does not improve the reliability to Plateau EC delivery points and customers due to long line lengths. Therefore, this alternative would not improve system reliability, voltage service quality, or support future load growth to the extent that the proposed Action Alternative would. For these reasons, this alternative was eliminated from further consideration.

2.1.3.2 Construct a New Switching Station, Substation, and Build an Approximate 9-Mile New 161-kV Transmission Line

Under this alternative, TVA would construct a new Rugby 161-kV Substation at a tap point along the Livingston–Huntsville 161-kV TL and build an approximate 9-mile new 161-kV TL to a new substation to be located in the Sunbright area.

Implementation of this alternative would provide the same amount of reliability and voltage service quality as the proposed Action Alternative, but it is less economical from a cost standpoint and would consist of a larger footprint, ultimately creating additional disturbance. Therefore, this alternative is considered to be the most costly in terms of initial capital and

future maintenance costs. For these reasons, this alternative was eliminated from further consideration.

2.1.3.3 Underground Utility Lines

A frequent objection to the construction of new TLs involves their adverse visual effects. Thus, a frequently suggested alternative is the installation of underground TLs.

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

Although buried TLs are much less susceptible to catastrophic storm damage, especially wind damage, they tend to be very expensive to install and maintain. Depending on the type of cable system used, special equipment or ventilation systems may be required to provide adequate cooling for the underground conductors. Similarly, special construction methods/equipment that are highly intrusive to the landscape must be used to protect the buried lines from flooding, which could cause an outage. High voltage underground cables typically require the use of an underground vault that would require extensive excavation along the entire transmission line route for initial installation, and would also require excavation to make repairs in the event of a cable fault. Locating an electrical fault in a buried cable can be very time consuming, and is often exacerbated by the need to perform excavation to locate the damaged section. Roadways and water bodies also increase the difficulties of locating faults, since the cables would be buried under roadways and streams. All of these issues make the installation of high voltage underground cables cost prohibitive and impractical.

The potential adverse environmental effects of constructing and operating a buried high-voltage TL would likely be greater overall than those associated with a traditional aboveground TL. In addition, the expense of a buried high-voltage TL would be prohibitive. For these reasons, burying the proposed TL is not a feasible option and this alternative was eliminated from further consideration.

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

2.2.1 Transmission Line Construction

2.2.1.1 Right-of-Way Acquisition and Clearing

An ROW utilizes an easement that would be designated for a TL and associated assets. The easement would require maintenance to avoid the risk of fires and other accidents and to ensure reliable operation. The ROW provides a safety margin between the high-voltage conductors and surrounding structures and vegetation. The ROW for this project is described in Section 2.1.2.

TVA would purchase easements from landowners for the proposed new ROW. These easements would give TVA the right to clear the ROW and to construct, operate, and maintain the TL, as well as remove "danger trees" adjacent to the ROW. Danger trees include any trees located beyond the cleared ROW that are tall enough to pass within ten feet of a conductor or strike a structure should one fall toward the TL. The fee simple ownership of the land within the ROW would remain with the landowner, and many activities and land uses could continue to occur on the property. However, the terms of the easement agreement prohibit activities within the ROW that could interfere with the operation or maintenance of the TL or create a hazardous situation.

Because of the need to maintain adequate clearance between tall vegetation and TL conductors, as well as to provide access for construction equipment, all trees and most shrubs would be removed from the entire width of the ROW. Equipment used during this ROW clearing would include chain saws, skidders, bulldozers, tractors, and/or low ground-pressure feller-bunchers[1]. Marketable timber would be salvaged where feasible; otherwise, woody debris and other vegetation would be piled and burned, chipped, or taken off site. In some instances, vegetation may be windrowed along the edge of the ROW to serve as sediment barriers.

Vegetation removal in streamside management zones (SMZs) and wetlands would be restricted to trees tall enough, or with the potential to soon grow tall enough, to interfere with conductors. Clearing in SMZs would be accomplished using handheld equipment or remote-handling equipment, such as a feller-buncher, to limit ground disturbance.

TVA utilizes standard practices for ROW clearing and construction activities. These guidance and specification documents (listed below) are provided on TVA's transmission system projects web page and are taken into account when considering the effects of the proposed Action Alternative (TVA 2016). TVA transmission projects also utilize best management practices (BMPs) as identified in *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Transmission Construction and Maintenance Activities* (Muncy 2012) to provide guidance for clearing and construction activities.

1. *ROW Clearing Specifications*

2. *Environmental Quality Protection Specifications for Transmission Line Construction*

3. *Transmission Construction Guidelines Near Streams*

4. *Environmental Quality Protection Specifications for Transmission Substation or Communications Construction*

5. *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Transmission Construction and Maintenance Activities* (hereafter referred to as "Muncy 2012")

[1] A feller-buncher is a self-propelled machine with a cutting head that is capable of holding more than one stem at a time. Tracked feller-bunchers are capable of operating on wet and loose soils, have a lower ground-pressure than wheeled equipment, and are less prone to rutting and compaction.

During ROW clearing and TL construction the emission of criteria pollutants or their precursors would not exceed *de minimis* levels specified in 40 CFR § 93.153(b). Thus, consistent with Section 176(c) of the CAA, project activities would be in conformity with the requirements of Tennessee's State Implementation Plan for attaining air quality standards.

Following clearing and construction, an appropriate vegetative cover on the ROW would be restored. TVA would utilize appropriate seed mixtures as described in Muncy (2012) or work with property owners with impacted crop land to ensure restoration supports or minimizes impacts to production. Erosion controls would remain in place until the plant communities become fully established. Streamside areas would be revegetated as described in the above documents. Failure to maintain adequate clearance can result in dangerous situations, including ground faults. As such, only native vegetation or plants with favorable growth patterns (slow growth and low mature heights) would be maintained within the ROW following construction.

2.2.1.2 Access Roads

Access roads would be needed to allow vehicular access to each structure and other points along the ROW. Typically, new permanent or temporary access roads used for TLs are located on the ROW wherever possible and are designed and located to avoid severe slope conditions and to minimize impacts to environmental resources. Access roads are typically about 12 to 16 feet wide and are surfaced with dirt, mulch, or gravel. Permanent access roads located within the TL ROW would be required to access the switches.

Culverts and other drainage devices, fences, and gates would be installed as necessary. Culverts installed in any permanent streams would be removed following construction. However, in ephemeral[2] streams, the culverts would be left or removed, depending on the wishes of the landowner or any permit conditions that might apply. If desired by the property owner, TVA would restore new temporary access roads to previous conditions. Additional applicable ROW clearing and environmental quality protection specifications are listed in *TVA ROW Clearing Specifications, Environmental Quality Protection Specifications for Transmission Line Construction* (TVA 2016) and in Muncy 2012.

2.2.1.3 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 a 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 areas that are typically five acres in size; relatively flat; well drained; previously cleared; preferably graveled and fenced; preferably with 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 TL. 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

[2] Ephemeral streams are also known as wet-weather conveyances or streams that run only following a rainfall.

site. Removal of TVA-installed fencing and site restoration would be performed by TVA at the discretion of the landowner.

2.2.1.4 Structures and Conductors

The proposed TL would primarily utilize single steel-pole structures. Examples of these structure types are shown in Figure 2-1. Structure heights would vary according to the terrain, but would range between 70 and 115 feet above ground.

Figure 2-1 Typical Single Steel-Pole Structures

Three conductors (the cables that carry the electrical current) are required to make up a single circuit in alternating current TLs. For a 69-kV TL, each single-cable conductor is attached to porcelain insulators that are either suspended from the structure cross arms or attached directly to the structure. A smaller overhead ground wire or wires are attached to the top of the structures.

Poles at angles (angle points) in the TL may require supporting screw, rock, or log-anchored guys. Some angle structures may be self-supporting poles or steel towers, which would require concrete foundations. 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 two 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, depending on local soil conditions.

Switch structures are necessary to periodically isolate sections of a TL for maintenance or in the event of an unplanned outage. One 110-foot tall switch structure would be installed just outside Plateau EC's Sunbright 69-kV Substation. This structure is similar to that shown in Figure 2-2.

Figure 2-2 Transmission Line Switch Structure

Equipment used during the construction phase would include trucks, truck-mounted augers and drills, and excavators, 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.

2.2.1.5 Conductor and Ground Wire Installation

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

2.2.2 Substation Construction

Property for the proposed Rugby 161-kV substation would be located adjacent to the intersection of the Livingston-Huntsville 161-kV TL and Brewstertown Road in Morgan County (Figure 2-3). There would be three TL terminations at the Rugby 161-kV substation, namely, the new Rugby-Sunbright 69-kV TL and both connections of the existing Livingston-Huntsville 161-kV TL. The 10-acre substation site, access road, and associated TL connections would be obtained in fee simple ownership.

Figure 2-3 Proposed Rugby 161-kV Substation Arrangement

TVA would clear remaining vegetation on the site, remove the topsoil, and grade the property in accordance with TVA's Site Clearing and Grading Specifications (TVA 2013). Equipment used during clearing would include chain saws, skidders, bulldozers, tractors, and/or low ground-pressure feller-bunchers. However, because the site proposed for the substation was previously essentially clear-cut, no marketable timber occurs on the parcel. As necessary, any woody debris and other vegetation would likely be piled and burned, chipped, or taken off-site. If the vegetation was burned, TVA would obtain any necessary permits before burning. 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*, and Muncy (2012) provide further guidance for clearing and construction activities.

The proposed substation site is located on a knoll between two ravines and would be leveled through a cut and fill process to help achieve final design grade. The areas of the site that are too high (sloped) would 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.

Once the substation site has been graded, excess soil (i.e., "spoil") would be removed in preparation for foundations. Temporary spoil storage is proposed to be located onsite. Silt fences and site drainage structures would be installed during construction. Total disturbance, including grading and onsite spoil storage, would be approximately 9 acres. The substation yard would be covered with crushed stone and enclosed with chain link fencing. A new gravel access road, approximately 1,800 feet long, would be constructed from Brewstertown Road to the substation site. Once completed, the substation would occupy approximately two acres.

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

Major equipment that would be installed at the substation site includes three circuit breakers, one transformer, disconnect switches, associated protective and communication equipment, and a switch house. The circuit breakers installed would utilize Sulfur hexaflouride as the electrical insulator and would contain no oil. The switch house would not include a potable water supply or bathroom facilities.

As described in TVA's *Substation Lighting Guidelines* (TVA 2008), 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* (TVA 2013) would be utilized during the construction of the substation.

2.2.3 Operation and Maintenance

2.2.3.1 Inspection

Periodic inspections of 69-kV TLs are performed by helicopter aerial surveillance after operation begins. Foot patrols or climbing inspections are performed 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.

2.2.3.2 Vegetation Management

Management of vegetation along the ROW would be necessary to ensure access to structures and to maintain an adequate distance between TL conductors and vegetation. Adequate ground clearance is important to account for construction, design, and survey tolerances (e.g., conductor sagging). TVA uses more conservative distances than National Electric Safety Code (NESC) requirements in order to ensure reliability. TVA uses a minimum ground clearance of 23 feet for a 69-kV TL at the maximum line operating temperature. Vegetation management along the ROW would consist of two different activities: felling danger trees adjacent to the limit of the ROW (as described in Section 2.2.1.1), and controlling vegetation within the total width of the ROW. These activities occur on approximately three- to five-year cycles.

After tall trees and other tall-growing vegetation are removed from the ROW during construction, routine management of vegetation within the cleared ROW is necessary and would include an integrated vegetation management approach designed to encourage low-growing plant species and discourage tall-growing plant species. A vegetation re-clearing plan would be developed for each TL 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 U.S. Environmental Protection Agency (USEPA) are used. A list of the herbicides currently used by TVA in ROW management is presented in TVA's *Transmission Environmental Protection Procedures Right-Of-Way Vegetation Management Guidelines* (TVA 2016). This list may change over time as new herbicides are developed or new information on presently approved herbicides becomes available.

2.2.3.3 Structure Replacement

Other than vegetation management within ROWs, only minor maintenance work is generally required as TL structures and other components (e.g., conductor, insulators, arms, etc.) 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. 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 TL followed the basic steps used by TVA to determine a TL route. These include the following:

- Determine the potential existing power sources to supply the TL.
- Define the study area.
- Collect data to minimize potential impacts to social, engineering, and environmental (cultural and natural) features.
- Locate potential substation sites.
- Identify general route segments producing potential routes.
- Gather public input.
- Analyze route alternatives incorporating public input.
- Define the proposed TL route.

2.3.1 Definition of the Study Area

The first task in defining the study area was to identify the power sources that could supply the power need. TVA's existing Livingston-Huntsville 161-kV TL was the most practical source because it is the closest 161-kV TL, and it would serve as the most reliable power source to ultimately improve the power supply in the Sunbright service area.

The study area was determined primarily by the geographic boundaries of existing power system assets, along with geographic features that provide natural boundaries for consideration. The northern boundary was set along the source TL (Livingston-Huntsville 161-kV TL). The boundaries to the east and west were defined by the lack of viable substation locations, access roads, and increased new transmission line length. The boundary to the south is marked by Plateau EC's existing Sunbright 69-kV Substation.

2.3.2 Description of the Study Area

The study area predominantly consists of steep terrain composed of valleys and ridges that are mostly forested. The forest is a combination of commercial timber pine plantations and noncommercial hardwoods. There is very little agricultural farmland due to the nature of the terrain. The only agricultural land use in this area is located along Brewerstown Road, which consist of pasture land for cattle and cultivated fields comprised of corn or silage. The residential homes are concentrated around the main road systems along Burrville Road, U.S. 27, Morris Cemetery Road, and Hughes Jones Road. Numerous oil and gas pumping-storage facilities, along with their associated gas and oil lines that traverse the landscape, are present within the study area. Based on the aerial photography, these facilities are located along the ridge tops.

2.3.3 Data Collection

TVA collected geographic data, such as topography, land use, transportation, environmental features, and cultural resources for the study area. Information sources used in the TL study included design drawings for area TLs, data collected into a

geographic information system (GIS), including U.S. Geological Survey (USGS) digital line graphs, National Wetland Inventory (NWI) maps, photo-interpreted data including wetlands, and Morgan County tax maps. Also used were various proprietary data maintained by TVA in a corporate geo-referenced database (i.e., TVA Regional Natural Heritage file data on sensitive plants and animals and archaeological and historical resources).

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

Data were analyzed 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 TL route that would best meet project needs, which included avoiding or reducing potential environmental impacts.

Calculations from aerial photographs, tax maps, and other sources included, but were not limited to, the number of road crossings, stream crossings, and property parcels. The aerial photography, GIS-based map, and other maps and drawings were supplemented by reconnaissance throughout the study area by TVA personnel.

2.3.4 Establishment and Application of Siting Criteria

TVA uses a set of evaluation criteria that represent opportunities and constraints for development of alternative TL routes and substation sites. These criteria include social, engineering, and environmental factors such as existing land use, ownership patterns, environmental features, terrain, cultural resources, and visual quality. Cost is also an important factor, with engineering considerations, materials, and ROW acquisition costs being the most important elements. Identifying feasible TL routes and substation sites involves weighing and balancing these criteria.

2.3.4.1 Substation Criteria

The substation social, engineering, and environmental criteria used in evaluating the three potential sites are described below.

- **Engineering and Construction Criteria** take into account the suitability of the size of the site for grading, fencing, and security needs. Evidence that the site is not in a 100-year floodplain is required. 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 permit the ease of 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 electrical service and communications sources are also considered. Ensure there are sufficient linear corridors available for the required TL connections that avoid features and areas that are generally incompatible with TLs.

- **Social Criteria** include issues raised in public comments, consideration of visual aesthetics, and proximity to schools, houses, commercial or industrial buildings, and barns.

- **Environmental Criteria** include the presence of streams and wetlands or rare species and/or their habitat, including locations outside the property boundary of the site that would be crossed by future transmission line corridors. 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.

2.3.4.2 Transmission Line Routing Criteria

Specific criteria used to evaluate TL route options as described below. For each feature identified as occurring along a proposed route option, specific considerations related to these features were identified and scored. In the evaluation, a higher score means a bigger constraint or obstacle for locating a TL. For example, a greater number of streams crossed, a longer TL route length, or a greater number of historic resources affected would produce a higher, more unfavorable score.

- **Engineering and Constructability Criteria** include considerations such as terrain (steeper slopes can present major challenges for design and construction), total length of the TL, number of primary and secondary road crossings, accessibility, the presence of pipeline and TL crossings, and total TL cost.

- **Social Criteria** include the total acreage of new ROW, number of affected property parcels, issues raised in public comments, consideration of visual aesthetics, and proximity to schools, houses, commercial or industrial buildings, and barns.

- **Environmental Criteria** include the number of forested acres within the proposed ROW, the number of open water crossings, the number of floodplain or floodway crossings, the presence of wetlands, rare species habitat, sinkholes, and sensitive stream crossings (i.e., those supporting endangered or threatened species), the number of perennial and intermittent stream crossings, and the presence of archaeological and historic sites, churches, and cemeteries.

A tally of the number of occurrences for each of the individual criteria was calculated for each potential alternative route. Next, a normalized ranking of alternative routes was performed for each individual feature based on each route's value as it related to the other alternative routes. Weights reflecting the severity of potential effects were then developed for each individual criterion. These criterion-specific weights were multiplied by the individual alternative rankings to create a table of weighted rankings. The weighted rankings for each alternative were added to develop overall scores for each alternative route based on engineering, social, and environmental criteria, then summed for an overall total. For each of these criteria, a ranking of each alternative route was calculated based on the relationship between the scores of various routes.

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

2.3.5 Development of Potential Substation Sites

Using information gathered during the system studies and data development phases, potential sites between the source TL and existing 69-kV Sunbright substation were identified that could be utilized as locations for TVA's proposed Rugby 161-kV substation. These potential sites must meet line engineering requirements such as proximity to existing TLs, grading feasibility, geotechnical feasibility, and permanent access to the site. Additionally, considerations to include are environmental impacts, land use, and ease of accessibility to the site.

When looking at the study area for possible places for a suitable substation site, several challenges were presented. Suitable public road systems for transporting new substation equipment were limited within in the boundaries. Additionally, the terrain within the study area presented major grading issues. As a result, three sites were chosen in close proximity to the intersection of Brewstertown Road and the identified TL source.

All three sites offered the necessary available land, which is located outside of the 100-year floodplain with good access.

Sites 1 and 2 were directly adjacent to Brewstertown Road and had homes within 1,000 feet, while Site 3 was located further off of the road and presented fewer visual impacts to the homes within the vicinity. From a design standpoint, Site 3 would require the least amount of grading and site preparation.

Although all three alternative substation sites are feasible options, Site 3 is considered most favorable for nearly all criteria. As a result, alternative substation Sites 1 and 2 were eliminated from further consideration. Eliminating Sites 1 and 2 also eliminated the need for TL Segments 13, 15, and 16 as presented at the open house (Figure 1-2).

2.3.6 Development of General Route Segments and Potential Transmission Line Routes

As described in Section 2.3.3, the collected data were analyzed to develop possible TL route segments that would best meet the project needs while avoiding or reducing conflict with constraints.

Utilizing aerial photography of the study area, 7.5-minute USGS topographic maps and other data layers such as property boundaries, digital elevation model results (which were used to identify steepness and terrain characteristics), and transportation, a GIS-based constraint map was developed. The constraint map was used to locate the Rugby–Sunbright 69-kV TL segments (Figure 1-2) that would best meet project needs while avoiding or reducing conflict with constraints and by using identified opportunities.

In routing the TL from the proposed Rugby 161-kV substation toward the existing Sunbright 69-kV substation, the major challenge involved in the northern portion of the study area was traversing the steep, forested terrain. Additionally, the development of potential route segments in this area was limited due to the minimal access available to allow construction crews to build the TL. In the southern part of the study area, the development of potential route segments was limited by the City of Sunbright and associated residential areas.

2.3.6.1 Potential Transmission Line Corridors

As a result of the constraints mentioned in the previous section, nine alternate TL routes were developed consisting of a combination of 13 constituent segments (see Figure 1-2 and Table 2-1).

Table 2-1 Alternative Route Corridors with Constituent Segments

Alternative Route	Constituent Segments
1	1,2,3,5,8,11,12,14
2	1,2,4,5,8,11,12,14
3	1,2,3,5,7,10,11,12,14
4	1,2,4,5,7,10,11,12,14
5	1,2,3,5,7,9,14
6	1,2,4,5,7,9,14
7	1,6,7,9,14
8	1,6,8,11,12,14
9	1,6,7,10,11,12,14

2.4 Identification of the Preferred Transmission Line Route

Some of the considerations used in identifying and assessing alternative TL route locations were residential development, TL length, terrain, road/highway crossings, construction access, forest clearing, wetlands, stream and/or stream crossings, cultural resources, and number of parcel/property tracts.

As the proposed TL route exits the Sunbright s 69-kV Substation and heads north toward the proposed Rugby 161-kV substation site (Site 3), the options for the TL route included routing it east or west of the City of Sunbright. Alternative TL Routes 7, 8, and 9 all ran along the eastern portion of the study area. These routes did not score well in the analysis because they all include Segment 6, which is located within close proximity to the City of Sunbright and the Sunbright School, thus creating substantially greater residential and commercial impacts than the other alternatives.

Alternative TL Routes 1 thru 6 all had substantially fewer residential and commercial impacts; however, Routes 2, 4, and 6 included Segment 4, which would involve longer TL lengths and a greater number of road crossings.

As the TL alternative routes traverse around the City of Sunbright and proceed north toward the proposed Rugby 161-kV Substation, the TL alternative route choices were Segments 7 or 8. Overall, Segments 7, 9, and 10 received the most negative comments from property owners and ultimately, affected more property owners than Segments 8 and 11. Additionally, Segments 8 and 11 involved fewer stream crossings.

As discussed in 2.3.5 above, because Site 3 was selected as the location for the proposed Rugby substation, Segments 13, 15, and 16 were eliminated as potential segments for the TL route. Therefore, Segment 14 was deemed as the TL route between the power source TL and the proposed Rugby 161-kV substation.

Of the alternative routes considered, Route 1 had the fewest overall impacts when considering the social, engineering, and environmental criteria. This route avoided the residential and commercial areas in the City of Sunbright, crossed fewer road systems, involved fewer stream crossings, and allowed for the fewest number of forested acres to be cleared for the TL ROW.

TVA announced the preferred TL route as Alternative TL Route 1 in January 2015. Following this announcement, several adjustments were evaluated as a result of field surveys and additional public comment. The modified preferred TL route was then presented on the website in January 2015. These modifications are described below and reflected in Figure 1-1.

The preferred route was adjusted along the southern portion of Segment 8 to move the TL further away from a property owner's newly constructed home while remaining on the property owner's property.

A route adjustment was made along Segment 3 on the southwest side of U.S. 27 to relocate the TL further north away from a property owner's home while remaining on the property owner's property.

2.5 Comparison of Environmental Effects by Alternative

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

Table 2-2 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.	Any direct or indirect short-term and long-term effects to groundwater quality or quantity are anticipated to be insignificant.
Surface Water	No changes in local surface water quality are anticipated.	Any effects to local surface waters would be minor, temporary and insignificant.
Aquatic Ecology	Aquatic life in local streams would not be affected.	With the implementation of BMPs, effects to aquatic life in local surface waters are expected to be minor, temporary and insignificant.
Vegetation	Local vegetation would not be affected.	Site preparation and clearing of the proposed 69-kV TL ROW and substation would have a temporary minor effect on most local vegetation. An insignificant direct long-term effect on approximately 76 acres of forested area is anticipated.

Resource Area	Impacts From Implementing the No Action Alternative	Impacts From Implementing the Action Alternative
Wildlife	Local wildlife would not be affected.	Wildlife inhabiting onsite forest, early successional, and edge habitats along the proposed 69-kV TL ROW and substation would be displaced. Because there are sufficient adjacent local habitats, any effects to wildlife are expected to be temporary and insignificant.
Endangered and Threatened Species	No effects to endangered or threatened species or any designated critical habitats (DCH) are anticipated.	No impacts to listed plant species would occur under the Action Alternative. With implementation of appropriate BMPs to minimize sediment runoff into the stream and application of an enhanced protective buffer for White Oak Creek, the proposed action is not likely to adversely affect the federally endangered Cumberland elktoe. There would be no impacts on the other listed aquatic species. There would be no impacts to DCH under the proposed Action Alternative. Tree clearing would remove 67 acres of potentially suitable summer roosting habitat for the federally listed as threatened northern long-eared bat and federally listed as endangered Indiana bat. To remove any potential for direct effects to roosting Indiana and northern long-eared bats, TVA would clear these areas of potentially suitable summer roosting bat habitat between October 15 and March 31. To mitigate indirect impacts to Indiana bat resulting from removal of suitable summer roost habitat, TVA would enter into an agreement with the Tennessee Wildlife Resources Agency (TWRA) to promote recovery of the Indiana bat.
Floodplains	Local floodplain functions would not be affected.	With the implementation of standard mitigation measures, no significant impact on floodplains would occur.

Resource Area	Impacts From Implementing the No Action Alternative	Impacts From Implementing the Action Alternative
Wetlands	No changes in local wetland extent or function are expected.	Although TVA was able to minimize potential wetland impacts through its routing process, TVA found no practicable alternative to avoiding all wetlands. A total of 1.67 acres of wetland are located within the proposed project footprint. 0.9 acre of forested wetlands would be converted to emergent and/or scrub-shrub wetland habitat, thus reducing some wetland functions. TVA would comply with permit requirements from the USACE/Tennessee Department of Environment and Conservation (TDEC). With the implementation of identified minimization and mitigation measures, there would be minimal adverse impacts and minimal cumulative impacts.
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 TL and substation would present a minor cumulative visual effect.
Archaeological and Historic Resources	No effects to archaeological or historic resources are anticipated.	With implementation of mitigation measures, no adverse impacts would occur to two archaeological sites of undetermined eligibility for the National Register of Historic Places (NRHP). For potential visual impacts to Site 1S-11, Sixteen Tunnel, that cannot be avoided, TVA would enter into a Memorandum of Agreement (MOA) to resolve potential adverse impacts to the NRHP-eligible site.
Recreation, Parks, and Natural Areas	No changes in local recreation opportunities or natural areas are expected.	With implementation of construction BMPs, potential impacts to White Oak Creek, an National River Inventory stream, would be insignificant. Other natural areas are of sufficient distance from the project area such that there would be no impacts. Construction of the proposed TL, substation and associated access roads could cause minor and insignificant recreation impacts.
Socioeconomics and Environmental Justice	Over time, the lack of reliable power service could have adverse economic effects to local businesses and residents.	There would be a positive impact from continued reliability of service that would benefit the area and help maintain its economic stability and growth. Any adverse social, economic or environmental justice effects would be minor and would diminish over time.

2.6 Identification of Mitigation Measures

TVA employs standard practices when constructing, operating, and maintaining TLs, structures, and the associated ROW and access roads. These can be found on TVA's transmission website (TVA 2016). Some of the more specific routine measures would be applied to reduce the potential for adverse environmental effects during the construction, operation, and maintenance of the proposed TL and access roads are as follows:

- TVA would utilize standard BMPs, as described in *A Guide for Environmental Management and Best Management Practices* (Muncy 2012), to minimize erosion during construction, operation, and maintenance activities.

- To minimize the introduction and spread of invasive species in the ROW, access roads and adjacent areas, TVA would follow standard operating procedures consistent with EO 13112 (Invasive Species) for revegetating with noninvasive plant species as defined in (Muncy 2012).

- Ephemeral streams that could be affected by the proposed construction would be protected by implementing standard BMPs as identified in (Muncy 2012).

- Perennial and intermittent streams would be protected by the implementation of Standard Stream Protection (Category A) or Protection of Unique Habitats (Category C) as defined in Muncy (2012).

- TVA would utilize *Environmental Quality Protection Specifications for Transmission Substation or Communications Construction* during the proposed construction of the proposed Rugby 69-161-kV substation.

- To minimize adverse impacts on natural and beneficial floodplain values, the following standard mitigation measures would be implemented:

    - BMPs would be used during construction activities.

    - Construction would adhere to the TVA subclass review criteria for transmission line location in floodplains.

    - Construction or improvement of access roads would be done in such a manner that upstream flood elevations would not be increased.

The following non-routine measures would be applied during the construction, operation, and maintenance of the proposed TL, access roads and substation to reduce the potential for adverse environmental effects.

- Improper use of herbicides to control vegetation could result in runoff to streams and subsequent aquatic impacts. Therefore, any pesticide/herbicide use as part of construction or maintenance activities would have to comply with the TDEC general permit for application of pesticides, which also requires a pesticide discharge management plan. In areas requiring chemical treatment, only USEPA-registered and TVA-approved herbicides would be used in accordance with label directions designed in part to restrict applications near receiving waters and to prevent unacceptable aquatic impacts.

- TVA would comply with permit requirements from the USACE/TDEC.

- In order to avoid potential effects to archaeological sites 40MO165 and 40MO166, TVA would create a sensitive area (10-meter buffer) surrounding these two sites. These sensitive areas would be marked on all drawings and profiles used in construction, as well as on documents that would be used in future operation and maintenance of the proposed transmission line. To further avoid the sites, TVA would:

    - Not locate any TL poles, guy wire anchors, or other infrastructure within the sensitive areas;

    - Avoid using heavy equipment within the sensitive areas.

    - Conduct any necessary vegetation clearing within the sensitive areas by hand with tools such as chain saws or by using a feller-buncher, and move all cut materials outside the sensitive areas.

- To mitigate the potential adverse effects to the NRHP-eligible Sixteen Tunnel, TVA and the Tennessee SHPO would enter into a Memorandum of Agreement (MOA). TVA would complete to following stipulations to request that Sixteen Tunnel be included in the NRHP.

    - TVA would complete a U.S. National Park Service (NPS) NRHP Registration Form (NPS 10-900) for Sixteen Tunnel and submit it to the Tennessee SHPO for review.

    - The guidelines described in the NPS' National Register Bulletin: How to Complete the National Register Registration Form would be used in preparing the NRHP registration form. The Tennessee Historical Commission's national register review coordinator on state processes would be consulted for review and comment.

    - Prior to submitting a final draft to the Tennessee SHPO, TVA would consider any comments and recommendations from the Tennessee SHPO concerning the adequacy of the NRHP registration form (received within 30 days of the SHPO receiving the draft NRHP registration form).

    - Upon TVA and Tennessee SHPO reaching agreement that the NRHP registration form is acceptable in its final form, TVA would submit the form to NPS and request that Sixteen Tunnel be included in the NRHP.

- To remove any potential for direct effects to Indiana bat and northern long-eared bat, TVA would clear the 67 acres of potentially suitable summer roosting bat habitat between October 15 and March 31.

- To mitigate indirect impacts to Indiana bat resulting from removal of suitable summer roost habitat, TVA would enter into an agreement with TWRA wherein TVA would contribute $200,000 to TWRA for the protection, enhancement, and monitoring of known and currently unprotected, Indiana bat maternity habitat in Tennessee.

2.7 The Preferred Alternative

The Action Alternative – TVA Constructs, Operates, and Maintains a 161-kV Substation and 69-kV Transmission Line – is TVA's preferred alternative. TVA's preferred substation site for the proposed project is Substation Site 3. TVA's preferred TL route is Alternative TL Route 1. This route is comprised of alternate route Segments 1, 2, 3, 5, 8, 11, 12, and 14.

TVA would purchase ROW easements, substation property, and any associated access road easements to build a new 69-kV TL from Plateau EC's Sunbright 69-kV substation to a new TVA Rugby 161-kV substation. The TL route would be approximately 7.5-mile long with a 100 feet wide ROW. The substation and TL ROW would occupy about 103 acres.

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CHAPTER 3

3.0 AFFECTED ENVIRONMENT

The existing condition of environmental resources that could be affected by the proposed Action Alternative during construction, operation, or maintenance of the proposed 7.5-mile TL and substation is described in this chapter. The descriptions below of the potentially affected environment are based on field surveys conducted between July 2015 and June 2016, on published and unpublished reports, and on personal communications with resource experts. This information establishes the baseline conditions against which TVA decision makers and the public can compare the potential effects of implementing the alternatives under consideration.

The analysis of potential effects to federally or state-listed as endangered and threatened species and their habitats included records of occurrence within a three-mile radius for terrestrial animals, a five-mile radius for plants, and within 10-digit hydrologic unit code[3] (HUC) watershed for aquatic animals. This chapter also provides a listing of these species from Morgan County. The analysis of potential effects to aquatic resources included the local watershed, but was focused on watercourses within or immediately adjacent to the proposed ROW and associated access roads. The area of potential effect (APE) for architectural resources included all areas within a 0.5-mile radius from the proposed TL route, as well as any areas where the project would alter existing topography or vegetation in view of a historic resource. The APE with respect to archaeological resources included the entire ROW width as described in Section 2.2.1.1 for the proposed route and the associated access roads.

3.1 Groundwater and Geology

The project area is located in the Cumberland Plateau section of the Appalachian Plateau Physiographic Province. Rock units in the project area are of Pennsylvanian Age and consist of alternating sandstone, shale, siltstone, coal, and clay. Due to the low porosity of the rock units, groundwater is primarily located in fractures in the sandstone and shale rock units. Water yields are typically low, but can be adequate for domestic use. Even though groundwater is frequently high in iron and may contain objectionable levels of sulfate, private groundwater wells and springs derived from perched aquifers are used throughout the Cumberland Plateau region (Lloyd and Lyke 1995). Available information indicates public drinking water for Morgan County is supplied by surface water (USEPA 2016). Due to the absence of carbonate rock units in the formations which comprise the Cumberland Plateau province, the potential for the development of karstic features in the project area is remote.

3.2 Surface Water

This project area drains to several streams within White Oak Creek (HUC 051301401) part of the Cumberland South Fork watershed. The surface water streams in the vicinity of this project area are listed below in Table 3.1. Precipitation in the proposed project area averages about 53.8 inches per year. The wettest month is May, with an average of 5.5

[3] The United States is divided and subdivided to into hydrologic units by the U. S. Geological Survey. There are six levels of classification. A 10-digit HUC is the fifth (watershed) level of classification.

inches of precipitation, and the driest month is October, with 2.9 inches. The average annual air temperature is 54.7 degrees Fahrenheit, ranging from a monthly average of 34.1 degrees Fahrenheit in January to 73.6 degrees Fahrenheit in July (NOAA 2002). Stream flow varies with rainfall and averages about 25.2 inches of runoff per year, i.e., approximately 1.86 cubic feet per second, per square mile of drainage area (USGS 2008).

The CWA requires all states to identify waters where required pollution controls are not sufficient to attain or maintain applicable water quality standards and to establish priorities for the development of stricter pollutant control limits based on the severity of the pollution and the sensitivity of the established uses of those waters. The term "303(d) list" refers to the list of impaired and threatened streams and water bodies identified by the state. States are required to submit their 303(d) reports to the USEPA. None of the streams in the project area are on Tennessee's 303(d) list (TDEC 2014); however, White Oak Creek is listed on the List of Exceptional Tennessee Waters and Outstanding Natural Resource Waters. This stream designation extends from Clear Fork River upstream to confluence with Bone Camp Creek. It includes a portion of the creek that is located in the Big South Fork National River and Recreation Area (NRRA). Table 3.1 provides a listing of local streams with their state-designated uses (TDEC 2013).

Table 3-1 Uses for Streams in the Vicinity of the Proposed Rugby 161-kV Substation – Rugby-Sunbright 69-kV Transmission Line

Stream	Use Classification[1]					
	DOM	IWS	FAL	REC	LWW	IRR
Big South Fork Cumberland River[2]	X	X	X	X	X	X
Clear Fork[2]			X	X	X	X
White Oak Creek			X	X	X	X
Cal Hurst Branch			X	X	X	X
Bone Camp Creek			X	X	X	X
Hickory Spring Branch			X	X	X	X
Rhodas Branch			X	X	X	X
Massingale Branch			X	X	X	X
Pigeon Branch			X	X	X	X

[1] Codes: DOM = Domestic Water Supply; IWS = Industrial Water Supply; FAL = Fish and Aquatic Life; REC = Recreation; LWW = Livestock Watering and Wildlife; IRR = Irrigation
[2] Not in project area, shown for flow network.

3.3 Aquatic Ecology

Field surveys within the White Oak Creek (0513010401) HUC project area documented 51 watercourse intersections occurring along the proposed TL route, access roads, and/or within the proposed ROW and substation site. These watercourses include nine perennial, two intermittent, and twenty wet-weather conveyances (ephemeral streams) (Appendix B). The White Oak Creek watershed has suffered from coal mining, forestry and agricultural practices, domestic runoff, and oil and gas extraction over the years, resulting in significant declines to aquatic biodiversity in the Big South Fork and its tributaries (Ahlstedt et al. 2003–2004; Evaldi and Garcia 1991).

Because TL and access road construction and maintenance activities primarily affect riparian conditions and instream habitat, TVA evaluated the condition of these factors at each stream crossing along the proposed TL route. Riparian conditions were evaluated during the July and December 2015 field surveys using the Tennessee Division of Water

Pollution Control (Version 1.4) field forms. These forms evaluate the geomorphology, hydrology, and biology of each stream. Additional information regarding watercourses in the vicinity of the project area can be found in Section 3.2.

Three classes were used to indicate the current condition of streamside vegetation across the length of the proposed TL and access roads, as defined below, and accounted for 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.

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

- Nonforested – No or 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 Along the Proposed 161-kV - Transmission Line Route and Associated Access Roads

Riparian Condition	Perennial Streams	Intermittent Streams	Total
Forested	5	1	6
Partially forested	2	1	3
Non-forested	2	0	2
Total	**9**	**2**	**11**

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

3.4 Vegetation

The proposed upgrades to the TVA transmission system would occur in the Cumberland Plateau IV ecoregion. Elevations are generally 1,200 to 2,000 feet, with some areas, like the Crab Orchard Mountains, reaching over 3,000 feet. The plateau surface is less dissected with lower relief compared to the Cumberland Mountains to the east or the Plateau Escarpment to the west. The region is largely forested, but some areas support agriculture and coal-mining activities (Griffith et al. 1998).

Field surveys were conducted in July and December 2015, and January 2016 to document plant communities and any infestations of invasive plants, and to search for possible threatened and endangered plant species. All areas along the proposed ROW, access roads, and proposed substation site were visited during the survey. Using the national vegetation classification system (Grossman et al. 1998), vegetation types observed during field surveys were classified as herbaceous or deciduous, evergreen, or mixed evergreen deciduous forest. No forested areas in the proposed project area had structural characteristics indicative of old growth forest stands (Leverett 1996). The plant

communities observed onsite are common and well represented throughout the region. Vegetation in the proposed TL ROW is characterized by two main types: forest (70 percent) and herbaceous (30 percent).

Deciduous forest, which is characterized by trees with overlapping crowns where deciduous species account for more than 75 percent of the canopy cover, is the most common type of forest found along the proposed ROW and accounts for almost 60 percent of total forest cover. Deciduous forests are dominated by a variety of tree species including American beech, chestnut oak, red maple, scarlet oak, southern red oak, tulip poplar, white oak, and white pine. The understory consists of American holly, black cherry, black gum, flowering dogwood, sourwood, and immature canopy species. Herbaceous plants and woody vines observed included American climbing fern, bearded shorthusk, cranefly orchid, cat greenbrier, Christmas fern, downy rattlesnake plantain, Japanese honeysuckle, lady fern, New York fern, roundleaf greenbrier, and summer grape. Small, forested wetlands were found in many locations on the proposed ROW. Red maple is the dominant overstory species on these sites with ironwood and smooth alder in the understory. The herbaceous layer for these forested wetlands consisted of mainly of broad looseflower sedge, cypress panic grass, harvestlice, golden ragwort, Japanese stiltgrass, netted chain fern, royal fern, rush, sensitive fern, slender woodoats, smallspike false nettle, Virginia water horehound, and wild sweet William. All forested areas encountered are fragmented; the largest contiguous stand covers just eleven acres. Most deciduous forests in the project area have trees that average between six and 18 inches diameter at breast height (dbh), with some trees approaching two feet.

Evergreen forest, which accounts for over thirty percent of total forest cover, has very low species diversity and is dominated by plantation-grown pitch pine. Canopy trees in forests stands like these are all approximately the same size (less than one foot dbh), are regularly harvested to produce wood products, and bear little resemblance to native plant communities found in the region. The herbaceous layer lacks a variety of species due to prior disturbances.

Mixed evergreen-deciduous forest, defined as stands where both evergreen and deciduous species contribute between 25 to 75 percent of total canopy cover, account for about ten percent of total forest cover. Mature mixed evergreen-deciduous forest occurs on mostly upland sites and commonly contains the evergreens eastern hemlock, pitch pine, and white pine along with the deciduous species beech, red maple, scarlet oak, southern red oak, tulip poplar, and white oak. In this forest type, the dbh for trees ranged between 6 inches and 18 inches, with some trees reaching two feet. The understory consists of American holly, cucumber magnolia, deerberry, flowering dogwood, sassafras, witch hazel, and immature canopy species. Common herbaceous species and vines species include American climbing fern, cat greenbrier, Christmas fern, cranefly orchid, downy rattlesnake plantain, dwarf crested iris, Jack-in-the-pulpit, lady fern, Loomis' mountain mint, roundleaf greenbrier, summer grape, and wild yam.

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. Fields in different stages of succession, and maintained TL ROW account for the vast majority herbaceous vegetation in the project area. Most of these areas are dominated by plants indicative of early successional habitats including many non-native species. Common species in the most disturbed areas include American climbing fern, broomsedge bluestem, southern blackberry, and slender woodoats. Old fields, in later succession, along with the

herbaceous vegetation, also exhibit small trees such as pitch pine, red maple, tulip poplar, and Virginia pine. A few herbaceous wetlands were found, consisting mainly of bearded beggar ticks, blue mistflower, brownish beak sedge, bushy bluestem, fox sedge, green bulrush, and small carp grass.

EO 13112 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 non-native species that invade natural areas, displace native species, and degrade ecological communities or ecosystem processes (Miller et al. 2010). During field surveys, invasive plants were found occasionally in both forest and herbaceous vegetation types. However, no federally listed noxious weeds were observed. Populations of five plant species designated by the Tennessee Exotic Plant Pest Council as a severe threat were observed sporadically throughout the project area (TN-EPPC 2010). These species were tree of heaven, Japanese privet, Japanese honeysuckle, Japanese stiltgrass, and multiflora rose.

3.5 Wildlife

Wildlife habitat assessments were conducted in July 2015, December 2015, and June 2016 for the proposed TL ROW, substation site, and access roads. The project area occupies approximately 103 acres. Landscape features within and surrounding the project area consist of a variety of fragmented and contiguous forest habitat, wetlands, stream crossings, early successional habitat (i.e., pasture and agricultural), and residential or otherwise disturbed areas. Approximately 76 acres of forested habitat within the proposed ROW footprint would be cleared and maintained as early successional habitat. The substation site has been heavily disturbed and cleared of most standing trees. Each of the varying vegetative community types offers suitable habitat for animal species common to the region, both seasonally and year-round.

As stated above, deciduous, evergreen, and mixed deciduous-evergreen forest represents approximately 70 percent of the habitat type across the ROW and access roads. These forest types provide habitat for an array of common terrestrial animal species. Birds typical of this habitat include Acadian flycatcher, chuck-will's-widow, downy and hairy woodpecker, eastern screech-owl, eastern wood-pewee, great horned owl, indigo bunting, red-headed woodpecker, red-tailed hawk, summer tanager, wood thrush, wild turkey, and yellow-billed cuckoo (National Geographic 2002). This area also provides foraging and roosting habitat for several species of bat, particularly in areas where the forest understory is partially open. Bat species likely found within this habitat include big brown bat, eastern red bat, evening bat, silver-haired bat, and tricolored bat. Eastern chipmunk, gray fox, and woodland vole are other mammals likely to occur within this habitat (Kays and Wilson 2002; Whitaker 1996). Black kingsnake, black rat snake, eastern box turtle, and ring-necked snake are common reptiles of deciduous forests in this region (Conant and Collins 1998; Dorcas and Gibbons 2005; Scott and Redmond 2008).

Early successional, herbaceous habitat (i.e., pasture, agricultural land, and herbaceous fields) comprises approximately 30 percent or 31.2 acres of the project area. Common inhabitants of this type of early successional habitat include brown-headed cowbird, brown thrasher, common yellowthroat, dickcissel, eastern bluebird, eastern kingbird, eastern meadowlark, field sparrow, and grasshopper sparrow (National Geographic 2002). Bobcat, coyote, eastern cottontail, eastern mole, and red fox are mammals typical of fields and cultivated land (Kays and Wilson 2002; Whitaker 1996). Reptiles, including northern

copperhead and northern black racer are also are known to occur in this habitat type (Dorcas and Gibbons 2005; Scott and Redmond 2008).

Residential, developed areas, and areas otherwise previously disturbed by human activity are home to a large number of common species. American robin, Carolina chickadee, blue jay, European starling, house sparrow, mourning dove, northern cardinal, northern mockingbird, black vulture, and turkey vulture are birds commonly found along road edges, industrial properties, and residential neighborhoods (National Geographic 2002). Mammals found in this community type include eastern gray squirrel, northern raccoon, and Virginia opossum (Kays and Wilson 2002; Whitaker 1996). Road-side ditches provide potential habitat for amphibians including American toad, upland chorus frog, and spring peeper. Reptiles potentially present include eastern black kingsnake, eastern garter snake, and midland brown snake (Conant and Collins 1998; Dorcas and Gibbons 2005; Scott and Redmond 1996; Scott and Redmond 2008).

Forested wetland and streamside riparian habitat, both forested and herbaceous, occurs within the project area. Such habitat provides resources for birds, including Acadian flycatcher, northern harrier, prothonotary warbler, red-winged blackbird, song sparrow, swamp sparrow, and white-throated sparrow (National Geographic 2002). American beaver, golden mouse, and muskrat are common mammals of palustrine wetland and aquatic communities (Whittaker 1996). Eastern worm snake, ringneck snake, rough green snake, and timber rattlesnake, are common reptiles likely present within this habitat (Dorcas and Gibbons 2005; Scott and Redmond 2008). Amphibians likely found in forested wetlands in this area include marbled, northern slimy, and spotted salamander, eastern narrowmouth toad, eastern spadefoot toad, Fowler's toad, gray treefrog, and southern leopard frog (Conant and Collins 1998; Scott and Redmond 1996).

Review of the TVA Regional Natural Heritage database indicated that no caves have been documented within three miles of the project area and no caves were observed within the project area during the field reviews. No unique or important terrestrial habitats were identified within the project area. Further, no aggregations of migratory birds or wading bird colonies have been documented within three miles of the project area and none were observed during field surveys. The proposed Action Alternative is approximately 11.2 miles from Frozen Head State Park, a known destination for migratory birds.

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

The State of Tennessee provides protection for species considered threatened, endangered, or deemed in need of management within the state other than those federally listed under the ESA. The listing is handled by TDEC; however, the Tennessee Natural Heritage Program and the TVA Regional Natural Heritage database both maintain a list of species considered threatened, endangered, of special concern, or tracked in Tennessee. TVA considers all these databases. A listing of these federally and state-listed species known to occur near the proposed TL ROW, access roads, and proposed substation site is provided as Table 3-3.

Table 3-3 Federally and State-listed Species from and/or within Morgan County, Tennessee[1]

Common Name	Scientific Name	Federal Status[2]	State Status[2]	State Rank[3]
Plants[4]				
Lucy Braun's white snakeroot	*Ageratina luciae-brauniae*	-	THR	S3
American barberry	*Berberis canadensis*	-	SPCO	S2
Piratebush	*Buckleya distichophylla*	-	THR	S2
Cumberland rosemary	*Conradina verticillata*	LT	THR	S3
Shortleaf sneezeweed	*Helenium brevifolium*	-	END	S1
Gorge filmy fern	*Hymenophyllum tayloriae*	-	SPCO	S2
Cumberland sandwort	*Minuartia cumberlandensis*	LE	END	S2
Tennessee pondweed	*Potamogeton tennesseensis*	-	THR	S2
Virginia spiraea	*Spiraea virginiana*	LT	END	S2
Crayfish[5,6]				
Emory River crayfish	*Cambarus sp. 1*	--	TRKD	S1
Fishes[5,6]				
Ashy darter	*Etheostoma cinereum*	--	THR	S2S3
Blackside dace	*Chrosomus cumberlandensis*	LT	THR	S2
Emerald darter	*Etheostoma baileyi*	--	NMGT	S2
Laurel dace	*Chrosomus saylori*	LE	END	S1
Longhead darter	*Percina macrocephala*	--	THR	S2
Olive darter	*Percina squamata*	--	NMGT	S2
Spotfin chub	*Erimonax monachus*	LT	THR	S2
Tangerine darter	*Percina aurantiaca*	--	NMGT	S3
Tennessee dace	*Chrosomus tennesseensis*	--	NMGT	S3
Mussels[5,6]				
Alabama lampmussel	*Lampsilis virescens*	LE	END	S1
Cumberland bean	*Villosa trabalis*	LE	END	S1
Cumberland elktoe	*Alasmidonta atropurpurea*	LE	END	S1S2
Finerayed pigtoe	*Fusconaia cuneolus*	LE	END	S1

Common Name	Scientific Name	Federal Status[2]	State Status[2]	State Rank[3]
Purple bean	*Villosa perpurpurea*	LE	END	S1
Shiny pigtoe	*Fusconaia cor*	LE	END	S1
Tennessee clubshell	*Pleurobema oviforme*	--	TRKD	S2S3
Turgid blossom pearlymussel	*Epioblasma turgidula*	LE	EXTI	SX
Birds				
Swainson's warbler[7]	*Limnothlypis swainsonii*	--	NMGT	S3
Mammals				
Gray bat[8]	*Myotis grisescens*	LE	END	S2
Indiana bat[8]	*Myotis sodalis*	LE	END	S1
Northern long-eared bat[9]	*Myotis septentrionalis*	LT	--	S1S2
Smoky shrew[7]	*Sorex fumeus*	--	NMGT	S4
Woodland jumping[7] mouse	*Napaeozapus insignis*	--	NMGT	S4
Allegheny woodrat[7]	*Neotoma magister*	--	NMGT	S3

[1] Sources: TVA Regional Natural Heritage database, Tennessee Natural Heritage data, and USFWS Ecological Conservation Online System, USFWS Information, Planning, and Assessment (IPaC) database.
[2] Status Codes: END = Endangered; EXTI = Extirpated from state or region; LE = Listed Endangered; LT = Listed Threatened; NMGT = In Need of Management; SPCO = Special Concern; THR = Threatened; TRKD = Tracked by state natural heritage program (no legal status).
[3] State Ranks: S1 = Extremely rare and critically imperiled in the state with 5 or fewer occurrences, or very few remaining individuals, or because of some special condition where the species is particularly vulnerable to extirpation; S2 = Very rare and imperiled within the state, 6 to 20 occurrences; S3 = Rare or Uncommon with 21 to 100 occurrences; S4 = Apparently Secure; SX = Presumed Extirpated; S#S# = Denotes a range of ranks because the exact rarity of the element is uncertain (e.g., S1S2).
[4] Plant species previously reported from within five miles of ROW.
[5] Heritage Element Occurrence Rank: E = extant record ≤25 years old.
[6] Records of federally and state-listed aquatic animal species from within the White Oak Creek (0513010401) 10-digit HUC watershed, a 10-mile radius of the proposed project area, and/or within Morgan County, Tennessee.
[7] Terrestrial species reported from Morgan County, Tennessee and other species of conservation concern documented within three miles of ROW.
[8] Federally endangered species whose known range includes Morgan County, Tennessee, but that has not yet been recorded in Morgan County.
[9] Federally threatened species known from Morgan County, Tennessee, but not within three miles of the project area.

3.6.1 Aquatic Animals

A December 2015 review of the TVA Regional Natural Heritage database indicated that 10 federally listed species and eight additional state-listed species have been reported within the White Oak Creek HUC watershed, a 10-mile radius of the proposed project area, and/or within Morgan County, Tennessee (Table 3-3). DCH for Cumberlandian combshell, Cumberland elktoe, and oyster mussel (unoccupied in the DCH) occurs in White Oak Creek within the proposed Action Alternative project area.

The federally listed Alabama lampmussel, fine-rayed pigtoe, laurel dace, purple bean, shiny pigtoe, and spotfin chub are all endemic to the Tennessee River drainage (Etnier and Starnes 1993; Page and Burr 2011; Parmalee and Bogan 1998; USFWS 2015a).

Therefore, these species would not occur in streams potentially affected by the proposed project which are part of the Cumberland River drainage. Aside from experimental populations, the federally endangered turgid blossom pearlymussel was last observed by TVA biologists in the Duck River in 1965, and is possibly functionally extinct (Parmalee and Bogan 1998; USFWS 2007b). Consequently, these species will not be considered further in this EA as potentially being affected by the project.

The blackside dace is restricted to the Upper Cumberland River system in Kentucky and Tennessee, where it inhabits small upland streams with sand, sandstone, and shale substrates (Etnier and Starnes 1993). The species is not presently known from White Oak Creek in Morgan County (USFWS 2015b).

The Cumberland bean occurs in small rivers and streams in areas of swift current over sand and gravel substrates, and is a Cumberlandian species restricted to tributary streams of the Tennessee and Cumberland rivers. Recent reports suggest this species may be limited to the Hiwassee River in the Tennessee River drainage, and Sinking Creek, Buck Creek, and Big South Fork in the Cumberland River drainage (USFWS 2010).

The Cumberland elktoe is endemic to the Cumberland River drainage in Kentucky and Tennessee. The species shows preference for slow-flowing water among cobbles with a sand and mud substrate, where individuals half-bury themselves beneath the substrate (Parmalee and Bogan 1998). This species inhabits medium-sized rivers and may extend into headwater streams where it is often the only mussel present, and has declined significantly due to factors such as coal and gravel mining, sedimentation, and other developmental activities (USFWS 2007a). This species is very likely to occur in White Oak Creek within the TL ROW crossing given habitat observations by TVA biologists during field surveys, and the collection of one fresh dead individual at this location. The individual was collected and taken to Gerry Dinkins (Curator of Natural History and Malacology, McClung Museum) for verification, where it is now catalogued (M. Reed, pers. comm., 2016).

3.6.2 Plants

Review of the TVA Regional Natural Heritage database indicated that three federally listed plant species and six state-listed plant species have been previously reported within a five-mile vicinity of the project area (Table 3-3). No additional federally listed species have been previously reported from Morgan County. No federally or state-listed plants or their habitats were observed in the proposed ROW, access roads or substation location. No DCH for plants occurs in the project area.

3.6.3 Terrestrial Animals

The TVA Regional Natural Heritage database indicated four state-listed species (Allegheny woodrat, smoky shrew, Swainson's warbler, and woodland jumping mouse) and no federally listed species occur within three miles of the project area. One federally listed species (northern long-eared bat) has a documented presence in Morgan County. Additionally, the federally endangered gray bat and Indiana bat are thought by the USFWS to have the potential to occur in Morgan County, although no records of their presence are known to date (Table 3-3).

Swainson's warbler is a small ground feeding bird often found in rich, damp, deciduous floodplain and swamp forests with deep shade from both canopy and understory cover. Moist lower slopes of mountain ravines with a shrub layer of rhododendron appear to be preferred by this species (NatureServe 2016). The breeding biology of this species is

poorly understood. Nesting records are not known to occur in east Tennessee (Nicholson 1997). The nearest species account of Swainson's warbler occurs approximately 2.6 miles from the project footprint, on the bank of Clear Fork Creek. Suitable habitat exists for this species within the project footprint in forested floodplains and shaded ravines.

Allegheny woodrats are associated with rock outcroppings, rocky cliffs, talus slopes with boulders and crevices. This species generally occurs at higher elevations and is rarely found in lowlands or open areas. This species is also known from cave habitat, especially when found in a mixed coniferous-hardwood forests (NatureServe 2016). The nearest known occurrence of Allegheny woodrat is from a rock shelter approximately 1.7 miles from the project footprint. Suitable habitat for this species does not exist within the project footprint, as all rock outcrops within the project area occur at low elevations surrounding bodies of water.

Smoky shrews are most abundant in damp coniferous and deciduous forested habitat where they nest beneath stumps, rotted logs, and rocks (NatureServe 2016). The nearest smoky shrew record is approximately 0.6 miles from the project footprint. Woodland jumping mice utilize herbaceous ground cover in both deciduous and coniferous forests, as well as brushlands. They nest in underground burrows, logs, stumps, and various other cover types (NatureServe 2016). The nearest woodland jumping mouse record occurs approximately 1.7 miles from the project footprint. Suitable habitat for these species exists across the project footprint within deciduous and coniferous forest fragments, primarily in areas of lower elevation.

Gray bats roost in caves year-round and migrate between summer and winter roosts during spring and fall (Brady et al. 1982; Tuttle 1976). Bats disperse over bodies of water at dusk where they forage for insects emerging from the surface of the water (Harvey 1992). The closest gray bat record is known from a cave approximately 14.6 miles from the project footprint in Fentress County. No caves are known within three miles of the project footprint and none were observed during field surveys in July and December 2015. One large tunnel suitable for roosting bats was observed approximately 0.2 miles from the project footprint during field surveys. This tunnel would not be impacted by the proposed project. Foraging habitat for gray bat exists over wetlands and streams within the project footprint.

Indiana bats hibernate in caves in winter and use areas around them in fall and spring (for swarming and staging), prior to migration back to summer habitat. During the summer, Indiana bats roost under the exfoliating bark of dead and living trees in mature forests with an open understory, often near sources of water. Indiana bats are known to change roost trees frequently throughout the season, yet still maintain site fidelity, returning to the same summer roosting areas in subsequent years. This species forages over forest canopies, along forest edges and tree lines, and occasionally over bodies of water (Kurta et al. 2002; Pruitt and TeWinkel 2007; USFWS 2015c). There are no known records of Indiana bat from Morgan County. No caves have been documented within three miles of the project area, and none were observed during field surveys in July and December 2015. One large tunnel suitable for roosting bats was observed approximately 0.2 miles from the project footprint during field surveys. This tunnel would not be impacted by the proposed project. Foraging habitat for Indiana bat exists throughout the project footprint over forested wetlands, forest fragments, fence rows, and streams. Suitable summer roosting habitat for Indiana bat exists in five forested areas of the project footprint, as well as along two proposed access roads.

The northern long-eared bat predominantly overwinters in large hibernacula such as caves and abandoned mines with high humidity and low air flow. During the fall and occasionally in spring, this species utilizes entrances of caves and the surrounding forested areas for swarming (mating). In the summer, northern long-eared bats roost individually or in colonies beneath exfoliating bark or in crevices of both live and dead trees. Roost selection by northern long-eared bat is similar to that of Indiana bat; however, northern long-eared bats are thought to be more opportunistic in roost site selection. This species is also known to roost in abandoned buildings and under bridges, though primary summer roosting sites appear to be trees. Northern long-eared bats emerge at dusk to forage below the canopy of mature forests on hillsides and roads, and occasionally over forest clearings and along riparian areas (USFWS 2014). Northern long-eared bat records are known from Morgan County, approximately 18.5 miles from the project area. No caves have been documented within three miles of the project area. One large tunnel suitable for roosting bats was observed approximately 0.2 miles from the project area during field surveys. This tunnel would not be impacted by the proposed action. No additional roosting structures were observed during field surveys of the project area. Foraging habitat exists throughout the proposed project area in forest fragments, along fence rows, and over forested wetlands and streams. Suitable summer roosting habitat for northern long-eared bat exists within five forested areas of the project area and two access roads.

Assessment of the project area for presence of Indiana bat and northern long-eared bat summer roosting habitat followed USFWS guidance and resulted in the identification of approximately 274 suitable roost trees scattered across five forest fragments and two proposed access roads, totaling approximately 67 acres (USFWS 2014; USFWS 2015c). Habitat quality ranged from moderate to high based on the presence of trees with exfoliating bark (i.e., 52 dead trees [snags] and 222 white oaks), open forest understory, and proximity to water. Suitable summer roosting areas were comprised of deciduous mature hardwood stands dominated by a mixture of eastern white pine, post oak, red maple, scarlet oak, tulip poplar, and white oak.

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. It is necessary to evaluate development in the 100-year floodplain to ensure that the project is consistent with the requirements of EO 11988. The proposed TL route would cross floodplain areas associated with streams (see Section 3.3) in Morgan County.

3.8 Wetlands

Wetlands are those areas inundated by surface or groundwater such that vegetation adapted to saturated soil conditions is prevalent. Examples include bottomland forests, swamps, marshes, wet meadows, and fringe wetlands along the edge of watercourses and impoundments. Wetlands provide many societal benefits including toxin absorption and sediment retention for improved water quality, storm water attenuation for flood control, shoreline buffering for erosion protection, and provision of fish and wildlife habitat for commercial, recreational, and conservation purposes.

Field surveys were conducted in July 2015, December 2015, and January 2016 to map wetland areas and delineate forested, scrub-shrub, and emergent wetland habitats

potentially affected by the proposed preferred route, access roads and substation location under the proposed Action Alternative. Wetland determinations were performed according to the USACE standards, which require documentation of hydrophytic (wet-site) vegetation, hydric soil, and wetland hydrology (Environmental Laboratory 1987; Lichvar et al. 2016; USACE 2012; U. S. Department of Defense and USEPA 2003).

Using a TVA-developed modification of the Ohio Rapid Assessment Method (Mack 2001) specific to the TVA region (TVA Rapid Assessment Method or "TVARAM"), wetlands were evaluated by their functions and classified into three categories: low quality, moderate quality, and superior quality. Low quality wetlands are degraded aquatic resources which may exhibit low species diversity, minimal hydrologic input and connectivity, recent or ongoing disturbance regimes, and/or predominance of non-native species. These wetlands provide low functionality and are considered of low value. Moderate quality wetlands provide functions at a greater value due to a lesser degree of degradation and/or due to their habitat, landscape position, or hydrologic input. Moderate quality wetlands are considered healthy water resources of value. Disturbance to hydrology, substrate and/or vegetation may be present to a degree at which valuable functional capacity is sustained and there is reasonable potential for restoration. Superior quality wetlands include those wetlands offering high functions and values within a watershed or are of regional/statewide concern. Superior quality wetlands may exhibit little, if any, recent disturbance, provide essential and/or large scale storm water storage, sediment retention, and toxin absorption, contain mature vegetation communities, and/or offer habitat to rare species. Conditions found in superior quality wetlands often represent restoration goals for wetlands functioning at a lower capacity.

The proposed TL route would traverse a mountainous landscape, dominated by upland forested land dissected by streams, drainage features, and associated wetland flats. Field surveys identified seventeen wetlands, totaling 1.67 acres, within the proposed substation footprint, access roads, and TL ROW (Table 3-4). A detailed description of all wetlands identified during the field surveys can be found in Appendix C.

Table 3-4 Wetlands Located within the proposed Rugby Substation Site or the Proposed Rugby-Sunbright 69-kV Transmission Line Right of Way

Wetland Identifier	Type[1]	TVARAM[2] Existing Functional Capacity (Score)	Proposed Long-term Impact	Total Wetland Acreage (approximate)	Wetland Acreage in Project Footprint	Acreage of Impact
W001	PEM/PFO 1E	2 (41)	Fill	0.22	0.22	0.22
W002a	PFO1E	2 (47)	None/Avoid	0.42	0.10	0
W002b	PFO1E	2 (47)	Tree Removal		0.32	0.08
W003	PFO1E	2 (55)	Tree Removal	0.03	0.02	0.02
W004	PEM1E	2 (37)	None/Span	0.05	0.04	0

Wetland Identifier	Type[1]	TVARAM[2] Existing Functional Capacity (Score)	Proposed Long-term Impact	Total Wetland Acreage (approximate)	Wetland Acreage in Project Footprint	Acreage of Impact
W005	PFO1E	2 (58)	Tree Removal	0.35	0.10	0.10
W006	PSS1H	2 (45)	None/Span	0.25	0.07	0
W007	PFO1E	2 (53)	Tree Removal	0.25	0.08	0.08
W008	PSS1E	2 (57.5)	None/Span	0.64	0.14	0
W009a & b	PSS1E	2 (55.5)	None/Span	0.53	0.03	0
W010	PSS1E	2 (55.5)	None/Span	0.25	0.08	0
W011	PSS1E	2 (42)	None/Span	0.02	0.02	0
W012	PFO1E	2 (59)	Tree Removal	0.08	0.04	0.04
W013	PSS1E	2 (56.5)	None/Span	0.25	0.06	0
W014	PFO1E	2 (54)	Tree Removal	0.15	0.15	0.15
W015	PFO1E	2 (53)	Tree Removal	0.13	0.13	0.13
W016	PFO1E	2 (54)	Tree Removal	0.03	0.03	0.03
W017	PFO1E	2 (51)	Tree Removal	>3.0	0.05	0.05
Total Acres				**6.65**	**1.67**	**0.90**

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

[2]TVARAM = A TVA Rapid Assessment Method that categorizes wetland quality by their functions, sensitivity to disturbance, rarity, and ability to be replaced.

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, middle ground, and background distances.

In the foreground, defined as an area within 0.5 miles of the observer, details of objects are easily distinguished in the landscape. In the middle ground, normally between 0.5 and four miles from an 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 discernable 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 criteria for classifying the quality and value of scenery have been adapted from a scenic management system development by the U.S. Forest Service (USFS) and integrated with current planning methods used by the TVA. The classification process (i.e., the scenic value criteria for scenery inventory and management) is also based on fundamental methodology and descriptions adapted from USFS (USDA 1995).

The proposed tap point is located in a rural location and can be viewed by only two residential properties. The surrounding topography is mountain terrain with dense forest. The proposed substation location and tap point are located along Brewstertown Road, but visual access of the tap point is obscured by the forest.

The proposed Rugby 161-kV Substation site is located on an agricultural and commercial parcel according to the State of Tennessee property assessor. The proposed TL would begin at the tap point on the Livingston-Huntsville 161-kV TL in Morgan County and travel east-southeast away from Brewstertown Road, crossing Nydeck Road in about 0.75 mile. Southeast of Nydeck Road, the proposed TL turns south-southwest toward Zac Road; at Zac Road the proposed TL turns southeast and runs parallel to White Oak Creek and Rhodas Branch. At the crossing of Rhodas Branch, the proposed TL turns to the south parallel to Union Hill Road and crosses Massingale Branch then Pigeon Branch. Beyond the Pigeon Branch crossing, the proposed TL turns southwest toward Burrville Road. The proposed TL crosses Burrville Road at two locations and turns southeast toward Sunbright. After the proposed TL crosses U.S. 27, it turns south toward the existing 69-kV Sunbright substation.

The proposed TL would terminate at the Sunbright substation located east of U.S. 27 off of Dynatex Road. The termination point can be viewed from three residences along Dynatex Road. The surrounding topography is gently rolling to level and includes forested areas on three sides of the 69-kV Sunbright substation and a clear area facing Dynatex Road.

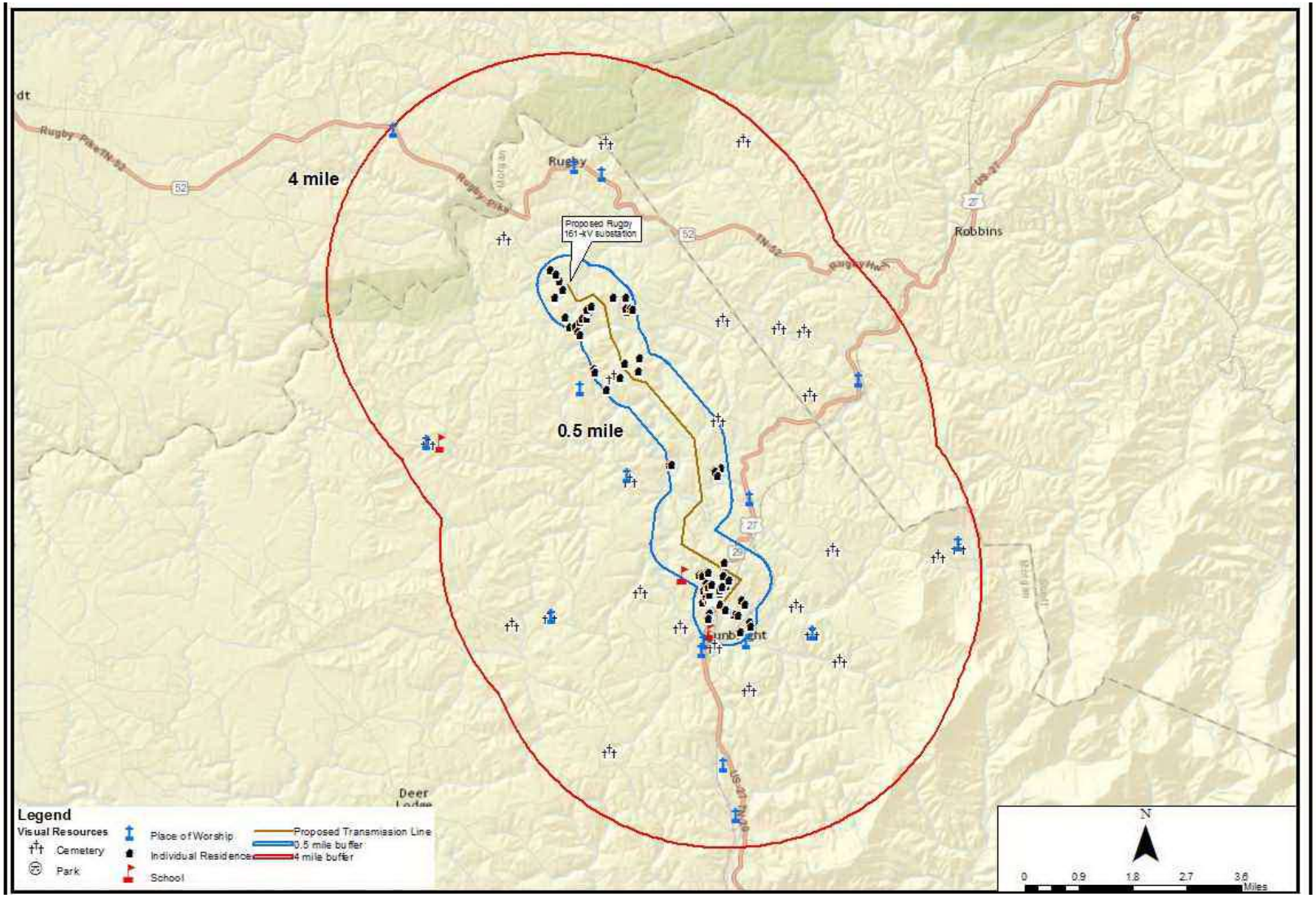

Figure 3-1 The Visual Resources Area of Potential Effect for the Proposed Transmission Line and Substation

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The majority of the proposed TL would be located within large, forested areas between Rugby and Sunbright. Along the proposed TL route, two schools and one cemetery are located within the foreground viewing distance (see Figure 3-1). Depending upon the amount of tree cover and season of the year, the proposed TL ROW may be located within view of Sunbright High School.

A number of places of worship, cemeteries and schools are located in the middle ground distance from the proposed project. However, due to topography and forested land, the proposed project would not be in view from these properties. Scenic attractiveness is common to good along the proposed route and ranges from rural residential to farmland and forested land. There is a clearing located in the forested area near the proposed connection to the Huntsville-Livingston 161-kV TL allowing the proposed TL to be more visible from three residences on Brewstertown Road. Scenic integrity is moderate to high based on the forested nature of the landscape along most portions of the proposed TL, with rural residential areas at the south end of the project.

3.9.2 Noise and Odors

There are no single major sources of noise along the proposed TL route or substation location. However, some traffic noise is generated along U.S. 27 and from the town of Sunbright, which are both in close proximity to the proposed TL route. The traffic noise has become part of the ambient noise and thus is not noticeable.

There are no known major sources of objectionable odors along the route or in the vicinity of the proposed TL or substation.

3.10 Archaeological and Historic Resources

Federal agencies are required by Section 106 of the NHPA and by the NEPA to consider the possible effects of their proposed actions (or 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 NRHP maintained by the NPS. “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 SHPO, federally recognized tribes that have an interest in the undertaking, and any other party with a vested interest in the undertaking. TVA is coordinating its Section 106 compliance with NEPA’s requirement to assess adverse impacts on cultural or historical resources.

The archaeological APE consists of a 7.5-mile TL with a 100-foot-wide ROW, 10.4-acre substation plot, and approximately 12.21 miles of 20-foot-wide off-ROW access roads to be used during construction. The architectural APE for the project consists of areas within a 0.5 mile (0.8 km) radius surrounding the center line of the proposed TL that are visually connected to the proposed TL, as well as any areas where the project would alter existing topography or vegetation in view of a historic resource.

TVA conducted two Phase I cultural resources surveys of the APE in order to identify any historic properties that may be impacted by the undertaking. The investigation included an archaeological survey and a survey of historic above ground (architectural) resources. Background research performed prior to the archaeological survey indicated that one previous archaeological survey, conducted in 1995 and 1996 by DuVall and Associates, included 11.5 acres within the current APE and identified no archaeological sites within this area. The current archaeological survey identified two archaeological sites: 40MO165 and 40MO166. Both sites are possibly historic or prehistoric stone piles consisting of stacked limestone slabs. Both are located within the proposed TL ROW. Based on existing knowledge of similar stone piles, these sites could potentially be prehistoric in origin and could contain prehistoric human burials, but no definitive conclusion can be reached on the basis of current evidence. Therefore TVA considers both sites to be of undetermined eligibility for the NRHP.

Background research performed prior to the historic architectural survey revealed that 14 architectural properties (MO-32, 33, 36, 37, 38, 42, 44, 45, 48, 49, 50, 51, 343, and 361) had been identified previously within the architectural APE. The historic architectural survey re-evaluated these properties, and also identified eleven previously unrecorded properties (designated IS-1 through IS-11). Based on the results of the survey, TVA has determined that property MO-38 is ineligible for the NRHP due to its lack of architectural distinction and to a loss of historic integrity caused by modern alterations. Architectural resources MO-32, 33, 36, 37, 44, 45, 48, 49, 51, 343, and 361 are extant, but are located outside the viewshed due to the rolling terrain and mature tree growth. Architectural resources MO-42 and 50 are no longer extant. Based on the investigation of IS-1 through IS-10, TVA has concluded that these properties are ineligible for inclusion in the NRHP due to a lack of historic architectural distinction and/or to a loss of integrity caused by modern alterations.

Property IS-11, Sixteen Tunnel, was constructed around 1879 as part of the Cincinnati Southern Railway. Based on its historic significance and integrity, TVA has determined that Sixteen Tunnel is eligible for inclusion in the NRHP under Criterion A for its historical association with the Cincinnati Southern Railway and under Criterion C for its engineering significance as an extant example of a late nineteenth-century railroad tunnel.

3.11 Recreation, Parks, and Natural Areas

This section describes recreational opportunities and natural areas near the proposed TL, ROW, and access roads. Natural areas include ecologically significant sites; federal, state, or local park lands; national or state forests; wilderness areas; scenic areas; wildlife management areas (WMAs); recreational areas; greenways; trails; Nationwide Rivers Inventory (NRI) streams; and Wild and Scenic Rivers.

A review of data from the TVA Regional Natural Heritage database indicated that there are two natural areas within the proposed project footprint and two natural areas within five

miles of the proposed TL. The proposed TL would cross White Oak Creek (NRI stream) and portions of White Oak Creek that are DCH for four mussel species. Rugby Designated State Natural Area (DSNA) is located 1.03 miles from the northern end of the project; Big South Fork NRRA is located 1.6 miles from the northern end of the proposed TL.

White Oak Creek is a 30.5-mile-long tributary of the Tennessee River. It has been designated as an NRI stream from River Mile (RM) 0 to its confluence with Clear Creek at RM 17 based on scenic, recreational, historical, and cultural features. DCH for mussel species within White Oak Creek is discussed in Section 3.6.1.

Rugby DSNA is a 667-acre site located southwest of the town of Historic Rugby. The site is known for diverse forested habitat and 1.2-mile hiking trail. Big South Fork NRRA, managed by the NPS, includes 125,000 acres of land along the Cumberland Plateau designated for outdoor recreation and natural resource protection.

Some informal recreational activity such as hunting, target practice, nature observation, and walking for pleasure may occur in the vicinity of the proposed TL corridor and associated access roads.

3.12 Socioeconomics and Environmental Justice

The proposed TL is located in Morgan County and would fall within census tract (9250), Block Group 1. The population of Morgan County is 21,660 and the population of Block Group 1 is 2,386 (USCB 2015).

The minority population in the city of Sunbright is approximately 1.6 percent of the total population. This is less than the minority population of Morgan County (5.8 percent) and the State of Tennessee (21.1 percent) as reported by the American Community Survey 2009–2013. See Table 3.5 for a summary of demographic data.

The poverty data are not available for individual blocks. However, the poverty level in Sunbright is approximately 24.4 percent, and for Morgan County, 23.4 percent. These percentages are higher than both the State of Tennessee and the national poverty levels (18.3 percent and 14.8 percent, respectively) (USCB 2015).

Table 3-5 Socioeconomic and Demographic Conditions in the City of Sunbright and in Morgan County, Tennessee

Demographic Characteristic	Sunbright (2013)	Morgan County	Tennessee
Estimated 2015 population	547	21,660	6,600,299
Black or African American	0.87%	3.7%	17.10%
Hispanic or Latino	0.87%	1.2%	5.00%
Total minority	1.56%	5.8%	21.1%
White (Non-Hispanic or Latino)	98.44%	94.2%	78.90%
Per capita income (2009-2013)	$12,102	$16,927	$24,811
Median household income (2009-2013)	$27,263	$38,003	$44,621
Below poverty level (2009-2013)	24.4%	23.4%	18.30%

Source: USCB 2015

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 the findings documented in this chapter. The potential effects are presented below by resource in the same order as in Chapter 3. Cumulative effects are discussed, as appropriate and necessary, under the respective resource areas.

4.1 No Action Alternative

As stated in Section 2.1.1, under the No Action Alternative, TVA would not construct the proposed TL and substation to improve the power system in the Sunbright service area. As a result, no property easements for locating the proposed TL would be purchased by TVA, and the proposed transmission facilities would not be built. TVA would continue to supply power to the Sunbright service area under the current conditions.

Because the proposed construction, operation, and maintenance of the new TL facilities would not occur under the No Action Alternative, no direct effects to those environmental resources listed in Chapter 3 are anticipated. However, changes to the project area and resources in this area may occur over time, independently of TVA's actions, due to factors such as population increases, changes in land use, and development in the area. These changes are not expected to be the result of implementing the No Action Alternative.

Under the No Action Alternative, a future decline in the reliability of electric service for some customers would be likely. Service problems and interruptions likely would gradually become more frequent and more severe. These outages would have negative impacts on the ability of businesses in the area to operate. Residents of the area would also incur negative impacts from outages, such as more frequent loss of power for household heating or cooling, as well as other activities such as cooking or clothes washing. These conditions would clearly diminish the quality of life for residents in the area and would likely have negative impacts on property values in the area. Any such impacts would negatively affect all populations in the region.

4.2 Action Alternative

4.2.1 Groundwater and Geology

Under the Action Alternative, the use of petroleum fuels, lubricants, and hydraulic fluids in construction and maintenance vehicles could result in the potential for small onsite spills. However, the use of BMPs to properly maintain vehicles to avoid leaks and spills, and procedures to immediately address any spills that did occur, would minimize the potential for adverse impacts to groundwater.

Transfer of sediments to groundwater would be avoided by using BMPs during construction activities. During revegetation and maintenance activities, herbicides with groundwater contamination warnings would not be used. Although some herbicides break down quickly, others may persist in groundwater. Use of fertilizers and herbicides would be considered with caution, and if used, would be applied according to the manufacturer's label. TVA's BMPs for herbicide and herbicide-related fertilizer application would be used to prevent

impacts to groundwater. The proposed substation would have oil containment facilities to capture any oil from the transformer banks. With the implementation of these practices, potential direct and indirect effects to groundwater during the construction, operation, and maintenance of the proposed substation and TL would be insignificant. Similarly, no changes in geological characteristics are anticipated under the Action Alternative. No cumulative impacts are anticipated.

4.2.2 Surface Water

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

To minimize such impacts, appropriate soil erosion prevention BMPs would be followed, all proposed project activities would be conducted in a manner to ensure that waste materials are contained, and the introduction of pollution materials to the receiving waters would be minimized. Coverage under the construction storm water general permit would be required if the project disturbs more than one acre. This permit also requires the development and implementation of a storm water pollution prevention plan (SWPPP). This SWPPP would identify specific BMPs to address construction-related activities that would be adopted to minimize storm water impacts. BMPs, as described in Muncy (2012), would be used to avoid contamination of surface water in the project area. Additionally, an ARAP and a USACE Section 404 and State 401 Water Quality Certification would be obtained as required for stream crossings. See Appendix B for stream crossing details.

Due to the fact that the project activities would be within Exceptional Waters of the State, additional measures would be required, such as additional vegetated buffers, different SWPPP sign-off requirements, and different design storm requirements (see sub-part 1.3 and 5.4 of the TDEC general construction storm water permit for details). Additionally, BMPs would be used to avoid contamination of surface water in the project area (Muncy 2012).

TVA routinely includes precautions in the design, construction, and maintenance of its TL projects to minimize potential impacts. Permanent stream crossings that cannot be avoided are designed to not impede runoff patterns and the natural movement of aquatic fauna. Temporary stream crossings and other construction and maintenance activities would comply with appropriate state permit requirements and TVA requirements as described in Muncy (2012). ROW maintenance would employ manual and low-impact methods wherever possible. Proper implementation of these controls is expected to result in only minor temporary impacts to surface waters. No cumulative impacts are anticipated.

Additionally, impervious infrastructure prevents rain from percolating through the soil and results in additional runoff of water and pollutants into storm drains, ditches, and streams. Because the steel transmission poles have such a small footprint, this construction would not significantly impact impervious surface area, but it would increase slightly. The proposed 10-acre substation site would mostly be pervious (graveled) and therefore would not impact impervious surface area. Under the proposed Action Alternative, all storm water

flows would need to be properly treated with either implementation of the proper BMPs or an engineered discharge drainage system that could handle any increased flows.

Portable toilets would be provided for the construction workforce as needed. These toilets would be pumped out regularly, and the sewage would be transported by tanker truck to a publicly owned wastewater treatment works that accepts pump out. Due to the size of the substation, no permanent restroom facilities would be included in the design. Equipment washing and dust control discharges would be handled in accordance with BMPs described in the SWPPP for water-only cleaning.

Improper use of herbicides to control vegetation could result in runoff to streams and subsequent aquatic impacts. Therefore, any pesticide/herbicide use as part of construction or maintenance activities would have to comply with the TDEC general permit for application of pesticides, which also requires a pesticide discharge management plan. In areas requiring chemical treatment, only USEPA-registered and TVA-approved herbicides would be used in accordance with label directions designed in part to restrict applications near receiving waters and to prevent unacceptable aquatic impacts. Proper implementation and application of these products would be expected to have no significant impacts to surface waters. No cumulative impacts are anticipated.

4.2.3 Aquatic Ecology

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

Potential impacts from removal of streamside vegetation within the riparian zone may include: increased erosion and siltation, loss of instream habitat, and increased stream temperatures. Other potential effects resulting 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 fish and mussel species (Brim Box and Mossa 1999; Sutherland et al. 2002).

Applicable ARAP and USACE 404 Permits would be obtained for any stream alterations located within the project area and the terms and conditions of these permits would require mitigation from the proposed activities. SMZs and BMPs identified in the TDEC Erosion & Sediment Control manual minimize the potential for impacts to water quality and instream habitat for aquatic organisms (TDEC 2012). These guidelines outline site preparation standards with emphasis on soil stabilization practices, structural and sediment controls including runoff management, and general stream protection practices associated with construction activities. Furthermore, TVA would follow BMPs identified within Muncy (2012).

Any alterations to perennial or intermittent streams would require BMPs as outlined in Muncy (2012) and/or TDEC (2012) to be implemented. Watercourses that convey only surface water during storm events (such as ephemeral streams) and that could be affected by the proposed TL route or access roads would be protected by standard BMPs and/or standard storm water permit requirements. These BMPs are designed in part to minimize disturbance of riparian areas and subsequent erosion and sedimentation that can be

carried to streams. Because appropriate BMPs would be implemented during site preparation and work, any impacts to aquatic ecology would be temporary and insignificant as a result of the proposed TVA action. No cumulative impacts are anticipated.

4.2.4 Vegetation

Implementation of the Action Alternative would require clearing of approximately 76 acres of forest. Such ground-disturbing activities would directly affect the existing plant communities in these areas. Additionally, vegetation management along the ROW is necessary to prevent tall, woody vegetation from becoming established within the ROW. Therefore, the type of vegetative cover that occurs on the ROW would be directly affected.

Converting forested land to managed ROW for construction of the proposed TL would be long-term in duration, but insignificant. The plant communities found within the project area are common and well represented throughout the region. As of 2013, there were over one million acres of forested land in Morgan County and the surrounding Tennessee counties (U.S. Forest Service 2016). Cumulatively, project-related effects to forest resources would be negligible when compared to the total amount of forested land occurring in the region. Also, project-related work would temporarily affect herbaceous plant communities, but these areas would likely recover to their pre-project condition in less than one year.

Some portions of project area currently have a large component of invasive terrestrial plants and 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 proposed ROW and along access roads.

Plant communities found within the proposed ROW are common and well represented throughout the region. No unique plant habitats possessing conservation value would be negatively impacted by construction, operation, and maintenance of the new TL. Adoption of the proposed Action Alternative would not significantly affect the terrestrial ecology of the region. Cumulative effects of the project on common plant communities are expected to be negligible.

4.2.5 Wildlife

Under the proposed Action Alternative, TVA would build a new 161-kV substation, a new 69-kV TL, an associated 100-foot-wide ROW, and access roads. Both forested and herbaceous vegetation that may provide habitat for common wildlife species would be initially removed in association with the proposed construction activities.

Vegetation removal may occur on some of the 31.2 acres of early successional, herbaceous habitat (pastures and cultivated fields). In a few areas, the TL would span agricultural and developed areas. Impacts to wildlife habitat would thus be limited to locations where the structures would be established. Ground disturbance would occur in these areas. Any wildlife (primarily common, habituated species) currently using these heavily disturbed areas may be temporarily displaced by increased levels of disturbance during construction actions, but it is expected that they would return to the project area upon completion of actions associated with the proposed Action Alternative.

Approximately 76 acres of forested habitat would be removed and maintained as early successional habitat for the life of the TL. Direct effects to some individuals that may be

immobile during the time of construction may occur, particularly if construction activities take place during breeding/nesting seasons. However, the actions are not likely to affect populations of species common to the area, as similar forested and herbaceous habitat exists in the surrounding landscape.

Construction-associated disturbances and habitat removal would disperse wildlife into surrounding areas in an attempt to find new food and shelter sources and to reestablish territories, potentially resulting in added stress or energy use to these individuals. Much of the forested areas within the project area have been impacted by human activity (i.e. forestry practices). However, these planted pine areas still provide shaded corridors for animal dispersal. These adjacent areas would be relatively pervious to terrestrial animal species dispersing from the action area. In the event that surrounding areas are already overpopulated, further stress to wildlife populations presently utilizing these areas may result, as well as to those attempting to relocate. The landscape surrounding the project area is relatively forested; thus, it is unlikely that species currently occupying adjacent habitat would be negatively impacted by the influx of new residents. Further, it is expected that over time those species that occur in early successional habitats would return to the project area upon completion of actions associated with the proposed Action Alternative.

Cumulative effects of the project on common wildlife species are expected to be negligible. Proposed actions across the TL would remove existing forested habitat for common wildlife. Following completion of the project, the ROW would be maintained as early successional herbaceous fields which would provide habitat for several common wildlife species that utilize early successional fields and agricultural/developed areas.

4.2.6 Endangered and Threatened Species

4.2.6.1 Aquatic Animals

As discussed in Sections 4.2.2 and 4.2.3, changes to water quality or habitat resulting from the implementation of the proposed Action Alternative could have direct and indirect impacts to aquatic biota within watercourses in the project area.

The federally listed as threatened blackside dace is not presently known from White Oak Creek in Morgan County (USFWS 2015b). Therefore, TVA has determined that the proposed construction would have no effect on blackside dace. TVA has determined that the proposed project would have no effect on Alabama lampmussel, finerayed pigtoe, laurel dace, purple bean, shiny pigtoe, spotfin chub, and turgid blossom pearlymussel. These species are either endemic to the Tennessee River drainage or functionally extinct (turgid blossom pearlymussel). Habitat for the Cumberland bean is not found within the project area; therefore, TVA has determined that the proposed construction would have no effect on this species.

In January 2016, the Cumberland elktoe was found within White Oak Creek during a field survey at approximately creek mile 12.5, on the downstream end of the proposed TL ROW. One individual (fresh dead) was collected and taken for verification. Aquatic habitat in the vicinity of the TL crossing consisted of bedrock substrates interspersed with some cobble, gravel, and sand. The current in this reach of the creek was relatively slow, with depths ranging from one to three feet, all of which corresponds to descriptions of the preferred Cumberland elktoe habitat as described in other studies (Parmalee and Bogan 1998). Given these habitat observations and the freshly dead individual collected, the Cumberland elktoe is very likely to occur in White Oak Creek in the vicinity of the proposed TL ROW

crossing. However, TVA would take precautions, including the application of appropriate BMPs, to minimize the indirect effect of erosion and sediment runoff into the stream (Muncy 2012). With application of an enhanced protective SMZ buffer for White Oak Creek (Category C, 110-foot-wide SMZ width), direct impacts to in-stream habitat which support this species would be non-existent. Based on the minor extent of potential in-stream effects associated with this project, TVA has determined that the proposed Action Alternative is not likely to adversely affect the federally listed as endangered Cumberland elktoe. Because no in-stream modification or impacts to water quality would occur, TVA has determined that there would be no adverse modification of DCH for Cumberlandian combshell, Cumberland elktoe, and oyster mussel. In a January 27, 2017, letter, the USFWS concurred with TVA's determinations (Appendix A).

4.2.6.2 Plants

Implementation of the proposed Action Alternative would have no impact on federally listed plant species or DCH because neither occurs within the area that would be affected by the proposed work. Field surveys found no habitat for state-listed plant species occurs along the proposed ROW, access roads and substation site; no rare plants were observed. Therefore, adoption of the proposed Action Alternative would have no impact on state-listed plants.

4.2.6.3 Terrestrial Animals

Under the proposed Action Alternative, clearing of some or all of the 76 acres of forested habitat would take place. Vegetation removal may also occur on the 31.2 acres of early successional, herbaceous habitat (pastures and cultivated fields).

Four state-listed terrestrial animal species were assessed based on the documented presence within three miles of the project footprint. Additionally, one federally listed as threatened and two federally listed as endangered species have been assessed based on the known or potential presence within Morgan County. Of these, six species have the potential to utilize the project area. Habitat for Allegheny woodrat does not exist within the project footprint; therefore, Allegheny woodrat would not be impacted by the proposed actions.

Suitable habitat exists for Swainson's warbler in forested floodplains and shaded ravines within the project footprint, primarily within property owned by the Cumberland Plateau Partners. The proposed actions would remove vegetation within the 100-foot-wide ROW, fragmenting this otherwise relatively contiguous forest. No nesting records of this species are known to occur in east Tennessee; therefore direct impacts to individuals are not expected to occur as all individuals would be mobile during construction activities and could vacate the premises if disturbed. Loss of existing habitat would temporarily displace individuals currently using these areas. Mobile individuals would be displaced into areas of similarly suitable habitat adjacent to the proposed ROW. Upon completion of the project activities, non-woody vegetation would be allowed to regrow within the ROW. This habitat may offer marginally suitable habitat for Swainson's warbler (NatureServe 2016). The proposed Action Alternative is not expected to affect Swainson's warbler.

Suitable habitat for smoky shrew and woodland jumping mouse exists in the project area within damp coniferous and deciduous forested habitat, especially along stream sides where they nest beneath stumps, rotted logs, and rocks (NatureServe 2016). An abundance of suitable habitat exists immediately adjacent to the proposed ROW. Several of the wetlands, streams and associated forested floodplains that fall within the path of the

proposed ROW extend beyond the proposed construction areas; therefore, temporarily displaced individuals would only need to travel a short distance to find similarly suitable habitat for the duration of the project activities. Furthermore, the use of BMPs in wetlands and around water bodies would minimize impacts to vegetation within SMZs. Stumps and rocks would not be removed in these areas, as actions focus on the removal of woody stem species only. Herbaceous vegetation would be allowed to grow in these SMZs, which would provide suitable habitat for these species once the proposed construction is completed. The proposed Action Alternative is not expected to affect smoky shrew or woodland jumping mouse.

No caves or other winter hibernacula for gray bat, Indiana bat, or northern long-eared bat exists within the project footprint or would be impacted by the proposed Action Alternative. However, suitable foraging habitat does exist for these species over streams and wetlands within the proposed project footprint. As mentioned above, BMPs would be utilized in SMZs and around wetlands. These BMPs would minimize impacts to these bodies of water and thus, bat foraging habitat and drinking water. Additional foraging habitat for Indiana and northern long-eared bats exists along fence rows and within forests. This foraging habitat would be removed in association with the proposed actions; however, similarly suitable foraging habitat is plentiful in the surrounding landscape. With the use of BMPs in and around the areas affected by the proposal, TVA has determined that the proposed Action Alternative would not adversely affect gray bats.

One man-made roosting structure was observed adjacent to the proposed ROW during field reviews. The Sixteen Tunnel, part of the historic Cincinnati Southern Railway, was observed approximately 0.2 miles from the proposed ROW (see Section 3.10). Although this tunnel would not be physically impacted by the proposed Action Alternative, TVA would complete another field survey of this tunnel to determine if it provides summer roosting habitat for rare bat species. No other known man-made roosting structures were observed within the proposed project footprint or would be impacted by the proposed Action Alternative.

Summer roosting habitat surveys for the Indiana bat and the northern long-eared bat recorded 274 suitable roost trees across five forest fragments and two access roads within the project footprint. Habitat suitability was determined by the number of trees with exfoliating bark (snags and live trees) and their proximity to water sources. A total of 67 acres of suitable summer roosting habitat for Indiana bat and northern long-eared bat would be removed in association with the proposed Action Alternative. TVA proposes to clear trees in these areas of potentially suitable summer roosting bat habitat between October 15 and March 31 to remove any potential for direct effects to roosting Indiana and northern long-eared bats.

In order to mitigate indirect impacts to Indiana bat resulting from removal of suitable summer roost habitat, TVA proposes to partner with the TWRA to promote recovery of the Indiana bat. TVA would enter into an agreement with TWRA wherein TVA would contribute $200,000 to TWRA for the protection, enhancement, and monitoring of known, currently unprotected, Indiana bat maternity habitat in Tennessee (Appendix A). In a January 27, 2017, letter, the USFWS agreed that the proposed agreement would be an appropriate method of mitigating for long-term Indiana bat habitat losses as an alternative to payment into Tennessee's Imperiled Bat Conservation Fund. USFWS concurred with TVA's determination and concluded that the requirements of Section 7 of the ESA are fulfilled for the proposed project.

TVA has determined that while removal of suitable roosting habitat in winter could have indirect adverse effects on the northern long-eared bat and result in "take" as defined in the ESA, this "take" is excepted from ESA Section 9, Take Prohibitions pursuant to the Key to Northern Long-Eared Bat 4(d) Rule for Federal Actions that May Affect Northern Long-Eared Bats (USFWS 2016a) and the Programmatic Biological Opinion on Final 4(d) Rule for the Northern Long-Eared Bat and Activities Excepted from Take Prohibitions (USFWS 2016b). In a letter dated January 27, 2017, the USFWS concurred with TVA's determination (Appendix A).

4.2.7 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" (USWRC 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.

Under the proposed Action Alternative, the proposed TL, substation, temporary access roads, and a permanent substation access road would be constructed. Portions of the TL would cross the 100-year floodplains of White Oak Creek and Massingale Branch in Morgan County. Consistent with EO 11988, overhead TLs and related support structures are considered to be repetitive actions in the 100-year floodplain that should result in minor impacts (46 FR 22845). The conducting wires of the TL would be located well above the 100-year flood elevation. The proposed substation and the access road to the substation would be located outside 100-year floodplains.

The support structures for the TL would not be expected to result in any increase in flood hazard, either as a result of increased flood elevations or changes in flow-carrying capacity of the streams being crossed. Construction in the floodplain would be consistent with EO 11988 provided the TVA subclass review criteria for TL location in floodplains are followed. Portions of some access roads would be located within 100-year floodplains. To minimize adverse impacts on natural and beneficial floodplain values, the following standard mitigation measures would be implemented:

- BMPs would be used during construction activities.
- Construction would adhere to the TVA subclass review criteria for TL location in floodplains (46 FR 22845).

Based upon implementation of the above standard mitigation measures, the proposed TL, substation, temporary access roads, and substation access road would have no significant impact on floodplains.

4.2.8 Wetlands

Activities in wetlands are regulated under Section 401 and 404 of the CWA and are addressed by EO 11990 (Protection of Wetlands). Section 401 requires water quality certification by the state for projects permitted by the federal government (Strand 1997). Section 404 implementation requires activities resulting in the discharge of dredge or fill into

waters of the U.S. to be authorized through a nationwide general permit or individual permit issued by the USACE. EO 11990 requires federal agencies to avoid to the extent possible the long- and short-term adverse impacts associated with the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative.

Under the Action Alternative, the proposed 7.5-mile TL and substation would be constructed and associated access roads would be used during construction. See Section 2.2 for descriptions of the methods for construction, operation, and maintenance of the TL, ROW, substation, and access road actions. Efforts were made during the TL siting process to avoid or minimize wetlands identified via desktop review. However, because of other social, environmental, and engineering factors considered in the siting process, as described in Section 2.3, there was no practicable alternative that would allow for complete avoidance of wetlands. During construction activities that would affect wetland areas, TVA would minimize any impacts to wetlands to the extent practicable.

A total of 1.67 acres of wetland is located within the project area (Table 3-4). One small 0.04-acre emergent wetland, W004, within an existing gas line ROW, would be spanned by the proposed TL due to the low stature of this habitat type. In addition, W002a and W002b consist of a linear wetland feature separated by a culverted logging road within the substation parcel, but outside the substation footprint. The 0.1-acre of W002a would be avoided entirely. Similarly, 0.24 acre of W002b would be avoided; however, the remaining 0.08 acre of W002b within the project footprint would be impacted by the proposed TL ROW. A total of 0.39 acre of scrub-shrub wetland area located along the proposed ROW would require minimal clearing to accommodate TL construction. However, it is anticipated that this community type would recover quickly due to the fast-growing nature of scrub-shrub vegetation.

The remaining 0.9 acre of wetland area located within the project footprint would be impacted by the proposed substation and associated ROW. Wetland W001, totaling 0.22 acre, would be filled for substation construction. In addition, and as described in Section 2.2.1.1, a TL corridor requires tree clearing within the full extent of the ROW, and future maintenance of low-stature vegetation to accommodate clearance and abate interference with overhead wires. Therefore, forested wetland within W002b, W005, W006, W008, W013, W015, W016, and W017, totaling 0.9 acre, would be cleared of large trees and the habitat would be converted to emergent-scrub shrub habitat for the perpetuity of the TL's existence.

In general, forested wetlands have deeper root systems and contain greater biomass (quantity of living matter) per area than do emergent and scrub-shrub wetlands, which do not grow as tall. As a result, forested wetlands tend to be able to provide higher levels of "wetland functions," such as sediment retention, carbon storage, and pollutant retention and transformation (detoxification), all of which support better water quality. Consequently, the clearing and conversion of forested wetlands to lower-growing wetlands reduces some wetland functions that support healthier or improved downstream water quality (Ainslie et al. 1999; Scott et al. 1990; Wilder and Roberts 2002). The 0.9 acre of forested wetland being converted to scrub-shrub habitat would provide the same suite of wetland functions, although at a reduced level.

In accordance with CWA Section 404 and 401, the proposed wetland fill for the substation and forested wetland conversion along the ROW are subject to the regulation of the

USACE Nashville District and TDEC to ensure no net loss of wetland and the function and values they provide. TVA has followed the requirements for wetland avoidance and minimization to the extent practicable. TVA would comply with any further requirements of the USACE/TDEC for compensatory wetland mitigation to offset loss of wetland function due to the proposed project activities.

TVA would minimize wetland disturbance during construction utilizing standard BMPs identified in Muncy (2012). These can include using a feller-buncher, low ground-pressure equipment, and/or mats during clearing and construction activities to reduce soil compaction and minimize rutting for any and all other work necessary within the delineated wetland boundaries (Muncy 2012). Wetland habitat within the ROW located in areas proposed for heavy equipment travel would experience minor and temporary impacts during TL construction. Vehicular traffic would be limited to narrowed access corridors along the ROW for structure and conductor placement. Similarly, potential structure placement in wetlands would be conducted within the parameters and meet the conditions of the approved USACE permit, resulting in no significant wetland impacts.

Cumulative impact analysis of wetland effects takes into account wetland loss and conversion at a watershed scale currently and within the reasonable and foreseeable future. The wetland impacts as a result of the proposed Action Alternative would be insignificant on a cumulative scale due to the avoidance, minimization, and mitigation measures in place, in accordance with the CWA and per the directives of the USEPA and USACE, to ensure compensation efforts result in no net loss of wetland resources. Similarly, general trends in wetland impact resulting from development within the watershed would be subject to CWA, USEPA, and USACE mandates such that compensatory mitigation is provided in a manner to offset impacts.

In compliance with the CWA and EO11990, TVA's siting procedure and alternative selection, as stated in Section 2.1, has identified that there is no practicable alternative to the proposed Action Alternative and its associated wetland impacts. As a result of the proposed BMPs that would be in place during construction, maintenance, and operation, and fulfilling USACE and TDEC permit requirements, the project would have no significant adverse direct, indirect, or cumulative impacts to wetland areas or to the associated wetland functions and values provided within the general watershed.

4.2.9 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.

4.2.9.1 Visual Resources

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

middle ground, and background viewing distance parameters were previously described in Section 3.9.1.

The new tap point would be visually similar to the existing lines and structures currently seen in the existing landscape of the forested area. The new TL would parallel Brewstertown Road for a short distance, but would primarily be located downslope of the road in unpopulated forested areas. Views for area motorists and residents are not likely to be negatively affected.

The proposed TL would be routed to the southeast toward a rural residential area of approximately 15 homes located on two- to 10-acre tracts along Nydeck Road. South and east of U.S. 27 toward the Sunbright substation are where the majority of residential tracts along the proposed TL are located, the closest approximately 250 feet from the proposed TL. Views from the road would be brief and in the foreground. This portion of the TL would be located in the foreground viewing distance of some residential, agricultural, and manufacturing properties adjacent to U.S. 27, Burrville Road, and Dynatex Road.

Operation, construction, and maintenance of the proposed TL and substation would have limited visual impacts. There may be some minor visual discord during the construction period due to the presence of personnel, equipment, and the use of laydown and materials storage areas. These minor visual obtrusions would be temporary until the existing and proposed ROW and laydown areas have been restored through the use of TVA standard BMPs (Muncy 2012). There may also be minor visual discord during annual agricultural and roadway maintenance as well as during TL ROW maintenance (three- to five-year cycles). The ROW would be less visible than roadway maintenance. Therefore, overall visual impacts are anticipated to be minimal as a result of the proposed transmission line.

It is anticipated that the incremental visual impacts of the proposed TL would be minor when considered in conjunction with other past, present, and reasonably foreseeable actions within the area.

4.2.9.2 Noise and Odors

During construction of the proposed TL and substation, equipment could generate noise above ambient levels. Because of the short construction period, noise-related effects are expected to be temporary and minor. For similar reasons, noise related to periodic TL and substation maintenance is also expected to be insignificant. TLs and substations may produce minor noise during operation under certain atmospheric conditions. Off the ROW or substation, this noise is below the level that would interfere with speech.

4.2.10 Archaeological and Historic Resources

For NRHP-listed or eligible archaeological resources located in the APE, project effects could result from vegetation clearing, construction, maintenance, and operation of the proposed TL and substation. These effects could include compaction from heavy equipment, the mixing of stratigraphic layers, displacement and removal of artifacts and features due to ground disturbance, and looting or vandalism stemming from the increased exposure of archaeological deposits due to vegetation clearing.

Based on the results of its surveys, TVA finds that the proposed project has the potential to affect archaeological sites 40MO165 and 40MO166. TVA would create a sensitive area buffer (10-meter radius) surrounding these two sites. These sensitive areas would be marked on pertinent design drawings used in TL construction, as well as on documents that

would be used in future operation and maintenance of the proposed TL. TVA would avoid effects to both sites by: (1) not locating any TL poles, guy wire anchors, or other infrastructure within the sensitive areas; (2) avoiding the use of heavy equipment within the sensitive areas; and (3) conducting any necessary vegetation clearing within the sensitive areas by hand or by using a feller-buncher, before moving all cut materials outside the sensitive areas. With these avoidance measures in place, the undertaking would have no effect on sites 40MO165 and 40MO166. In June 7, 2016, and August 23, 2016, letters, the Tennessee SHPO concurred with TVA's determination (Appendix A).

The undertaking has the potential for direct and indirect adverse effects to Sixteen Tunnel. TVA determined that the proposed action would result in no physical effects to Sixteen Tunnel, but would result in an adverse visual effect due to the installation of TL structures (poles) and conductor (cable) within view of this property. In July 2016, TVA and SHPO entered into a MOA for the resolution of these potential adverse effects to Sixteen Tunnel (Appendix A) should TVA decide to proceed with the project. The MOA identified the following stipulations to which TVA would adhere in order to mitigate potential adverse effects:

- TVA shall complete an NPS NRHP registration form (NPS 10-900) for Sixteen Tunnel and shall submit it to the Tennessee SHPO for review.

- In preparing the NRHP registration form, TVA shall follow the guidelines described in the NPS' *National Register Bulletin: How to Complete the National Register Registration Form* and shall consult with the Tennessee Historical Commission's national register review coordinator on state processes for review and comment.

- TVA shall consider any comments and recommendations that the Tennessee SHPO provides within thirty (30) days of receiving the draft NRHP registration form from TVA concerning the adequacy of the NRHP registration form, prior to submitting a final draft to the Tennessee SHPO.

- Upon TVA and Tennessee SHPO's reaching agreement that the NRHP registration form is acceptable in its final form, TVA would send the form to NPS and request that Sixteen Tunnel be included in the NRHP.

With implementation of these stipulation measures, TVA finds that the proposed undertaking would have no adverse effects on NRHP-eligible Sixteen Tunnel.

TVA also consulted with federally recognized Indian tribes regarding historic properties within the APE that may be of religious and cultural significance and are eligible for the NRHP. TVA did not receive any responses within the 30-day comment period.

4.2.11 Recreation, Parks, and Natural Areas

Under the proposed Action Alternative, a portion of the TL would cross White Oak Creek, an NRI stream and DCH for four mussel species, and two access roads would be located less than 0.25 miles from this stream crossing. Steep topography at this crossing would limit construction activities within the floodplain; standard practices for construction and clearing within a SMZ coupled with standard construction BMPs would minimize impacts to White Oak Creek to an insignificant level (Muncy 2012).

Big South Fork NRRA and Rugby DSNA are of sufficient distance from the project area such that there would be no impacts. Overall cumulative impacts to natural areas associated with this project would be minimal. Construction of the proposed TL, associated access roads, and substation could cause minor and insignificant recreation impacts.

4.2.12 Socioeconomics and Environmental Justice

Under the proposed Action Alternative, TVA would purchase an easement from private landowners to construct the proposed TL. That easement gives TVA the right to locate, operate, and maintain the TL across the property owner's land (see Section 2.2.1.1). In certain cases, such as with the proposed substation site, TVA may be required to acquire ownership in a property. In either case, current landowners would be compensated for the value of such rights purchased. Nonetheless, the direct local economic effect from the purchase of any additional property or ROW easements would be minor.

The proposed ROW has been routed to minimize impacts to the properties it would cross, generally avoiding populated areas to the extent feasible. No residents would be relocated due to the construction of the proposed project. Various studies have concluded that TLs of this size have little or no impact on the value of nearby properties, and that if there are any impacts on property value, they would dissipate over time (Kroll and Priestley 1992). A more recent study based on the use of regression analysis confirms that TLs and structures have little or no effect on sales prices despite the fact that surveys conducted in the course of that study identified subjective feedback from market participants of their perceptions that property values would be impacted (Jackson and Pitts 2010). This same study also found, based on paired sales and other techniques, that TLs did not have effects on property values, and that any effects dissipate with time and distance (Jackson and Pitts 2010).

Construction of the new TL and substation would result in temporary jobs for the duration of the construction. This would result in a localized beneficial impact on the area economy.

The proposed TL would be constructed primarily through rural land, and the population in the areas near the proposed TL is generally small, with only 20 parcels crossed in the 7.5-mile route. The minority population consists of approximately two percent of the total population in Sunbright, which is less than the minority population in the county (5.8 percent) and in the state (21.1 percent). Poverty levels in Sunbright are similar to those in Morgan County and slightly higher than those in Tennessee. While there is a slightly higher poverty level in the project area as compared to the state, the impacts would be similar or equal for the entire population. Therefore, there would be no disproportionate adverse impacts to minority or low-income populations.

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

4.2.13 Post-construction Effects

4.2.13.1 Electric and Magnetic Fields

Transmission lines, like all other types of electrical wiring, generate both electric and magnetic fields (i.e., EMFs). The voltage on the conductors of a TL generates an electric field that occupies the space between the conductors and other conducting objects such as the ground, TL 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 TL, and the distance from the TL.

The fields from a TL 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 very low amount of residual energy 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 TL 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 TL has been designed to minimize the potential for such shocks. This is done, in part, by maintaining sufficient clearance between the conductors and objects on the ground. Stationary conducting objects, such as metal fences, pipelines, and highway guardrails that are near enough to the TL 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 TLs, such as the proposed 161-kV TL, may produce an audible low-volume hissing or crackling noise (Appendix D). 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-generated noise is not associated with any adverse health effects in humans or livestock.

Other public interests and concerns related to EMFs include 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 preventable and correctable.

Older 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, these 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, such as the proposed TL, no longer interfere (JAMA 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 have been reported for the low-energy power frequency fields (WHO 2007a). Effects associated with ungrounded metallic objects' static charge accumulation and with discharges 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 laboratory 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., AMA 1994; National Research Council 1997; NIEHS 2002). Some research continues on the statistical association between magnetic field exposure and a rare form of childhood leukemia known as acute lymphocytic leukemia. A review of this topic by the World Health Organization (WHO) 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 (IARC 2002).

TVA follows medical and health research related to EMFs, and thus far, 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 TLs. Statistical studies of overall populations and increased use of low-frequency electric power have found no associations (WHO 2007b). The 2007 WHO study is one of the most recent, credible studies exploring research exploring EMFs and adverse health outcomes.

TVA also follows media reports which suggest such associations, but these reports do not undergo the same scientific or medical peer review that medical research does. 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 position of the scientific and medical communities 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 (AMA 1994; DOE 1996; NIEHS 1998).

Although no federal standards exist for maximum EMF field strengths for TLs, two states (New York and Florida) do have such regulations. Florida's regulation is the more restrictive of the two, with field levels limited to 150 milligauss at the edge of the ROW for TLs 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 TL connectors are not anticipated to cause any significant impacts related to EMF.

Under the proposed Action Alternative, EMFs would be produced along the length of the proposed TL. The strength of the fields within and near the ROW varies with the electric load on the TL and with the terrain. Nevertheless, EMF strength attenuates rapidly with distance from the TL and is usually equal to local ambient levels at the edge of the ROW. Thus, public exposure to EMFs would be minimal, and no significant impacts from EMFs are anticipated.

4.2.13.2 Lightning Strike Hazard

TVA TLs 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 tops of structures and along the TL, for at least the width of the ROW. NESC standards are strictly followed when installing, repairing, or upgrading TVA TLs or equipment. TL structures are well grounded, and the conductors are insulated from the structure. Therefore, touching a structure supporting a TL poses no inherent shock hazard.

4.2.13.3 Transmission Structure Stability

The structures that would be used on the proposed TL are similar to those shown in Section 2.2.1.4 and are the result of detailed engineering design. They have been used by TVA, with minor technological upgrades over time, for over 70 years with an exceptional 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. Thus, the proposed structures do not pose any significant physical danger. For this reason, TVA does not typically construct barricades or fences around structures. To ensure this exceptional safety record, all TVA transmission structures are examined visually at least once a year.

4.3 Long-term and Cumulative Impacts

The presence of the TL would present long-term visual effects to the mostly rural character of the local area. However, because the route of the proposed TL would traverse mainly rural areas in Morgan County with few residences, the TL would not be especially prominent in the local landscape. Likewise, the establishment of easements for the proposed ROW with local landowners would not pose a long-term encumbrance on the affected properties. Various agricultural land uses could be practiced within the ROW, but any timber production within the ROW would be foregone for the life of the TL.

The increase in power supply is one factor in improving the overall infrastructure in the local Plateau EC area, which over time could attract future commercial and residential development, benefitting the local area in an economic capacity. However, the extent and degree of such development depends on a variety of factors and cannot be predicted. Therefore, residential and commercial growth in this predominantly rural area would be

minor, long-term, and a cumulative consequence of the proposed transmission system improvements.

4.4 Unavoidable Environmental Impacts

The following unavoidable effects would result from implementing the proposed actions as described under the Action Alternative in Section 2.1.2.

- Clearing associated with construction of the proposed TL could result in a small amount of localized siltation.
- Clearing and construction would result in the removal of trees, but due to the amount of acres of forested land in the surrounding area, the impact on forest resources is minimal.
- No trees would be permitted to grow within the TL ROW and only low-growing vegetation would be permitted to grow adjacent to the ROW. In areas where the ROW would traverse forested areas, this would cause a change in the visual character of the immediate area and would segment some forested areas.
- Clearing and construction would result in the disruption and/or loss of some plant and wildlife, and the loss of about 76 acres of forested habitat for the life of the TL.
- Any burning of cleared material would result in some short-term air pollution.
- ROW construction would involve tree clearing and conversion of 0.9 acre of forested wetland to emergent or scrub-shrub habitat, and maintenance of a total of 1.37 acres of wetland habitat as scrub-shrub habitat for the life of the TL. TVA would comply with any further requirements of the USACE/TDEC for compensatory wetland mitigation to offset loss of wetland function due to the proposed project activities.
- The proposed TL would result in minor long-term visual effects on the landscape in the immediate local area.

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

Land within the ROW of the proposed TL would be committed to use for electrical system needs for the foreseeable future. Approximately 103 acres of ROW and substation property would be utilized for the proposed project (as described in Sections 1.1 and 2.2.1.1). Some of this acreage would be converted from its current use as pasture, agricultural fields, and forest to use as an ROW. The proposed ROW would support the 69-kV TL (see Figure 1-1) and proposed substation with use of existing access roads outside the ROW. Agricultural uses of the ROW could and would likely continue. However, routine re-clearing of the ROW would preclude forest management within the ROW for the operational life of the TL. These losses of long-term productivity with respect to timber production and as wildlife habitat are minor both locally and regionally. The Action Alternative would likely result in positive long-term productivity for the area by providing reliable energy to the rapidly developing industrial corridor and short-term benefits from the money spent by workers in the area during construction.

4.6 Irreversible and Irretrievable Commitments of Resources

Irreversible commitments of resources are those uses of resources that cannot be undone. 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 TL would be committed for the life of the TL. 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 or laced-steel towers is expected to be at least 60 years. Thus, recyclable materials would be irretrievably committed until they are eventually recycled.

The ROW used for the TL would constitute an irretrievable commitment of onsite resources, such as wildlife habitat, forest resources, and forested wetlands 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 TL could continue. No irreversible and irretrievable commitments of resources for socioeconomics and environmental justice are anticipated.

CHAPTER 5

5.0 LIST OF PREPARERS

5.1 NEPA Project Management

Anita E. Masters

Position:	NEPA Project Manager
Education:	M.S., Biology/Fisheries; B.S., Wildlife Management
Experience:	28 years in Project Management, NEPA Compliance, and Community and Watershed Biological Assessments
Involvement:	Project Coordination, NEPA Compliance, Document Preparation, and Technical Editor

Loretta A. McNamee

Position:	Contract NEPA Specialist
Education:	B.S., Environmental Biology
Experience:	8 years in NEPA and Environmental Compliance
Involvement:	NEPA Compliance and Document Preparation

5.2 Other Contributors

Christopher A. Austin

Position	Siting Engineer
Education	B.S., Mechanical Engineering
Experience	15 years in Transmission Line Siting; 12 years in Transmission Line Construction
Involvement:	Project and Siting Alternatives; Document Review

Amanda K. Bowen, P.E.

Position:	Civil Engineer, Water Resources
Education:	M.S., Environmental Engineering; B.S., Civil Engineering; Professional Engineer
Experience:	4 years in Water Supply and River Managements
Involvement:	Surface Water

Kimberly D. Choate

Position	Manager, Transmission 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:	11 years in Cultural Resources; 4 years teaching at university level
Involvement:	Cultural Resources Compliance

David T. Nestor

Position:	Biologist, Botany
Education:	M.S., Botany; B.S., Aquaculture, Fisheries, & Wildlife Biology
Experience:	8 years Wetland Delineation; 21 years Field Botany; 11 years invasive Plant Species; 15 years Vegetation and Threatened and Endangered Plants
Involvement:	Vegetation; Threatened and Endangered Plants

Patricia B. Ezzell

Position:	Specialist, Native American Liaison
Education:	M.A., History with an 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

Elizabeth B. Hamrick

Position:	Biologist, Zoology
Education:	M.S., Wildlife; B.S., Biology
Experience:	5 years in Biological Surveys and Environmental Reviews
Involvement:	Wildlife; Threatened and Endangered Terrestrial Animals

Britta P. Lees

Position:	Biologist, Wetlands
Education:	M.S., Botany-Wetlands Ecology Emphasis; B.A., Biology
Experience:	14 years in Wetlands Assessments, Botanical Surveys, Wetlands Regulations, and/or NEPA Compliance
Involvement:	Wetlands

Joseph E. Melton

Position:	Environmental Scientist
Education:	B.S., Environmental Health and Science
Experience:	12 years in Environmental Compliance; Preparation of Environmental Review Documents
Involvement:	Project Coordination, Document Preparation

Michael Meulemans, PE

Position:	Consultant
Education:	B.S. Engineering Management
Experience:	30 years
Involvement:	Socioeconomics and Environmental Justice

Craig L. Phillips

Position:	Biologist, Aquatic Community Ecology
Education:	M.S., and B.S., Wildlife and Fisheries Science
Experience:	10 years Sampling and Hydrologic Determinations for Streams and Wet-Weather Conveyances; 9 years in Environmental Reviews
Involvement:	Aquatic Ecology; Threatened and Endangered Aquatic Animals

Kim Pilarski-Hall

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

Hayden Orr

Position:	Consultant
Education:	B.S., Engineering
Experience:	3 years
Involvement:	Socioeconomics and Environmental Justice

Kevin Ramsey

Position:	Planning Engineer
Education:	B.S., Electrical Engineering
Experience:	3 years Bulk Planning, 1 year System Protection; 4 years at TVA
Involvement:	Project and Justification, Document Review

Amos L. Smith, PG

Position:	Solid Waste Specialist
Education:	B.S., Geology
Experience:	29 years in Environmental Analyses and Groundwater Evaluations
Involvement:	Geology and Groundwater

Jesse C. Troxler

Position:	Biologist, Zoology
Education:	M.S. and B.S., Wildlife Science
Experience:	8 years in Biological Data Collection, 6 months in Environmental Reviews
Involvement:	Wildlife; Threatened and Endangered Terrestrial Animals

Daniel Wade

Position:	Consultant
Education:	M.S., Biosystems Engineering Technology
Experience:	1 year
Involvement:	Visual Resources

Carrie C. Williamson, P.E., CFM

Position:	Civil Engineer, Flood Risk
Education:	M.S., Civil Engineering; B.S., Civil Engineering
Experience:	3 years in Floodplains and Flood Risk; 11 years in Compliance Monitoring; 3 years in River Forecasting
Involvement:	Floodplains

Chevales Williams

Position:	Water Specialist II
Education:	B.S., Environmental Engineering
Experience:	12 years of experience in water quality monitoring and compliance; 11 years in NEPA planning and environmental services
Involvement:	Surface Water and Soil Erosion

Chad H. Worthington

Position:	Contract Biologist, Aquatic Communities
Education:	B.S., Wildlife and Fisheries Science
Experience:	2 years Stream Assessments and 1 year Hydrologic Determinations for Streams and Wet-Weather Conveyances
Involvement:	Aquatic Ecology; Threatened and Endangered Aquatic Animals

CHAPTER 6

6.0 ENVIRONMENTAL ASSESSMENT RECIPIENTS

6.1 Federal Agencies

U. S. Army Corps of Engineers

U. S. Fish and Wildlife Service

6.2 Federally Recognized Tribes

The following tribes were notified of the availability of the document:

Absentee Shawnee Tribe of Oklahoma

Cherokee Nation

Choctaw Nation of Oklahoma

Coushatta Tribe of Louisiana

Eastern Band of Cherokee Indians

Eastern Shawnee Tribe of Oklahoma

Kialegee Tribal Town

Muscogee (Creek) Nation

Shawnee Tribe

United Keetoowah Band of Cherokee Indians in Oklahoma

6.3 State Agencies

Tennessee State Historic Preservation Office

Tennessee Department of Environment and Conservation

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CHAPTER 7

7.0 LITERATURE CITED

Ahlstedt, S. A., S. Bakeletz, M. T. Fagg, D. Hubbs, M. W. Treece, and R. Butler. 2003-2004. Current status of freshwater mussels (Bivalvia: Unionidae) in the Big South Fork National River and Recreation Area of the Cumberland River, Tennessee and Kentucky (1999-2002). Evidence of Faunal Recovery. *Walkerana* 14(31): 33-77.

Ainslie, W.B., R.D. Smith, B.A. Pruitt, T.H. Roberts, E.J. Sparks, L. West, G.L. Godshalk, and M.V. Miller. 1999. A regional guidebook for assessing the functions of low gradient, riverine wetlands in western Kentucky. U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS, USA. Technical Report WRP-DE-17.

AMA (American Medical Association). 1994. *Effects of Electric and Magnetic Fields*. Chicago, Ill.: AMA, Council on Scientific Affairs (December 1994).

Brady et al. 1982. Gray Bat Recovery Plan. U.S. Fish and Wildlife Service. Denver, Colorado.

Brim Box, J. and J. Mossa. 1999. Sediment, Land Use, and Freshwater Mussels: Prospects and Problems. *Journal of the North American Benthological Society* 18(1):99-117.

Conant, R., and J. T. Collins. 1998. *A Field Guide to Reptiles and Amphibians: Eastern and Central North America*. 3rd ed. Houghton Mifflin, Boston, MA.

Cowardin, L. M., V. Carter, F. C. Golet, and E. T. LaRoe. 1979. *Classification of Wetland and Deepwater Habitats of the United States*. Washington, D.C.: U. S. Fish and Wildlife Publication FWS/OBS-79/31.

DOE (U. S. Department of Energy). 1996. *Questions and Answers; EMF in the Workplace*. *Electric and Magnetic Fields Associated With the Use of Electric Power.* National Institute for Occupational Safety and Health, National Institute of Environmental Health Sciences, Report No. DOE/GO-10095-218, September 1996.

Dorcas, L. and W. Gibbons. 2005. *Snakes of the Southeast*. The University of Georgia Press, Athens, GA.

Environmental Laboratory. 1987. *Corps of Engineers Wetland Delineation Manual*. Vicksburg, Miss.: U. S. Army Corps of Engineers Waterways Experiment Station. Technical Report Y-87-1.

Etnier, D.A., and W.C. Starnes. 1993. *The Fishes of Tennessee*. The University of Tennessee Press. Knoxville, Tennessee.

Evaldi, R. D., and R. Garcia. 1991. Quality of South Fork Cumberland River near Stearns, Kentucky, in Pages 417-434, Conferences and Proceedings, Tome 3, Second International Conference on the Abatement of Acidic Drainage, Montreal Quebec, Canada.

Griffith, G. E., J. M. Omernik, and S. Azevedo. 2009. Ecoregions of Tennessee (color poster with map, descriptive text, summary tables, and photographs): Denver, Colorado, U.S. Geological Survey (map scale 1:940,000).

Grossman, D. H., D. Faber-Langendoen, A. S. Weakley, M. Anderson, P. Bourgeron, R. Crawford, K. Goodin, S. Landaal, K. Metzler, K. D. Patterson, M. Pyne, M. Sneddon. 1998. International classification of ecological communities: terrestrial vegetation of the United States. Volume I. The National Vegetation Classification System: development, status, and applications. The Nature Conservancy, Arlington, Virginia.

Harvey, M.J. 1992. Bats of the Eastern United States. Arkansas Game and Fish Commission. Little Rock, Arkansas.

IARC (International Association for Research on Cancer). 2002. *Non-Ionizing Radiation, Part 1; Static and Extremely Low-Frequency (ELF) Electric and Magnetic Fields.* Lyon, France: IARC Press.

Jackson, T. and Jennifer Pitts, 2010. The Effects of Electric Transmission Lines on Property Values: A Literature Review. Volume 18, Number 2, *Journal of Real Estate Literature*.

JAMA (Journal of the American Medical Association). 2007. Implantable Cardioverter-Defibrillators. *JAMA* 297(17), May 2, 2007.

Kays, R, and D E. Wilson. 2002. *Mammals of North America*. Princeton University Press, Princeton, NJ.

Kroll, C. A. and T. Priestley. 1992. The Effects of Overhead Transmission Lines on Property Value. Report prepared for the Edison Electric institute Siting and Environmental Planning Task Force.

Kurta, A., S. W. Murray, and D. H. Miller. 2002. Roost selection and movements across the summer landscape. Pages 118-129 in A. Kurta and J. Kennedy, editors. *The Indiana Bat: Biology and Management of an Endangered Species*. Bat Conservation International, Austin, Texas.

Leverett, R. 1996. *Definitions and History in Eastern Old-growth Forests: prospects for rediscovery and recovery*. Edited by Mary Byrd Davis. Island Press, Washington D.C. and Covelo, California.

Lloyd, O. B. Jr., and W. L. Lyke. 1995. *Ground Water Atlas of the United States*, Segment 10. United States Geological Survey. Reston, Virginia.

Lichvar, R.W., D.L. Banks, W.N. Kirchner, and N.C. Melvin. 2016. The National Wetland Plant List: 2016 wetland ratings. *Phytoneuron* 2016-30: 1-15.

Mack, J. 2001. *Ohio Rapid Assessment Method for Wetlands*, Version 5.0, User's Manual and Scoring Forms. Columbus: Ohio Environmental Protection Agency, Division of Surface Water, 401/Wetland Ecology Unit, EPA Technical Report WET/2001-1.

Miller, J. H., S. T. Manning and S. F. Enloe. 2010. *A Management Guide for Invasive Plants in the Southern Forests*. Gen. Tech. Rep. SRS-131. U. S. Department of Agriculture, Forest Service, Southern Research Station: 1-3.

Muncy, J. A. 2012. *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Transmission Construction and Maintenance Activities* (revised edition). Edited by A. Bowen, et al. Norris: Tennessee Valley Authority, Technical Note TVA/LR/NRM 92/1. Available to the public at <https://www.tva.com/Energy/Transmission-System/Transmission-System-Projects>.

National Geographic. 2002. *A Field Guide to the Birds of North America.* 4th ed. National Geographic Society. Washington, D.C.

National Oceanic and Atmospheric Administration (NOAA). 2002. *Climatography of the United States No. 81*. National Climatic Data Center. Asheville, NC.

NatureServe. 2016. NatureServe Web Service. Arlington, VA. U.S.A. Retrieved from <http://services.natureserve.org> (accessed January 14, 2016).

Nicholson, C. P. 1997. *The Breeding Birds of Tennessee*. The University of Tennessee Press. Knoxville, Tennessee.

NIEHS (National Institute of Environmental Health Sciences). 1998. *Report on Health Effects From Exposure to Power Line Frequency Electric and Magnetic Fields*. Research Triangle Park: NIEHS, Publication No. 99-4493.

NIEHS. 2002. *Electric and Magnetic Fields Associated With the Use of Electric Power*. Retrieved from <http://www.niehs.nih.gov/health/materials/electric_and_magnetic_fields_associated_with_the_use_of_electric_power_questions_and_answers_english_508.pdf#search=electric%20and%20magnetic%20fields%20electric%20power> (accessed September 2016).

National Research Council. 1997. *Possible Health Effects of Exposure to Residential Electric and Magnetic Fields*. NRC, Committee on the Possible Effects of Electromagnetic Fields on Biologic Systems. Washington National Academy Press.

Page and Burr. 2011. Field Guide to Freshwater Fishes of North America North of Mexico. Boston: Houghton Mifflin Harcourt, 663p.

Parmalee, P.W., and A.E. Bogan. 1998. *Freshwater Mussels of Tennessee*. The University of Tennessee Press. Knoxville, Tennessee.

Pruitt, L., and L. TeWinkel, editors. 2007. Indiana Bat (Myotis sodalis) Draft Recovery Plan: First Revision. U.S. Fish and Wildlife Service, Fort Snelling, Minnesota. Retrieved from <http://www.fws.gov/midwest/endangered/mammals/inba/pdf/inba_fnldrftrecpln_apr07.pdf> (accessed 18 January 2016).

Scott, A. F. and W. H. Redmond. 1996. Atlas of Amphibians in Tennessee. The Center for Field Biology, Austin Peay University. Retrieved from <http://apbrwww5.apsu.edu/amatlas/index.html> (accessed 14 January 2016)

Scott, A. F. and W. H. Redmond. 2008. Atlas of Reptiles in Tennessee. The Center for Field Biology, Austin Peay University. Retrieved from <http://apbrwww5.apsu.edu/reptatlas/frames_file.htm> (accessed 14 January 2016)

Scott, Michael L., Barbara A. Kleiss, William H. Patrick, Charles A. Segelquist, et al. The Effect of Developmental Activities on Water Quality Functions of Bottomland Hardwood Ecosystems: The Report of the Water Quality Workgroup. As reported in: Gosselink, J.G. *et al.* (1990). Ecological processes and cumulative impacts: illustrated by bottomland hardwood wetland ecosystems / edited. Lewis Publishers, Chelsea, MI.

Strand, M. N. 1997. *Wetlands Deskbook*, 2nd Edition. Washington, D.C.: The Environmental Law Reporter, Environmental Law Institute.

Sutherland, A. B., J. L. Meyer, and E. P. Gardiner. 2002. "Effects of Land Cover on Sediment Regime and Fish Assemblage Structure in Four Southern Appalachian Streams." *Freshwater Biology* 47(9):1791-1805.

TDEC (Tennessee Department of Environment and Conservation). 2014. Year 2014 303 (d) List. Division of Water Resources. Nashville, TN.

TDEC. 2013. Rules of the Tennessee Department of Environment and Conservation – Use Classifications for Surface Waters.

TDEC. 2012. Erosion and Sediment Control Handbook: A Guide for Protection of State Waters Through the Use of Best Management Practices During Land Disturbing Activities, Fourth Edition. Tennessee Department of Environment and Conservation, Division of Water Pollution Control.

TN-EPPC (Tennessee Exotic Plant Pest Council). 2010. Invasive Exotic Pest Plants in Tennessee. Retrieved from < http://www.tneppc.org/> (accessed: January 7, 2016).

TVA (Tennessee Valley Authority). 1983. *Procedures for Compliance with the National Environmental Policy Act: Instruction IX Environmental Review*. Available to the public at <http://www.tva.gov/environment/reports/pdf/tvanepa_procedures.pdf>.

TVA. 2003. TVA Visual Resources Scenic Value Criteria for Scenery Inventory and Management.

TVA. 2008. TVA's *Substation Lighting Guidelines.* Chattanooga, TN. Available to the public at <https://www.tva.com/Energy/Transmission-System/Transmission-System-Projects>.

TVA. 2013. Tennessee Valley Authority's *Site Clearing and Grading Specifications*. Chattanooga, TN. Available to the public at <https://www.tva.com/Energy/Transmission-System/Transmission-System-Projects>.

TVA. 2015a. *Integrated Resource Plan: 2015 Final Report*. Available to the public at <http://www.tva.com/environment/reports/irp/index.htm>.

TVA. 2015b. *Environmental Impact Statement for TVA's Integrated Resource Plan: TVA's Environmental & Energy Future*. Knoxville, Tennessee. Available to the public at <http://www.tva.com/environment/reports/irp/pdf/TVA%20Final%20Integrated%20Resource%20Plan%20EIS%20Volume%201.pdf>.

TVA. 2016. *Transmission Environmental Protection Procedures Right-Of-Way Vegetation Management Guidelines.* Chattanooga, Tennessee. Available to the public at <https://www.tva.com/Energy/Transmission-System/Transmission-System-Projects>.

Tuttle, M.D. 1976. Population Ecology of the Gray Bat (*Myotis grisescens*): Philopatry, timing and patterns of movement, weight loss during migration and seasonal adaptive strategies. University of Kansas Museum of Natural History Occasional Paper 58:1-38.

U.S. Army Corps of Engineers. 2012. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Eastern Mountains and Piedmont Region. Version 2.0, ed. J. F. Berkowitz, J. S. Wakeley, R. W. Lichvar, C. V. Noble. ERDC/EL TR-12-9. Vicksburg, MS: U.S. Army Engineer Research and Development Center.

USCB (U.S. Census Bureau). 2015. American Community Survey. 2008-2012. Morgan County, TN Quick Facts from the United States Census Bureau. Retrieved from <http://factfinder2.census.gov/> (accessed April and September 2015).

USDA (U. S. Department of Agriculture). 1995. *Landscape Aesthetics, A Handbook for Scenery Management*. U.S. Forest Service. Agriculture Handbook Number 701.

U. S. Department of Defense and U.S. Environmental Protection Agency. 2003. *Advance Notice of Proposed Rulemaking on the Clean Water Act Regulatory Definition of Waters of the United States*. *Federal Register*, Volume 68(10), January 15, 2003.

USEPA (U. S. Environmental Protection Agency). 2016. Local Drinking Water Information. Retrieved from <https://www.epa.gov/ccr> (accessed June 22, 2016).

USFS (U.S. Forest Service). 2016. *Forest Inventory Data Online (FIDO).* Version 1.5.1.05b. Retrieved from <http://apps.fs.fed.us/fia/fido/index.html> (accessed January 7, 2016).

USFWS (U.S. Fish and Wildlife Service). 2007a. Cumberland elktoe (Alasmidonta atropurpurea) Five-year review: Summary and Evaluation. Cookeville, Tennessee.

USFWS. 2007b. Green-blossom pearlymussel (Epioblasma torulosa gubernaculum), Turgid-blossom pearlymussel (Epioblasma turgidula), and Yellow-blossom pearlymussel (Epioblasma florentina florentina) Five-year review: Summary and Evaluation. Cookeville, Tennessee.

USFWS. 2010. Cumberland bean (Villosa trabalis) Five-year review: Summary and Evaluation. Frankfort, Kentucky.

USFWS. 2014. Northern Long-eared Bat Interim Conference and Planning. Retrieved from <http://www.fws.gov/midwest/endangered/mammals/nlba/pdf/NLEBinterimGuidance6Jan2014.pdf> (accessed January 18, 2016).

USFWS. 2015a. Blackside dace (Phoxinus cumberlandensis) =Blackside dace (Chrosomus cumberlandensis) Five-year review: Summary and Evaluation. Frankfort, Kentucky.

USFWS. 2015b. Technical/Agency Draft Recovery Plan for the Laurel Dace (*Chrosomus saylori*). Cookeville, Tennessee.

USFWS. 2015c. Range-wide Indiana Bat Summer Survey Guidelines. April 2015. Retrieved from <https://www.fws.gov/athens/pdf/2015IndianaBatSummerSurveyGuidelines01April2015.pdf> (accessed January 18, 2016).

USFWS. 2016a. *Key to the Northern Long-Eared Bat 4(d) Rule for Federal Actions that May Affect Northern Long-Eared Bats*. January 2016, revised February 2016. Retrieved from <https://www.fws.gov/Midwest/Endangered/mammals/nleb/pdf/KeyFinal4dNLEB_FedAgencies17Feb2016.pdf> (accessed December 7, 2016).

USFWS. 2016b. Programmatic Biological Opinion on Final 4(d) Rule for the Northern Long-Eared Bat and Activities Excepted from Take Prohibitions. U.S. Fish and Wildlife Service Regions 2, 3, 4, 5 and 6. January 5, 2016. Retrieved from <https://www.fws.gov/midwest/endangered/mammals/nleb/pdf/BOnlebFinal4d.pdf> (accessed December 7, 2016).

USGS (U.S. Geological Survey). 2008. Annual Precipitation and Runoff Averages. PRISM Product. The PRISM Climate Group. Oregon State University. Corvallis, OR.

USWRC (United States Water Resources Council). 1978. "Floodplain Management Guidelines for Implementing E.O. 11988." *Federal Register* 43:6030, February 10, 1978.

Whitaker, J.O. 1996. National Audubon Society: Field Guide to North American Mammals. Alfred A. Knopf, Inc., New York.

WHO (World Health Organization). 2007a. *Electromagnetic Fields and Public Health.* WHO EMF Task Force Report, WHO Fact Sheet No. 299.

WHO. 2007b. *Extremely Low Frequency Fields.* Environmental Health Criteria Monograph No. 238.

WHO. 2007c. *Electromagnetic Fields and Public Health Exposure to Extremely Low Frequency Fields.* WHO Fact Sheet No. 322.

Wilder, T.C. and Roberts, T. H. 2002. "A Regional Guidebook for Applying the Hydrogeomorphic Approach to Assessing Wetland Functions of Low-Gradient Riverine Wetlands in Western Tennessee," ERDC/EL TR-02-6, U.S. Army Engineer Research and Development Center, Vicksburg, MS.

Appendix A – Correspondence

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

August 11, 2016

Mr. E. Patrick McIntyre, Jr.
Executive Director
Tennessee Historical Commission
2941 Lebanon Road
Nashville, Tennessee 37243-0442

Dear Mr. McIntyre:

TENNESSEE VALLEY AUTHORITY (TVA), ACCESS ROADS ASSOCIATED WITH THE PLANNED RUGBY-SUNBRIGHT 69-KV TRANSMISSION LINE, MORGAN COUNTY, TENNESSEE (36° 19' 50" N/ 84° 42' 30" W)

Earlier this year we initiated consultation with your office under Section 106 of the National Historic Preservation Act for TVA's proposed construction of the Rugby-Sunbright 69-kilovolt (kV) transmission line and associated substation in Morgan County, Tennessee. Based on a Phase I cultural resources survey of the proposed 100-foot right-of-way (ROW), TVA proposed that two archaeological sites (40MO165 and 40MO166) identified in the area of potential effects (APE) should be considered of undetermined eligibility for inclusion in the National Register of Historic Places (NRHP), and proposed avoidance measures for those sites. In your response, you presented your determination that the APE contains no NRHP-eligible, archaeological resources. Our offices agreed that one NRHP-eligible, historic, architectural resource in the APE, Sixteen Tunnel, would be adversely affected, and we have recently executed an MOA for the resolution of the adverse effect.

At the time of the survey, TVA had not yet completed project designs and did not have information on the access roads to be used for ingress and egress during construction. Recently, TVA identified 18 access roads, of which six are located entirely within the proposed TL ROW. The remaining 12 access roads are off-ROW and would affect land not included in the previous survey. Therefore, TVA proposes to enlarge the undertaking's APE to include these 12 off-ROW access roads, totaling approximately 8 miles. Each access road would have a width of approximately 20 feet.

TVA contracted with Tennessee Valley Archaeological Research (TVAR) to perform a Phase I cultural resources survey of this new section of the APE. Enclosed are two copies of the draft report, titled *A Phase I Archaeological Survey of Access Roads for the Tennessee Valley Authority's Rugby-Sunbright Transmission Line Project in Morgan County, Tennessee*, along with two CDs containing digital copies of the report. As none of the access roads would be within view of Sixteen Tunnel or require any above-ground modifications, TVA does not consider the access roads to have potential to affect NRHP-eligible historic structures.

Mr. E. Patrick McIntyre, Jr.
Page Two
August 11, 2016

TVAR's background study, conducted prior to the field study, indicated that no previously recorded archaeological sites, and no properties listed in the NRHP, are located within this new section of the APE. The archaeological survey identified no archaeological sites. TVAR recommends that no additional archaeological investigations are necessary in connection with the proposed project.

TVA has read the enclosed report and agrees with the authors' findings and recommendations. Based on this study, TVA finds that the off-ROW access roads for the Rugby-Sunbright 69-kV transmission line project contain no archaeological sites.

Pursuant to 36 CFR Part 800.4(d)(1), we are seeking your agreement with TVA's finding of no historic properties affected, for this portion of the APE.

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

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

Sincerely,

Clinton E. Jones
Manager, Biological and Cultural Compliance
Safety, River Management and Environment

SCC:CSD
Enclosures
cc (Enclosures):
Ms. Jennifer Barnett
Tennessee Division of Archaeology
1216 Foster Avenue, Cole Bldg. #3
Nashville, Tennessee 37210

INTERNAL COPIES:

Skip Markham, MR 4G-C
Joe Melton, MR 4G-C
Emily Willard, MR 4G-C
Richard Yarnell, WT11D-K
ECM, WT CA-K

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

Received
8/26/16

August 23, 2016

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

RE: TVA, ARCHAEOLOGICAL RESOURCES REPORT, RUGBY-SUNBRIGHT LINE ACCESS ROADS, UNINCORPORATED, MORGAN COUNTY, TN

Dear Mr. Jones:

In response to your request, we have reviewed the archaeological report of investigations and accompanying documentation submitted by you regarding the above-referenced undertaking. Our review of and comment on your proposed undertaking are among the requirements of Section 106 of the National Historic Preservation Act. This Act requires federal agencies or applicants for federal assistance to consult with the appropriate State Historic Preservation Office before they carry out their proposed undertakings. The Advisory Council on Historic Preservation has codified procedures for carrying out Section 106 review in 36 CFR 800 (Federal Register, December 12, 2000, 77698-77739).

Considering the information provided, we concur that no historic properties eligible for listing in the National Register of Historic Places will be affected by this undertaking. If project plans are changed or archaeological remains are discovered during project 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. Questions or comments may be directed to Jennifer Barnett (615) 741-1588, ext. 105.

Your cooperation is appreciated.

Sincerely,

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

EPM/jmb

Rec'd. 4/4/16

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

March 30, 2016

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

RE: TVA, ARCHAEOLOGICAL ASSESSMENT, RUGBY-SUNBRIGHT 69-KV LINE/STATION, UNINCORPORATED, MORGAN COUNTY, TN

Dear Mr. Jones:

At your request, our office has reviewed the above-referenced archaeological 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 archaeological resources 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 HISTORICAL COMMISSION
STATE HISTORIC PRESERVATION OFFICE
2941 LEBANON ROAD
NASHVILLE, TENNESSEE 37243-0442
OFFICE: (615) 532-1550

Received 6/13/16

June 7, 2016

Mr. Clinton E. Jones
Tennessee Valley Authority
400 W. Summet Hill Dr.
Knoxville, Tennessee, 37902-1499

RE: TVA, RUGBY-SUBRIGHT LINE & SUBSTATION, UNINCORPORATED, MORGAN COUNTY

Dear Mr. Jones:

Pursuant to your request, received on Wednesday, June 1, 2016, this office has reviewed documentation concerning the above referenced undertaking. This review is a requirement of Section 106 of the National Historic Preservation Act for compliance by the participating federal agency or applicant for federal assistance. Procedures for implementing Section 106 of the Act are codified at 36 CFR 800 (Federal Register, December 12, 2000, 77698-77739).

Based on the information provided, we find that the current documentation adequately mitigates project effects upon properties eligible for listing in the National Register of Historic Places as stipulated in the project Memorandum of Agreement (MOA).

Therefore, this office has no objection to the implementation of those project elements covered by the submitted documentation. Your continued cooperation is appreciated.

Sincerely,

E. Patrick McIntyre, Jr.

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

EPM/dlc

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Tennessee ES Office
446 Neal Street
Cookeville, Tennessee 38501

January 27, 2017

Mr. John T. Baxter Jr.
Tennessee Valley Authority
400 West Summit Hill Drive
Knoxville, Tennessee 37902-1499

Subject: FWS #2017-CPA-0256. Proposed construction of Rugby 161-kilovolt (kV) substation and Rugby – Sunbright 69-kV transmission line, Morgan County, Tennessee.

Dear Mr. Baxter:

Fish and Wildlife Service (Service) biologists have reviewed your description of a proposal for the subject project, which was provided with a letter dated December 22, 2016, and supporting materials. The project would involve construction of a new 161-kV substation and 7.25 miles of new 69-kV transmission line. Eighteen access roads would be required to construct and support the line. Approximately 76 acres of forested habitat would be permanently removed, and 67.1 acres of this habitat contains suitable Indiana bat and northern long-eared bat summer roosting habitat.

The Service's Information Planning and Conservation website indicated that several federally listed species may be located in the vicinity of the project site. You have determined that the majority of those species will not be affected by the project, including six mussels, three fish, three plants, and the gray bat. You have determined that best management practices would minimize impacts to habitat of the Cumberland elktoe (*Alasmidonta atropurpurea*), thereby avoiding take to the extent that the project is not likely to adversely affect this species. Conservation measures would be implemented to address potential impacts to the northern long-eared bat (*Myotis septentrionalis*), and you have determined that application of the 4(d) rule for this species adequately addresses its take.

The project may affect the Indiana bat (*Myotis sodalis*), and mitigation measures have been proposed to address this concern. Suitable Indiana bat roost trees would be removed between October 15 and March 31 to address the potential for injury to individual bats, and specific measures to address long-term loss of summer roosting habitat have been developed in coordination with Tennessee Wildlife Resources Agency biologists. You provided a description of the plan for implementation of these mitigation measures in Wilson County, Tennessee, and you requested that the Service approve the plan as a method for addressing long-term bat habitat loss at the subject project site. Funding at a level of $200,000 would be applied for implementation of conservation measures. We agree that this would be an appropriate method of mitigating for long-term Indiana bat habitat losses as an alternative to payment into Tennessee's Imperiled Bat Conservation Fund. We would like to emphasize the importance of continued close coordination with the Service and other partners in achieving the goals of bat conservation measures.

A potential concern involving this plan was raised during our review. The subject project site is approximately 75 miles from Indiana bat maternity areas in Wilson County, Tennessee, and this raises a

concern that conservation measures may be more appropriately implemented at sites occupied by the species that are closer to Morgan County. We have considered this concern but are not aware of closer locations that currently offer practical opportunities for conservation of Indiana bat habitat.

Adverse effects to the Indiana bat and northern long-eared bat could occur. You have determined that direct effects to the Indiana bat will be adequately addressed through seasonal removal of trees and that indirect effects to the species would be adequately addressed through implementation of conservation measures. Likewise, conservation measures would be used to address potential effects to the northern long-eared bat. You have requested concurrence from the Service with your determination that indirect impacts to the Indiana bat would be mitigated adequately and that any incidental take of northern long-eared bats will be covered in this case by the 4(d) rule for the species.

We concur with all of your determinations of potential effects, described above (including adequacy of the northern long-eared bat 4(d) rule in addressing take of the species). We believe that adequate implementation of the proposed best management practices (BMPs) for maintenance of water quality (especially to control erosion, sedimentation, and turbidity) would sufficiently address concerns about mussel impacts. In order to avoid potential impacts to the Cumberland elktoe, we would like to stress the need for diligence in implementing the BMPs.

We conclude that, based on adequate implementation of the above-described conservation measures, the requirements of section 7 of the Endangered Species Act of 1973, as amended, are fulfilled for this project. Obligations under the ESA must be reconsidered if (1) new information reveals impacts of the proposed action that may affect listed species or critical habitat in a manner not previously considered, (2) the proposed action is subsequently modified to include activities which were not considered during this consultation, or (3) new species are listed or critical habitat designated that might be affected by the proposed action.

Finally, we would like to acknowledge one point of clarification involving your letter dated December 22, 2016. Reference was made to the point that TVA would work with The Nature Conservancy (TNC) to ensure successful application of conservation measures to achieve on-the-ground benefits in promoting recovery of the Indiana bat. During a conversation on January 27, 2017, Liz Hamrick of your staff indicated that TNC will not actually be involved in this project.

Thank you for consulting with us to address species concerns relative to this project. We look forward to work with you in implementing conservation measures for the Indiana bat in Wilson County. Please contact David Pelren of my staff at 931-525-4974 or by e-mail at *david_pelren@fws.gov* as we continue to coordinate on this project or if you have questions.

Sincerely,

Mary E. Jennings

Mary E. Jennings
Field Supervisor

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

December 22, 2016

Mrs. Mary Jennings
Field Supervisor
Tennessee Ecological Services Field Office
U.S. Fish and Wildlife Service
446 Neal Street
Cookeville, Tennessee 38501

Dear Mrs. Jennings:

TENNESSEE VALLEY AUTHORITY RUGBY 161KV SUBSTATION, RUGBY - SUNBRIGHT 69KV TL, RIGHT-OF-WAY, AND ACCESS ROADS

Tennessee Valley Authority (TVA) proposes to construct a new 161-kV (kilovolt) substation and 7.25-miles of new 69-kV transmission line (TL) in Morgan County, Tennessee. The new TL would be built on new 100' right-of-way (ROW). Eighteen access roads (ARs) would be required to construct and support this new line. Approximately 76.0 acres of forested habitat would be removed and permanently maintained as early successional habitat for the proposed project. The project site encompasses approximately 108.8 acres in its entirety. Approximately 67.1 acres of this forested habitat may offer potentially suitable Indiana bat and northern long-eared bat (NLEB) summer roosting habitat. See attached Technical Report for more detailed project description, figures, and photos.

Review of the TVA Regional Natural Heritage database and the U.S. Fish and Wildlife Service IPaC website indicated that five species listed as endangered or threatened under the Endangered Species Act occur in Morgan County, Tennessee or within ten (10) miles of the project area. These species include seven mussels (Alabama lampmussel, Cumberland bean, Cumberland elktoe, finerayed pigtoe, purple bean, shiny pigtoe, and turgid blossom pearlymussel), three fish (blackside dace, laurel dace, spotfin chub), three mammals (gray bat, Indiana bat, and NLEB) and three plants (Cumberland rosemary, Cumberland sandwort, and Virginia spiraea) that have the potential to occur in Morgan County based on historic range, proximity to known occurrence records, biological characteristics and/or physiographic characteristics. See accompanying Table 1 for listing of species potentially occurring within the project action area. Designated Critical Habitat (DCH) for Cumberlandian combshell, Cumberland elktoe, and oyster mussel (unoccupied) occurs in one of the perennial streams within the action area (White Oak Creek).

Plants

Field reviews were conducted July 29, 2015, December 14, 2015, January 6, 2016, and June 20, 2016 to determine whether suitable habitat for federally listed species occurs

within the project action area. No federally listed plants were observed in the proposed right-of-way or access roads. No designated critical habitat for plants occurs in the project area. TVA has determined that the proposed construction would have no effect on Cumberland rosemary, Cumberland sandwort, and Virginia spiraea.

Aquatic Species

Field surveys conducted in December 2015 of the proposed TL route documented 17 ephemeral streams/wet weather conveyances (WWCs), two intermittent streams, and seven perennial streams within the project footprint, one of which (White Oak Creek) contains federally Designated Critical Habitat (DCH) for Cumberlandian combshell, Cumberland elktoe, and oyster mussel (unoccupied). Descriptions regarding the location of the TL crossing at White Oak Creek are listed below. Proposed Best Management Practices (BMPs) are listed according to Muncy (2012); the White Oak Creek crossing would receive a Streamside Management Zone (SMZ) designed to protect sensitive aquatic species from potential impacts resulting from construction and maintenance activities associated with riparian area clearing for the proposed TL and ROW (refer to Figure 1 for a complete description of BMP measures). In addition, Figures 2 and 3 provide further information on location and habitat present within this reach of White Oak Creek.

Location of Proposed White Oak Creek Crossing, Morgan County, TN
White Oak Creek, Mile ~12.5
Coordinates: 36.306228, -84.685363

- Category C SMZ Riparian Buffer (110 ft) protecting stream banks, as outlined in Muncy (2012)
- Construction would maintain a minimum distance of 225 ft from both the left and right bank for structure siting because of surrounding slope, per TVA Engineering

The federally listed Alabama lampmussel, finerayed pigtoe, laurel dace, purple bean, shiny pigtoe, and spotfin chub are all endemic to the Tennessee River drainage (Etnier and Starnes 1993, Parmalee and Bogan 1998, Page and Burr 2011, USFWS 2015b), and would not occur in streams potentially affected by the proposed project, which are part of the Cumberland River drainage. Aside from experimental populations, the federally endangered turgid blossom pearlymussel was last observed by TVA biologists in the Duck River in 1965, and is possibly functionally extinct (Parmalee and Bogan 1998, USFWS 2007b). TVA has determined that the proposed construction would have no effect on Alabama lampmussel, finerayed pigtoe, laurel dace, purple bean, shiny pigtoe, spotfin chub, and turgid blossom pearlymussel.

The federally listed threatened blackside dace is restricted to the Upper Cumberland River system in Kentucky and Tennessee, where it inhabits small upland streams with sand, sandstone, and shale substrates (Etnier and Starnes 1993). It is not presently

known from White Oak Creek in Morgan County, Tennessee (USFWS 2015a). TVA has determined that the proposed construction would have no effect on blackside dace.

The federally endangered Cumberland bean occurs in small rivers and streams in areas of swift current over sand and gravel substrates, and is a Cumberlandian species restricted to tributary streams of the Tennessee and Cumberland Rivers. Recent reports suggest this species may be limited to the Hiwassee River in the Tennessee River drainage, and Sinking Creek, Buck Creek, and Big South Fork in the Cumberland River drainage (USFWS 2010). TVA has determined that the proposed construction would have no effect on Cumberland bean.

The federally endangered Cumberland elktoe is endemic to the Cumberland River drainage in Kentucky and Tennessee. Its former distribution included the main stem Cumberland River and its tributaries entering from the south between the Big South Fork Cumberland River upstream to Cumberland Falls, in addition to Marsh Creek above Cumberland Falls. It has been observed in areas of slow current with sand, mud, and cobble substrates, generally at depths of one to two feet (Parmalee and Bogan 1998). Little is known about the life history of the Cumberland elktoe. This species has declined significantly due to factors such as coal and gravel mining, sedimentation, and other developmental activities (USFWS 2007a). Its greatest local abundances occur in stretches of the Clear Fork and White Oak Creek with slow current and an abundance of large cobbles with sand and mud substrate at depths of one to two feet (Parmalee and Bogan 1998). Ahlstedt et al. (2003-2004) reported 61 individuals in White Oak Creek at creek mile 5.5 below Highway 52 Bridge near Rugby, TN.

In January 2016, TVA biologists reported the Cumberland elktoe (*Alasmidonta atropurpurea*) in White Oak Creek at approximately creek mile 12.5, on the downstream end of the proposed TL ROW (Figure 4). One individual (fresh dead) was collected and taken to Gerry Dinkins (Curator of Natural History and Malacology, McClung Museum) for verification, where it is now catalogued (M. Reed, pers. comm., 2016). Aquatic habitat in the vicinity of the TL crossing consisted of bedrock substrates interspersed with some cobble, gravel and sand. Current in this reach was relatively slow, with depths ranging from 1-3 ft, all of which corresponds to descriptions of preferred Cumberland elktoe habitat described in other studies (Parmalee and Bogan 1998).

The Cumberland elktoe is very likely to occur in White Oak Creek within the TL ROW crossing given habitat observations by TVA biologists and the collection of one fresh dead individual at this location. However, TVA would apply appropriate best management practices (BMPs) to minimize sediment runoff into the stream. Application of an enhanced protective buffer for White Oak Creek (SMZ Category C, 110' SMZ width), direct impacts to in-stream habitat and supported species would be non-existent. Indirect effects such as erosion and sedimentation would be minimized according to BMPs outlined in Muncy (2012). Based on the minor extent of potential in-stream effects associated with this project, TVA has determined that proposed actions are not likely to adversely affect the federally endangered Cumberland elktoe known

from this reach of White Oak Creek. Because no in-stream modification, or impacts to water quality would occur, TVA has determined that there would be no adverse modification of DCH for Cumberlandian combshell, Cumberland elktoe, and oyster mussel.

Bat Species

Phase 1 Habitat Assessments (2015 and 2016 Range-Wide Indiana Bat Summer Survey Guidelines) were conducted July 29, 2015, December 14, 2015, and June 20, 2016 to determine whether suitable habitat for federally listed species occurs within the project action area. No caves, buildings, or bridges were identified during field surveys of the project footprint. An abandoned railroad tunnel was observed 0.2 miles from the ROW during field surveys. It would not be impacted by the proposed actions. No evidence of bats was observed during field surveys of the tunnel in December; however there is some potential for use by small numbers of summer roosting bats. The project footprint includes 18 wetland areas, (totaling 1.67 acres), an additional 3 acres of wetland adjacent to AR 15, 17 ephemeral WWCs, two intermittent streams, and seven perennial streams, all of which may provide suitable foraging habitat and sources of drinking water for bats. Forest fragments and forested edges in the project footprint offer additional suitable foraging habitat for Indiana bat and NLEB. In total, 268 potentially suitable bat roosting trees spread over seven sites would be removed for construction of the proposed substation, TL ROW, and ARs. All requested information is contained within the Technical Report (e.g., project description, methods, survey locations, maps, summary of results, photos etc.). (Technical Report Figures 3-2 through 3-6).

No records of Indiana bat are known from Morgan County, Tennessee. The nearest record of Indiana bat is approximately 16.7 miles away at Xanadu Cave in Fentress County. Three mist net captures of NLEB have been recorded in Morgan County but the closest known record for this species is approximately 13.7 miles away in neighboring Scott County. The nearest known hibernaculum for NLEB is Wolf River Cave, approximately 19.0 miles away in Fentress County. The closest gray bat record is known from a cave approximately 14.6 miles from the project footprint in Fentress County. The closest reported cave, Hole in the Wall Cave in Fentress County, is approximately 13.7 miles from the proposed activities and would not be affected by the proposed actions. No other potential winter roosting structures would be impacted by the proposed actions. Best Management Practices would be used in and along all bodies of water within the project footprint in order to minimize impacts on foraging habitat and drinking water. With the use of BMPs in and around the action areas, TVA has determined that the proposed actions would not adversely affect gray bats.

TVA biologists have determined that approximately 67.1 acres of potentially suitable summer roosting habitat would be removed within seven sections of mature hardwood and dead pine forest within the project footprint. Wetlands, streams, and forested habitat on site provide drinking water and foraging habitat for these species as well as gray bats. The project proposes to clear these areas of potentially suitable summer roosting bat habitat between October 15 and March 31 to remove any potential for direct effects to roosting bats. TVA has determined that

removal of this habitat during the clearing window would avoid direct impacts to Indiana bat or northern long-eared bat, but could cause indirect adverse effects to these species.

Proposed Conservation Measures – Indiana bat

The USFWS Cookeville Ecological Services guidance document ***Conservation Strategy for Forest-dwelling Bats in Tennessee*** indicates that protection of "known and previously unprotected Indiana and/or northern long-eared bat habitat with a demonstrated significant to either or both species" is a mitigation measure "applicable to the CMOU process." In order to mitigate indirect impacts to Indiana bat resulting from removal of suitable summer roost habitat, TVA proposes to partner with the Tennessee Wildlife Resources Agency (TWRA) to promote recovery of the Indiana bat. TVA would enter into an agreement with TNC to include a contribution of $200,000 from TVA to protect, enhance, and monitor known unprotected Indiana bat maternity habitat in Wilson County Tennessee. See the attached Proposed Agreement and letter of support from the Assistant Director of TWRA, Bill Reeves.

Known maternity roosting locations for Indiana bat in Tennessee are rare, particularly outside of National Forest Lands in East Tennessee. Known maternity roosting areas in middle and west Tennessee are typically not on protected lands leaving them vulnerable to destruction. The proposed agreement would establish contracts with several landowners for up to 10 years to ensure much of the Wilson County maternity habitat would be protected for as long as possible. Installation of artificial roosts would enhance the habitat and ensure available roosting locations long after ephemeral natural roosts are gone. Additional funds to monitor these roosts and provide research opportunities would add greatly to our understanding of summer roosting Indiana bats, outside of National Forest Lands. Understanding the habits of summer roosting Indiana bats in middle and western Tennessee would greatly benefit conservation efforts across the state. The proposed agreement would be immensely beneficial to Indiana bats in Tennessee while also adhering to the Service's Conservation Strategy for Forest Dwelling Bats.

Northern long-eared bat

As per the 2016 Programmatic Biological Opinion on Final 4(d) Rule for the Northern Long-Eared Bat (NLEB) and Activities Excepted from Take Provisions (2016 BO), this clearing schedule avoids removal of trees during the NLEB pup season (June 1 to July 31). No known NLEB maternity roosting sites are present within 150 feet of the project area. No known NLEB hibernacula are present within 0.25 miles of the project area. All tree removal would occur outside of the time (June 1 - July 31) when northern long-eared bat pups would be present in maternity roosts.

TVA has determined that while removal of suitable roosting habitat would have indirect adverse effects on northern long-eared bat and result in 'take' as defined in the Endangered Species Act (ESA), this 'take' is excepted from ESA Section 9 Take Prohibitions. Determinations regarding potential effects on NLEB were made per the Key to Northern Long-Eared Bat 4(d) Rule for

Ms. Mary Jennings
Page Six
December 22, 2016

Federal Actions that May Affect Northern Long-Eared Bats (USFWS - January 2016) and the Programmatic Biological Opinion on Final 4(d) Rule for the Northern Long-Eared Bat and Activities Excepted from Take Prohibitions (2016 BO).

TVA requests concurrence from your office with our determination that this project is not likely to adversely affect the Cumberland elktoe, and that indirect impacts to Indiana bat would be properly mitigated with the above proposed agreement. TVA also requests confirmation from your office that any incidental take of NLEB (as measured by removal of suitable roosting habitat) resulting from this action is covered by the 2016 BO. It is our understanding that TVA's actions are in compliance with the Conservation Strategy and that TVA's obligations regarding ESA compliance would be fulfilled following contributions to the proposed conservation efforts discussed above.

Should you have any questions or wish to discuss the project in more detail, please contact Liz Hamrick at 865-632-4011.

Sincerely,

John T. (Bo) Baxter
Endangered Species Compliance Manager
Biological Permitting and Compliance

EBH:ABM
Enclosures

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

October 18, 2016

Ms. Najah Duval-Gabriel
Advisory Council on Historic Preservation
401 F Street NW, Suite 308
Washington, DC 20001-2637

Dear Ms. Duvall-Gabriel:

TENNESSEE VALLEY AUTHORITY (TVA), BROWN SWISS SOLAR PROJECT, GREENE COUNTY, TENNESSEE, NOTIFICATION OF MOA BETWEEN TVA AND THE TENNESSEE STATE HISTORIC PRESERVATION OFFICER

In May of this year we notified you of TVA's finding, reached in consultation with the Tennessee State Historic Preservation Office (TNSHPO), that the "Rugby-Sunbright 69-kV Transmission Line and Substation Project" in Morgan County, Tennessee would result in an adverse effect to an historic resource known as "Sixteen Tunnel," which was discovered during our Phase I Cultural Resources Survey of the undertaking's area of potential effects (APE). TVA and TNSHPO have agreed that Sixteen Tunnel is eligible for inclusion in the National Register of Historic Places (NRHP) under Criterion A for its historical association with the Cincinnati Southern Railway and under Criterion C for its engineering significance as an extant example of a late nineteenth-century railroad tunnel. According to TVA's current project plans, a proposed new transmission line would be built across the tunnel's southern entrance, resulting in an indirect adverse effect due to its effect on the tunnel's integrity of feeling and setting.

In late July of this year, TVA and TNSHPO executed a Memorandum of Agreement (MOA) for the resolution of adverse effects to Sixteen Tunnel from the aforementioned undertaking. TVA invited Mr. Don Edwards, Mayor, Morgan County, to participate in the MOA, but received no reply. Your letter of June 21, 2016 to our office indicated that your participation in the consultation to resolve adverse effects is not needed.

Pursuant to 36 CFR §800.6(b)(1)(iv) TVA is providing you with a copy of the executed MOA.

Ms. Najah Duvall-Gabriel
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If you have any questions or comments, please contact Richard Yarnell at (865) 632-3463 or wryarnell@tva.gov.

Sincerely

Clinton E. Jones
Manager, Biological and Cultural Compliance
Safety, River Management and Environment

SCC:ABM
Enclosures
cc (No Enclosures)
Mr. E. Patrick McIntyre, Jr.
Executive Director
Tennessee Historical Commission
2941 Lebanon Road
Nashville, Tennessee 37243-0442

MEMORANDUM OF AGREEMENT

BETWEEN THE TENNESSEE VALLEY AUTHORITY

AND THE

TENNESSEE STATE HISTORIC PRESERVATION OFFICER

REGARDING THE RUGBY-SUNBRIGHT 69-KV TRANSMISSION LINE AND

SUBSTATION PROJECT,

MORGAN COUNTY, TENNESSEE

1. **WHEREAS**, the Tennessee Valley Authority (TVA) proposes to construct a new 161-kilovolt (kV) substation in Rugby, Tennessee and to build a new, ca. 7.25-mile long, 69-kV transmission line (TL) from the new substation to TVA's existing Sunbright, TN Substation ("the Undertaking"); and

2. **WHEREAS**, pursuant to 36 CFR § 800.3(c), TVA has initiated consultation with the Tennessee State Historic Preservation Officer (TN SHPO) regarding the Undertaking's potential to affect historic properties; and

3. **WHEREAS**, TVA has determined, in consultation with TN SHPO, that the area of potential effects (APE) for this Undertaking, for archaeological resources, consists of the area within which the substation and an associated 1,370 foot long/20-foot wide access road would be built (totaling ca. 10.4 acres), a ca. 0.2 mile loop line on 100 foot right-of-way (ROW) connecting to the existing STR 33 New River-STR 230A New Jamestown Sw Sta 161-kV TL, and ca. 7.25 miles of proposed 100-ft ROW for the new TL; and

4. **WHEREAS**, TVA has determined, in consultation with TN SHPO, that the APE for above-ground (historic architectural) resources consists of areas within a 0.5-mile radius of the TL centerline, substation, and loop line from which unobstructed views to the new constructed features would be possible; and

5. **WHEREAS**, pursuant to 36 CFR § 800.4(a), TVA carried out a cultural resources survey in the APE (Karpynec et al. 2016; Appendix A) and identified two archaeological sites (40MO165 and 40MO166), which TVA has determined to be of undetermined eligibility for inclusion in the National Register of Historic Places (NRHP), a determination with which TN SHPO did not disagree; and

6. **WHEREAS**, TVA has proposed avoidance measures for archaeological sites 40MO165 and 40MO166, and TN SHPO has agreed that no archaeological sites included in, or eligible for inclusion in, the NRHP would be affected by the undertaking; and

7. **WHEREAS**, TVA's survey also identified 11 above-ground resources, and TVA and TN SHPO have agreed, in consultation, that ten of these (IS-1 through IS-10) are ineligible for inclusion in the NRHP; and

8. **WHEREAS**, TVA and TN SHPO have agreed that one of the identified above-ground resources in the APE, known as Sixteen Tunnel (Appendix B), is eligible for the NRHP under Criterion A for its historical association with the Cincinnati Southern Railway and under Criterion C for its engineering significance as an extant example of a late nineteenth-century railroad tunnel; and

9. **WHEREAS**, TVA and TN SHPO have agreed in consultation that the Undertaking, as currently proposed, would result in no physical effects to Sixteen Tunnel but would result in an adverse visual effect due to the installation of TL structures (poles) and conductor (cable) within view of this property; and

10. **WHEREAS**, TVA is unable to identify any avoidance or minimization measures that are feasible and prudent, due to the presence of other protected resources and private land ownership, which restrict TVA's options for relocating the proposed TL; and

11. **WHEREAS**, pursuant to 36 CFR § 800.6(a)(1), TVA has notified the Advisory Council on Historic Preservation ("Council") of the adverse effect finding by providing documentation specified in 36 CFR § 800.11(e), and the Council has elected not to participate in the resolution of adverse effects for this undertaking; and

12. **WHEREAS**, pursuant to 36 CFR § 800.3(f)(2), TVA has consulted on a government-to-government basis with the Cherokee Nation, Absentee Shawnee Tribe of Oklahoma, the Muscogee (Creek) Nation, Kialegee Tribal Town, Eastern Band of Cherokee Indians, Eastern Shawnee Tribe of Oklahoma, Shawnee Tribe, Coushatta Tribe of Louisiana, United Keetoowah Band of Cherokee Indians in Oklahoma, and Thlopthlocco Tribal Town, and none of the consulted tribes identified historic properties that would be affected by the Undertaking, or objected to the Undertaking; and

13. **WHEREAS**, TVA has consulted, pursuant to 36 CFR § 800.2(c)(3), with Don Edwards (Mayor of Morgan County, Tennessee) regarding the Undertaking, TVA's cultural resources survey, and TVA's finding of adverse effect, and has invited him to participate as a concurring party, and TVA received no response;

NOW, THEREFORE, TVA and TN SHPO agree that the Undertaking shall be implemented in accordance with the following stipulations to satisfy TVA's responsibility under Section 106 of the National Historic Preservation Act to mitigate adverse effects on historic properties that result from the Undertaking.

STIPULATIONS

TVA shall ensure that the following stipulations are implemented:

I. SECTION 106 REVIEW COORDINATION AND QUALIFICATIONS

A TVA archaeologist shall be TVA's point of contact with TN SHPO for all matters pertaining to the implementation of this MCA. TVA archaeologists exceed the Secretary of the Interior's ("the Secretary's") Historic Preservation Professional Qualification Standards for Archaeology. TVA will ensure that all consultants performing cultural resources work in relation to the Undertaking meet or exceed the Secretary's Professional Qualification Standards for the appropriate discipline (archaeology, history, historic architecture, or architectural history).

II. MITIGATION OF ADVERSE EFFECTS ON SIXTEEN TUNNEL

Preparation of NRHP Registration form:

A. TVA shall complete a U.S. National Park Service (NPS) National Register of Historic Places (NRHP) Registration Form (NPS 10-900) for Sixteen Tunnel and shall submit it to TN SHPO for review.

B. In preparing the NRHP Registration form, TVA shall follow the guidelines described in the NPS's *National Register Bulletin: How to Complete the National Register Registration Form* and shall consult with the Tennessee Historical Commission's National Register Review Coordinator on state processes for review and comment.

C. TVA shall consider any comments and recommendations that TN SHPO provides within thirty (30) days of receiving the draft NRHP Registration form from TVA concerning the adequacy of the NRHP Registration form, prior to submitting a final draft to TN SHPO.

D. Upon TVA and TN SHPO reaching agreement that the NRHP Registration Form is acceptable in its final form, TVA will send the form to NPS and request that Sixteen Tunnel be included in the NRHP.

III. SCHEDULE

A. Compiling the documentation
TVA shall ensure that all required field documentation (e.g., photography, drawings) of Sixteen Tunnel is completed prior to TVA's initiation of vegetation clearing for the Undertaking.

B. Submission of draft NRHP Registration form to TN SHPO
TVA shall submit a draft of the NRHP Registration form for Sixteen Tunnel to TN SHPO within one hundred eighty (180) days of the completion of field documentation for the NRHP Registration form. TN SHPO shall send any comments on the form to TVA within thirty (30) days of receipt of the form. If TVA makes revisions to the draft form after receiving TN SHPO comments, TVA shall submit the revised NRHP Registration form to TN SHPO within ninety (90) days of receiving the comments. TN SHPO shall have 30 days to provide comments on the revised form.

C. Submission of NRHP Registration form to NPS
TVA shall submit a final NRHP Registration form for Sixteen Tunnel to the TN SHPO and NPS once TVA and TN SHPO agree on the final form. If no revisions are made to the form following TN SHPO's review, TVA shall send the form to NPS within sixty (60) days of receiving comments from TN SHPO, or within ninety (90) days of sending the form to TN SHPO for initial review, whichever comes first.

D. This schedule is based on calendar days.

IV. AUTHORITY

The TVA Federal Preservation Officer, or the designee thereof, shall act for TVA in all matters concerning the administration of this agreement.

V. DURATION

This MOA will be in effect for three (3) years from the date of its execution unless all Signatories mutually agree to extend the duration of the MOA, or unless TVA terminates the Undertaking before the end of said term.

VI. REPORTING OF UNANTICIPATED EFFECTS

If unanticipated effects on historic properties occur during the Undertaking, TVA shall implement the Plan for Reporting Unanticipated effects included as Attachment C of this MOA.

VII. DISPUTE RESOLUTION

Should TN SHPO object at any time to any actions proposed herein or to the manner in which the terms of this MOA are implemented, TVA shall consult with TN SHPO to resolve the objection. If TVA determines that the objection cannot be resolved, TVA, or TN SHPO, may seek guidance from the Council pursuant to 36 CFR § 800.2(b)(2). TVA will take into account any Council comment provided in response to such a request, in resolving any such dispute. The Signatories are responsible for carrying out all actions under this MOA that are not the subject of the dispute.

VIII. AMENDMENTS

The Signatories to this agreement may agree to amend the terms of this agreement. Any such amendment shall become effective upon its signing by the Signatories, and the final amendment shall thereafter be appended to this agreement.

IX. TERMINATION

If either Signatory to this MOA determines that the terms cannot be or are not being carried out, that party shall immediately consult with the other party to attempt to develop an amendment in accordance with Stipulation VIII of this agreement. If the agreement is not amended within thirty (30) days of the initiation of such consultation (or another time period agreed to by the Signatories), either Signatory may terminate the MOA upon written notification to the other Signatory.

Once the MOA is terminated, and prior to work continuing on the Undertaking, TVA must either (a) execute a new MOA, or (b) request, take into account, and respond to the comments provided by the Council under 36 CFR § 800.7. TVA shall notify TN SHPO as to the course of action TVA will pursue.

If Stipulations II.A through II.D have not been implemented within 3 years from the date of execution, this MOA will be terminated unless TVA and TN SHPO mutually agree to extend the duration of the MOA.

If the MOA is terminated prior to TVA's completion of the Undertaking and prior to TVA's completion of Stipulations II.A through II.D, TVA shall continue to follow the procedures outlined by Subpart B of 36 CFR Part 800 for the resolution of adverse effects to historic properties resulting from the Undertaking.

EXECUTION of this Memorandum of Agreement (MOA) by TVA and the TN SHPO, the submission of documentation and filing of this MOA with the Council, and implementation of its terms evidence that TVA has, in accordance with Section 106 of the National Historic Preservation Act, taken into account the effects of this Undertaking on Historic Properties and afforded the Council an opportunity to comment. TVA will submit a copy of the executed MOA along with the documentation that is specified in 36 CFR § 800.11(f), to the Council.

SIGNATORY

TENNESSEE VALLEY AUTHORITY

By: Wilbourne C. Markham Jr. Date: 7/22/16

Wilbourne C. Markham, TVA Federal Preservation Officer

SIGNATORY

THE TENNESSEE STATE HISTORIC PRESERVATION OFFICER

By: E. Patrick McIntyre Date: 8/31/16

E. Patrick McIntyre, Jr., Tennessee State Historic Preservation Officer

Appendix A

Reference Cited

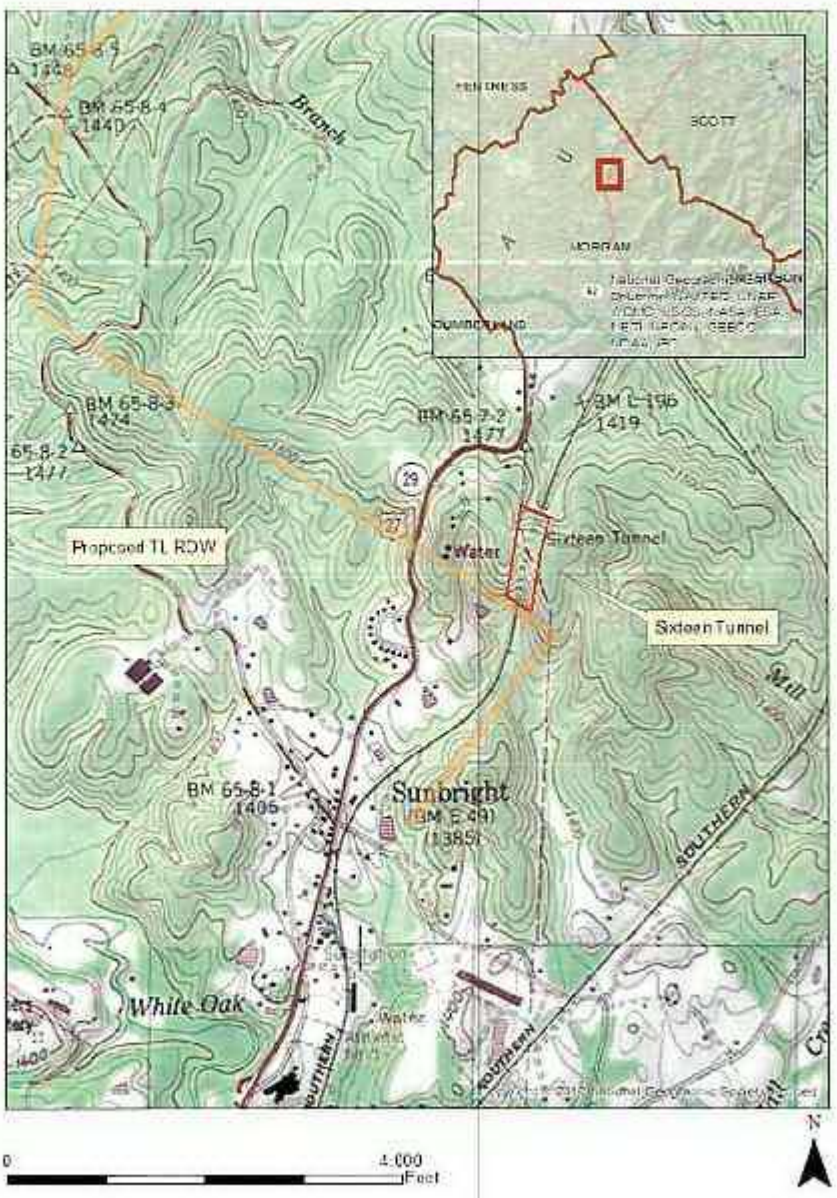
8 - Memorandum of Agreement Between the Tennessee Valley Authority and the Tennessee State Historic Preservation Officer Regarding the Rugby-Sunbright 69-kV Transmission Line and Substation Project, Morgan County, Tennessee

REFERENCE CITED

Karpynec, Ted, Heidi Rosenwinkel, Meghan Weaver, Elin Crook, and Monica Warner
2016 *A Phase I Cultural Resources Survey of the Rugby-Sunbright Transmission Line Project in Morgan County, Tennessee.* Prepared for the Tennessee Valley Authority, Knoxville, TN. Prepared by Tennessee Valley Archaeological Research, Huntsville, Alabama.

Appendix B

Location of Sixteen Tunnel, Morgan County, Tennessee


BM 65-8-5
1446
BM 65-8-4
1440
Branch
BM 65-8-3
1424
65-8-2
1477
BM 65-7-2
1477
BM L-196
1419
Proposed TL ROW
Water
Sixteen Tunnel
Sixteen Tunnel
Mill
BM 65-8-1
1405
Sunbright
(BM E 49)
(1385)
SOUTHERN
White Oak
Water
SOUTHERN
SCOTT
MORGAN
0
4,000
Feet
N

Appendix C

Plan for Reporting Unanticipated Effects

An Unanticipated Effect is any physical damage to any part of an historic property (including as-yet unrecorded archaeological sites that are eligible for inclusion in the National Register of Historic Places, Sixteen Tunnel, and any as-yet unrecorded historic architectural properties that may be identified after the initiation of the Undertaking) that was not foreseen and not expected, that occurs during any activity that is part of the Rugby-Sunbright 69-Kv Transmission Line and Rugby 161-Kv Substation Retirement and Removal Project (the "Project").

TVA will ensure that on-site personnel responsible for supervising and overseeing the Project are aware of their responsibility to report any Unanticipated Effect, and to do so in a timely manner.

In the event of an Unanticipated Effect, the on-site supervisor or the Principal Engineer overseeing the Project will contact TVA Cultural Compliance immediately. Contact information is provided below.

TVA Cultural Compliance will evaluate whether the Unanticipated Effect constitutes an adverse effect to the historic property. Cultural Compliance staff will utilize whatever methods and means necessary to make this evaluation, and will make the evaluation as expeditiously as possible.

If Cultural Compliance determines that the Unanticipated Effect constitutes an adverse effect to an historic property (pursuant to 36 CFR § 800.5(a)(1)), then TVA will follow the procedures under 36 CFR § 800.13(b)(3) (for resolution of adverse effects that occur after the agency official has completed the Section 106 process without establishing a process to plan for subsequent discoveries):

1. TVA shall notify TN SHPO and the Advisory Council within 48 hours of discovering the Unanticipated Effect. The notification will summarize TVA's earlier determination on the eligibility of the affected property for inclusion for the National Register of Historic Places (NRHP) and will include one or more proposed actions to resolve the adverse effect.

2. TVA will allow 48 hours for TN SHPO and the Advisory Council to respond.

3. TVA shall take into consideration the recommendations of TN SHPO and the Advisory Council regarding the proposed actions and the NRHP eligibility of the property, and shall then carry out appropriate actions.

Contact information:

TVA Business Unit	Name, title	Phone number	Email
Cultural Compliance	Richard Yarnell, Archaeologist	(865) 632-3463	wryarnel @tva.gov
Natural Resources Compliance	Bo Baxter, Manager	(865) 632-3360	jtbaxter@tva.gov
Biological & Cultural Compliance	Clint Jones, Manager	(865) 632-3404	cjones5@tva.gov

INTERNAL COPIES:

A. Michelle Cagley, KFP 1T-KST
Amy B. Henry, WT 11C-K
Susan R. Jacks, WT 11C-K
Khurshid K. Mehta, WT 6A-K
Charles P. Nicholson, WT 11D-K
M. Susan Smelley, LP 3K-C
Emily P. Willard, MR 4G-C
W. Richard Yarnell, WT11D-K
ECM, WT CA-K

Preserving America's Heritage

June 21, 2016

Clinton Jones
Deputy FPO/Manager
Biological & Cultural Compliance
Tennessee Valley Authority
400 West Summit Hill Drive
Knoxville, TN 37902

Ref: *Proposed Rugby-Sunbright 69-KV Transmission Line and Substation Project*
Morgan County, Tennessee

Dear Mr. Jones:

The Advisory Council on Historic Preservation (ACHP) has received your notification and supporting documentation regarding the adverse effects of the referenced undertaking on a property or properties listed or eligible for listing in the National Register of Historic Places. Based upon the information provided, we have concluded that Appendix A, *Criteria for Council Involvement in Reviewing Individual Section 106 Cases*, of our regulations, "Protection of Historic Properties" (36 CFR Part 800), does not apply to this undertaking. Accordingly, we do not believe that our participation in the consultation to resolve adverse effects is needed. However, if we receive a request for participation from the State Historic Preservation Officer (SHPO), Tribal Historic Preservation Officer (THPO), affected Indian tribe, a consulting party, or other party, we may reconsider this decision. Additionally, should circumstances change, and it is determined that our participation is needed to conclude the consultation process, please notify us.

Pursuant to 36 CFR §800.6(b)(1)(iv), you will need to file the final Memorandum of Agreement (MOA), developed in consultation with the Tennessee State Historic Preservation Office (SHPO), and any other consulting parties, and related documentation with the ACHP at the conclusion of the consultation process. The filing of the MOA, and supporting documentation with the ACHP is required in order to complete the requirements of Section 106 of the National Historic Preservation Act.

Thank you for providing us with the notification of adverse effect. If you have any questions or require further assistance, please contact Ms. Najah Gabriel at 202-517-0210 or via e-mail at ngabriel@achp.gov.

Sincerely,

Artisha Thompson
Historic Preservation Technician
Office of Federal Agency Programs

ADVISORY COUNCIL ON HISTORIC PRESERVATION
401 [illegible] NW, Suite 308 • Washington, DC 20001-2637
Phone 202-517-0200 • Fax 202-517-6381 • achp@achp.gov • www.achp.gov

Dudley, Cynthia S

From:	Shuler, Marianne M
Sent:	Wednesday, March 23, 2016 5:11 PM
To:	'sheila-bird@cherokee.org'; 'Eric Oosahwee-voss'; 'Tyler B. Howe (tylehowe@nc-cherokee.com)'; 'Llangley@coushatta.org'; 'Section106'; 'dc13.dc4@gmail.com'; 'thpo@tttown.org'; 'Ken Blanchard (kblanchard@astribe.com)'; 'Robin Dushane (RDushane@estoo.net)'; 'Kim Jumper (kim.jumper@shawnee-tribe.com)'
Cc:	Ezzell, Patricia Bernard; Russell Townsend (RussellT@nc-cherokee.com); 'Leonard Longhorn (llonghorn@astribe.com)'; 'Dee Gardner (dgardner@estoo.net)'
Subject:	TVA-Rugby-Sunbright 69-kV TL Substation, Morgan County, TN 3-23-16
Attachments:	TVA-Rugby -Sunbright 69-kV TL Substation Morgan County TN 20160323.pdf

Good Afternoon!
By this email, I am sending you the attached letter regarding TVA's proposal to construct a new 161-kilovolt (kV) substation in Rugby, Tennessee and to build a new, circa 7.6-mile long, 69-kV transmission line from the new substation to TVA's existing Sunbright, TN substation.

The referenced report can be found online at the following link: \\TVARSERVER2\TVARdata\08_Client_FTP\TVA\Rugby-Sunbright\Draft_Rpt-TVA_Review

If you have any questions please let me know. Please respond by April 22, 2016, if you have any comments on the proposed undertaking.

Thanks
Marianne

Marianne Shuler
Archaeologist
TVA Biological & Cultural Compliance
865-632-2464
mmshuler@tva.gov

1

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

March 23, 2016

To Those Listed:

TENNESSEE VALLEY AUTHORITY (TVA), RUGBY-SUNBRIGHT 69-KV TRANSMISSION LINE AND RUGBY 161-KV SUBSTATION, MORGAN COUNTY, TENNESSEE (36° 19' 50"' N/ 84° 42' 30" 'W)

TVA proposes to construct a new 161-kilovolt (kV) substation in Rugby, Tennessee and to build a new, circa 7.6-mile long, 69-kV transmission line from the new substation to TVA's existing Sunbright, TN substation. The new transmission line would be built on new 100-foot right-of-way (ROW) using steel poles. TVA has determined that this proposed project is an undertaking (as defined at 36 CFR § 800.16(y)) that has the potential to cause effects on historic properties. We are initiating consultation under Section 106 of the National Historic Preservation Act for this undertaking.

TVA has identified the area of potential effects (APE) for archaeological resources as the area within which the substation would be built (totaling circa 22.3 acres), a circa 1,370 foot long/20-foot wide access road associated with the substation, a circa 9.9-acre area that may be needed for a loop line (connecting to the existing STR 33 New River-STR 230A New Jamestown SW Station 161-kV line), and the circa 7.6 miles of proposed 100-ft ROW for the new transmission line. The APE for above-ground (historic architectural) resources is defined as areas within a 0.5-mile radius of the TL centerline, substation, and loop line within which unobstructed views to the new constructed features would be possible.

TVA contracted with Tennessee Valley Archaeological Research (TVAR) to perform a Phase I cultural resources survey of APE. Please find enclosed a copy of the draft report, titled *A Phase I Cultural Resources Survey of the Rugby-Sunbright Transmission Line Project in Morgan County, Tennessee* online at the following link:

\\TVARSERVER2\TVARdata\08_Client_FTP\TVA\Rugby-Sunbright\Draft_Rpt-TVA_Review

TVAR's background study, conducted prior to the field study, indicated that no previously recorded archaeological sites, and no properties listed in the National Register of Historic Places (NRHP), are located within the APE. The archaeological survey identified two possibly historic or prehistoric stone piles, consisting of stacked limestone slabs, which have been given archaeological site numbers 40MO165 and 40MO166. TVAR recommends that both stone piles are of undetermined eligibility for inclusion in the NRHP, and that both should be avoided by the undertaking if possible.

The historic architectural survey identified 11 previously undocumented, above-ground resources, numbered IS-1 through IS-11. TVAR recommends IS-1 through IS-10 as ineligible

for the NRHP. TVAR recommends IS-11, Sixteen Tunnel, as eligible for the NRHP under Criterion A for its historical association with the Cincinnati Southern Railway, and under Criterion C for its engineering significance as an extant example of a late nineteenth-century railroad tunnel. In TVAR's opinion, the undertaking (as currently planned) would result in an adverse effect on this resource.

TVA has reviewed the enclosed report and agrees with the authors' findings and recommendations. According to TVA's current project plans, proposed centerline for the new 69-kV transmission line would cross the railroad cut through approximately 50 feet in front (south) of the southern entrance of Sixteen Tunnel, which would place the tunnel entrance just inside the TL ROW. A small number of trees within the ROW on either side of the tunnel entrance may need to be removed, in order to provide required clearance for the conductor (power cables). TVA would cut these trees by hand, in order to avoid ground disturbance. Most of the existing vegetation would be left in place, so that the root balls would continue to stabilize the slopes of the railroad cut and prevent erosion. No trucks or equipment would enter the railroad cut-through or pass over the tunnel during construction or future maintenance of the proposed TL. Thus, the undertaking would not result in any physical effects on Sixteen Tunnel or the railroad cut-through.

TVA finds that the undertaking would result in an adverse visual effect on Sixteen Tunnel. Avoiding this effect by relocating the TL ROW further north could result in physical effects due to the clearing of vegetation and use of equipment on top of the tunnel, and therefore TVA is not considering that option. Avoiding the visual effect by moving the TL ROW further south is not feasible, as such an alignment would affect a protected streamside management zone and a private property, to which the landowner is likely to object. Thus, TVA proposes to mitigate the adverse effect. We propose that the mitigation should include submittal of a National Register of Historic Places (NRHP) registration form for this property to the National Park Service and requesting that it be included in the NRHP. TVA is also open to considering other possible mitigation measures that would be economically prudent and technically feasible. We plan to consult further with your office regarding the resolution of the adverse effect, prior to initiating the undertaking. TVA proposes to develop a Memorandum of Agreement (MOA) for the resolution of adverse effects to this resource.

TVA proposes to avoid possible effects to 40MO165 and 40MO166 by placing restrictions on the proposed work and on future maintenance work. A sensitive area has been created for each of these sites, consisting of a 10-meter buffer, which will be marked on all plans used in construction and future transmission line maintenance. TVA would require that any vegetation clearing within these buffers would be carried out using hand tools, and that the cut material would be moved outside the buffer by hand; that no vehicle use be permitted within the sensitive area buffers; and that no transmission line structures or related infrastructure (such as guy wires) be placed within the buffers. With these restrictions in place, the undertaking would have no effect on either site.

TVA has notified the Advisory Council on Historic Preservation of the undertaking's adverse

effects on NRHP-eligible Sixteen Tunnel and of our plans to propose a MOA for the resolution of this effect.

Pursuant to 36 C.F.R. Part 800.3(f)(2), TVA is consulting with the following federally recognized Indian tribes regarding historic properties within the proposed project's APE that may be of religious and cultural significance and are eligible for the NRHP: Cherokee Nation, Eastern Band of Cherokee Indians, United Keetoowah Band of Cherokee Indians, Coushatta Tribe of Louisiana, Muscogee (Creek) Nation of Oklahoma, Kialegee Tribal Town, Thlopthlocco Tribal Town, Absentee Shawnee Tribe of Oklahoma, Eastern Shawnee Tribe of Oklahoma, and the Shawnee Tribe.

By this letter, TVA is providing notification of these findings and is seeking your comments regarding this undertaking and any properties that may be of religious and cultural significance and may be eligible for listing in the NRHP, pursuant to 36 CFR § 800.2(c)(2)(ii), 800.3(f)(2), and 800.4(a)(4)(b).

Please let me know if you would like to participate in this MOA, and please respond with your comments by April 22, 2016. If you have any questions, please contact me at (865)632-6461 or by email at pbezzell@tva.gov.

Sincerely,

Pat Bernard Ezzell

Patricia Bernard Ezzell
Senior Program Manager
Native American Tribal Relations and Corporate Historian
Public Relations and Corporate Information
Communications
WT460 7D-K

MMS:CSD
Enclosure

A Phase I Cultural Resources Survey of the Rugby-Sunbright Transmission Line Project in Morgan County, Tennessee

Tennessee Valley Archaeological Research

IDENTICAL LETTER MAILED TO THE FOLLOWING ON MARCH 23, 2016:

Ms. Sheila Bird
Cherokee Nation
Post Office Box 948
Tahlequah, Oklahoma 74465

Mr. Ken Blanchard
Tribal Historic Preservation Officer
Absentee Shawnee Tribe of Oklahoma
2025 S. Gordon Cooper
Shawnee, Oklahoma 74801

cc: Mr. Leonard Longhorn
Absentee Shawnee Tribe of Oklahoma
2025 S. Gordon Cooper
Shawnee, Oklahoma 74801

Ms. RaeLynn Butler
Tribal Historic Preservation Officer
Muscogee (Creek) Nation
P.O. Box 580
Okmulgee, Oklahoma 74447

Mr. David Cook
Tribal Administrator
Kialegee Tribal Town
Post Office Box 332
Wetumka, Oklahoma 74883

Ms. Robin DuShane
Tribal Historic Preservation Officer
Eastern Shawnee Tribe of Oklahoma
127 West Oneida
Seneca, Missouri 64865

cc: Ms. Dee Gardner
NAGPRA/Cell Tower Coordinator
Eastern Shawnee Tribe of Oklahoma
127 West Oneida
Seneca, Missouri 64865

Mr. Tyler Howe
Tribal Historic Preservation Specialist
Historic Preservation Specialist
Eastern Band of Cherokee Indians
Post Office Box 455
Cherokee, North Carolina 28719

cc: Mr. Russell Townsend
Tribal Historic Preservation Officer

Eastern Band of Cherokee Indians
Post Office Box 455
Cherokee, North Carolina 28719

Ms. Kim Jumper
Tribal Historic Preservation Officer
Shawnee Tribe
Post Office Box 189
Miami, Oklahoma 74355

Dr. Linda Langley
Tribal Historic Preservation Officer
Coushatta Tribe of Louisiana
P.O. Box 10
Elton, Louisiana 70532

Eric Oosahwee-Voss
Tribal Historic Preservation Officer
United Keetoowah Band of Cherokee Indians in Oklahoma
Post Office Box 1245
Tahlequah, Oklahoma 74465

cc: Karen Pritchett
United Keetoowah Band of Cherokee Indians in Oklahoma
Post Office Box 1245
Tahlequah, Oklahoma 74465

Mr. Emman Spain
Tribal Historic Preservation Officer
P.O. Box 188
Okemah, Oklahoma 74859

INTERNAL COPIES:

Amy Henry, WT11D-K
Susan Jacks, WT11C-K
Skip Markham, MR 4G-C
Joe Melton, MR 4G-C
Paul Pearman, MR 4G-C
Emily Willard, MR 4G-C
Richard Yarnell, WT11D-K
EDMS, WT CA-K

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

August 17, 2016

To Those Listed:

TENNESSEE VALLEY AUTHORITY (TVA), ACCESS ROADS ASSOCIATED WITH THE PLANNED RUGBY-SUNBRIGHT 69-KV TRANSMISSION LINE, MORGAN COUNTY, TENNESSEE (36° 19' 50" N/ 84° 42' 30" W)

Earlier this year, we initiated consultation with your office under Section 106 of the National Historic Preservation Act for TVA's proposed construction of the Rugby-Sunbright 69-kilovolt (kV) transmission line and associated substation in Morgan County, Tennessee. TVA has now completed project designs and knows the location of the proposed access roads to be used for ingress and egress during construction. Recently, TVA identified 18 access roads, of which six are located entirely within the proposed TL ROW. The remaining 12 access roads are off-ROW and would affect land not included in the previous survey. Therefore, TVA proposes to enlarge the undertaking's APE to include these 12 off-ROW access roads, totaling approximately eight miles. Each access road would have a width of approximately 20 feet.

TVA contracted with Tennessee Valley Archaeological Research (TVAR) to perform a Phase I cultural resources survey of this new section of the APE. Please find enclosed a copy of the draft report, titled *A Phase I Archaeological Survey of Access Roads for the Tennessee Valley Authority's Rugby-Sunbright Transmission Line Project in Morgan County, Tennessee*.

TVAR's background study, conducted prior to the field study, indicated that no previously recorded archaeological sites, and no properties listed in the NRHP, are located within this new section of the APE. The archaeological survey identified no archaeological sites. TVAR recommends that no additional archaeological investigations are necessary in connection with the proposed project.

TVA has read the enclosed report and agrees with the authors' findings and recommendations. Based on this study, TVA finds that the off-ROW access roads for the Rugby-Sunbright 69-kV transmission line project contain no archaeological sites.

Pursuant to 36 C.F.R. Part 800.3(f)(2), TVA is consulting with the following federally recognized Indian tribes regarding historic properties within the proposed project's APE that may be of religious and cultural significance and are eligible for the NRHP: Cherokee Nation, Eastern Band of Cherokee Indians, United Keetoowah Band of Cherokee Indians in Oklahoma, Coushatta Tribe of Louisiana, Kialegee Tribal Town, Muscogee (Creek) Nation of Oklahoma, Thlopthlocco Tribal Town, Absentee Shawnee Tribe of Oklahoma, Eastern Shawnee Tribe of Oklahoma, and the Shawnee Tribe.

To Those Listed
Page Two
August 17, 2016

By this letter, TVA is providing notification of these findings and is seeking your comments regarding any properties that may be of religious and cultural significance and may be eligible for listing in the NRHP pursuant to 36CFR § 800.2 (c)(2)(ii), 800.3 (f)(2), and 800.4 (a)(4)(b).

Please respond by September 16th, 2016, if you have any comments on the proposed undertaking. If you have any questions, please contact me at (865)632-6461 or by email at pbezzell@tva.gov.

Sincerely,

Pat Bernard Ezzell

Patricia Bernard Ezzell
Senior Program Manager
Tribal Relations and Corporate Historian
Communications
WT 7D-K

MMS:CSD
Enclosure

IDENTICAL LETTER MAILED TO THE FOLLOWING ON AUGUST 17, 2016:

Ms. Sheila Bird
Cherokee Nation
Post Office Box 948
Tahlequah, Oklahoma 74465

Mr. Ken Blanchard
Tribal Historic Preservation Officer
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2025 S. Gordon Cooper
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cc: Mr. Leonard Longhorn
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2025 S. Gordon Cooper
Shawnee, Oklahoma 74801

Ms. RaeLynn Butler
Manager
Historic & Cultural Preservation Department
Muscogee (Creek) Nation
P.O. Box 580
Okmulgee, Oklahoma 74447

cc: Ms. Corain Lowe-Zepeda
Tribal Historic Preservation Officer
Historic & Cultural Preservation Department
Muscogee (Creek) Nation
P.O. Box 580
Okmulgee, Oklahoma 74447

Mr. David Cook
Tribal Administrator
Kialegee Tribal Town
Post Office Box 332
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NAGPRA/Cell Tower Coordinator
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Eastern Band of Cherokee Indians
Post Office Box 455
Cherokee, North Carolina 28719

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Shawnee Tribe
Post Office Box 189
Miami, Oklahoma 74355

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Coushatta Tribe of Louisiana
P.O. Box 10
Elton, Louisiana 70532

Eric Oosahwee-Voss
Tribal Historic Preservation Officer
United Keetoowah Band of Cherokee Indians in Oklahoma
Post Office Box 1245
Tahlequah, Oklahoma 74465

cc: Karen Pritchett
United Keetoowah Band of Cherokee Indians in Oklahoma
Post Office Box 1245
Tahlequah, Oklahoma 74465

Mr. Emman Spain
Thlopthlocco Tribal Town
Tribal Historic Preservation Officer
P.O. Box 188
Okemah, Oklahoma 74859

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Appendix B – Stream Crossings along the Proposed Transmission Line Right-of-Way

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Stream Crossings along the Proposed Rugby 161-kV Substation - Rugby-Sunbright 69-kV Transmission Line Route and Access Roads in Morgan County, Tennessee.

Stream ID	Stream Type	Streamside Management Zone Category	Stream Name	Field Notes
001	Perennial	Category A (50 ft)	Tributary to Cal Hurst Branch	Stream is in clear cut.
002	Perennial	Category A (50 ft)	Tributary to Cal Hurst Branch	Fish observed in stream. Logging has removed most of SMZ trees and a logging road fords the stream in one location.
003	Perennial	Category A (50 ft)	Tributary to Cal Hurst Branch	
004	Perennial	Category A (50 ft)	Hickory Spring Branch	Hickory Spring Branch. Main channel 8ft x 4ft deep with smaller overlow channel.
005	Perennial	Category A (50 ft)	Tributary to Hickory Spring Branch	Fish observed in channel.
006	Perennial	Category C (110 ft)	White Oak Creek	White Oak Creek; 45- to 55-feet-wide; boulder/cobble/sand substrate; fish/mussels present; Federal DCH for multiple species of mussels
007	Intermittent	Category A (50 ft)	Tributary to Rhodas Branch	Intermittent stream crossing ROW; 5-8' wide, 1/2-1' deep
008	Intermittent	Category A (50 ft)	Rhodas Branch	Intermittent stream crossing ROW; 4-6' wide, 1-2' deep; crayfish/fish present; cobble/gravel/sand substrate
009	Perennial	Category A (50 ft)	Massingale Branch	10-20' wide; fish present; braided channel; cobble/sand substrate
010	Perennial	Category A (50 ft)	Pigeon Branch	6-12' wide, 1-3' deep; significant beaver activity observed; fish/crayfish present
001AR	Perennial	Category A (50 ft)	Unnamed Tributary to Hickory Spring Branch	12ft width, 2 ft deep, bedrock cobble silt bottom, fish and frogs observed

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Appendix C – Detailed Wetland Descriptions

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Wetland Descriptions

W001 totals 0.22 acre within the substation footprint. Surface water was present and soils were saturated at the time of the site visit. W001 receives rain water runoff via a wet weather conveyance. This wetland has developed on an upper elevation flat within a forested area lot. The northeast portion of the wetland extends into a recently clearcut area, and is traversed by a logging road. This wetland empties overland or via groundwater into an unnamed tributary of Cal Hurst Creek. W001 was dominated by wetland vegetation including red maple in the overstory with jewelweed and Nepalese browntop grass dominating the understory and emergent areas.

W002a and W002b consist of a wide drainage flat associated with a perennial creek tributary to Cal Hurst Creek. W002a and W002b are separated by a culverted logging road. Together, this wetland area totals 0.42 acre of forested wetland on the substation parcel. W002a and W002b contained flowing water, with inundation present in wider portions of this linear wetland feature. Otherwise, soils were found to be saturated and exhibiting hydric coloration. W002a and W002b were dominated by wetland vegetation including red maple, jewelweed, Nepalese browntop, and New York fern.

W003 consists of 0.02 acre of forested wetland within a headwater drain crossed by the ROW. Hydric soil coloration was evident within a saturated soil profile. W003 receives hydrology via precipitation and run off from the immediate landscape, and drains via a natural valley to Cal Hurst Creek. W003 was dominated by red maple, beggar's seed tick, Nepalese browntop grass, water horehound, and New York fern.

W004 is a 0.04 acre emergent wetland located within a gas line ROW where TVA's transmission line is proposed to cross. This wetland has formed within an upper elevation depression, receiving hydrology via a wet weather conveyance. W004 contained standing water, a high water table, and saturated soils resulting in mottled soil coloration indicative of hydric conditions. This wetland extends outside TVA's ROW to roughly double in size, before draining via a more defined channel to Cal Hurst Creek. W004 was dominated by flat nut sedge, with fog fruit, marsh seedbox, and mist flower present.

W005 consists of 0.1 acre of forested wetland habitat within the ROW, likely extending to a quarter acre total outside the ROW. This wetland has developed in the headwaters of a natural valley tributary to White Oak Creek. Surface water, a high water table, and saturated soils have resulted in grey soil coloration indicative of wetland conditions. Dominant wetland vegetation consisted of red maple and Nepalese browntop grass.

W006 consists of 0.07 acre of scrub-shrub wetland habitat within the ROW, likely totaling a quarter acre outside the ROW. This wetland area included a small excavated and shallow pond. It appears as though the pond collects water from the surrounding landscape and spills over into a wide flat tributary to Rhodas Branch. While the ponded area is man-made, it functions as vernal pool habitat, providing habitat for aquatic species in need of ephemeral aquatic conditions. Surface water, a high water table, and saturated soils have resulted in mottled soil coloration indicative of wetland conditions. A gravel/shale bottom was found within the ponded area of this wetland. Dominant wetland vegetation consisted of red maple saplings, tag alder, and Nepalese browntop grass.

W007 consists of 0.08 acre of forested wetland habitat within the ROW, likely totaling a quarter acre including area outside the ROW. This wetland has developed in the headwaters of a natural valley tributary to White Oak Creek. Surface water, a high water table, and saturated

soils have resulted in grey soil coloration indicative of wetland conditions. This wetland contains braided channels as water is conveyed across the upper flats of this natural valley. Dominant wetland vegetation consisted of red maple and Nepalese browntop grass.

W008 comprises 0.14 acre of scrub-shrub wetland habitat within the ROW at the intersection with Rhodas Branch. This wetland flat is located within a wide the floodplain of the stream. It appears to receive hydrology via recharge/discharge dynamics, before draining directly into the associated stream channel. The flat contained ponded water in places, with saturated hydric soils. Drainage patterns and drift deposits were evident. Dominant vegetation consisted of hydrophytic species such as tag alder, red maple saplings, arctic reed grass, bushy bluestem, and fall panic grass.

W009a and W009b encompass a headwater wetland flat comprised of two lobes totaling 0.03 acre on the ROW, being connected immediately outside and west of the ROW for an estimated total wetland area of a half acre. The natural valley in which this wetland is located is tributary to Rhodas Branch. Surface water, drainage patterns, drift deposits and saturated hydric soils were present. Dominant vegetation consisted of hydrophytic species including tag alder, red maple saplings, leathery rush, fall panic grass, and trumpet creeper.

W010 is a scrub-shrub headwater wetland flat totaling 0.08 acre on the ROW, and extending off ROW to the west to roughly triple in size before emptying into a natural drain tributary to Massingale Branch. Surface water, drainage patterns, drift deposits and saturated hydric soils were present. Dominant vegetation consisted of hydrophytic species including tag alder, red maple saplings, leathery rush, giant goldenrod, and ironweed.

W011 is a scrub-shrub headwater wetland flat totaling 0.02 acre, located entirely on the ROW. W011 is connected via a small conveyance to a linear wetland drain outside the ROW and tributary to Massingale Branch. Surface water, drainage patterns, and saturated hydric soils were present. Dominant vegetation consisted of hydrophytic species including tag alder, red maple saplings, redtop panic grass, and fall panic grass.

W012 comprises of 0.04 acre of forested floodplain wetland habitat located on a peninsula between a backwater ox-bow channel and main stem of Massingale Branch. Drift deposits and drainage patterns within the peninsula were evident, indicating sufficient hydrology for wetland development. However, due to the landscape position of this wetland, soils were alluvial in nature resulting in problematic hydric soil identification. Dominant vegetation consisted of wetland species such river birch trees, red maple trees and saplings, and musclewood.

W013 consists of 0.06 acre of scrub-shrub wetland located in a backwater swale of the Massingale Branch floodplain. Drift deposits and drainage patterns were present overlying mottled soils, all indicative of hydric conditions. Dominant vegetation consisted of hydrophytic species including red maple saplings, tag alder, sensitive fern, and golden ragwort.

W014 totals 0.15 acre of forested headwater wetland habitat, located entirely on the ROW. This wetland feature has developed in a headwater flat feeding Pigeon Branch. A high water table, resulting in saturated soils, flowing and ponded water, and hydric soil coloration was present. Dominant vegetation consisted of hydrophytic species including red maple trees and saplings, musclewood, fall panic grass, golden ragwort, and New York fern.

W015 totals 0.13 acre of forested wetland habitat within a headwater flat crossing the ROW and tributary to Pigeon Creek. A high water table was present, resulting in saturated soils, flowing and ponded surface water, and hydric soil coloration. Dominant vegetation consisted of

hydrophytic species including red maple trees and saplings, musclewood, and trumpet creeper vine.

W016 totals 0.03 acre of forested wetland habitat within a headwater flat beginning in the ROW, extending west outside the ROW for an estimated quarter acre total. It is likely this wetland eventually drains into a more defined channel within a natural valley feeding an unnamed tributary of White Oak Creek. Ponded and flowing surface water were evident over saturated hydric soils. Dominant vegetation consisted of hydrophytic species including red maple trees and saplings, Cinnamon fern, golden ragwort, New York fern, and trumpet creeper vine.

W017 consists 0.05 acre of a forested floodplain wetland flat associated with an unnamed tributary of White Oak Creek. This wetland likely totals less than three acres outside the ROW, as it extends closer and along the main channel. Landscape position has resulted in a high water table, surface water, and saturated hydric soils. Dominant hydrophytic vegetation consisted of red maple and sycamore trees.

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Appendix D – Noise During Transmission Line Construction and Operation

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Noise During Transmission Line 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 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 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 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. The temporary nature of construction would reduce the duration of noise impacts on nearby residents.

Operational Noise

Transmission lines 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.

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

Bolt, Beranek, and Newman Inc. 1971. *Noise From Construction Equipment and Operation, Building Equipment, and Home Appliances.* U.S. Environmental Protection Agency Report NTID300.1.

Cowan, J. P. 1993. *Handbook of Environmental Acoustics*. Wiley, New York.

Federal Interagency Committee on Noise (FICON). 1992. *Federal Agency Review of Selected Airport Noise Analysis Issues.* Fort Walton Beach, Fla.: Spectrum Sciences and Software Inc.