Document Type: EA-Administrative Record
Index Field: Environmental Assessment
Project Name: Bud Crockett-Henderson 161-kV TL
Project Number: 2023-2

BUD CROCKETT-HENDERSON 161-KV TRANSMISSION LINE

ENVIRONMENTAL ASSESSMENT

Chester and Henderson Counties, Tennessee

Prepared by:
TENNESSEE VALLEY AUTHORITY
Chattanooga, Tennessee

April 2024

To request further information, contact:
Anita E. Masters
NEPA Compliance
Tennessee Valley Authority
1101 Market Street, BR 2C
Chattanooga, Tennessee 37402
E-mail: aemasters@tva.gov

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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
BMP	Best management practice or accepted construction practice designed to reduce environmental effects
circuit	A section of conductors (three conductors per circuit) capable of carrying electricity to various points
conductors	Cables that carry electrical current
CEQ	Categorical Exclusion
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
dB	Decibels
dBA	A-weighted decibel
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
EIS	Environmental Impact Statement
EMF	Electromagnetic field
endangered species	A species in danger of extinction throughout all or a significant part of its range
EO	Executive Order
EPA	United States Environmental Protection Agency
ephemeral stream	Watercourses or ditches that only have water flowing after a rain event; also called a wet-weather conveyance
ESA	Endangered Species Act
FHWA	Federal Highway Administration
FIRM	Flood Insurance Rate Map
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
FONSI	Finding of No Significant Impact

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
HUC	Hydrologic Unit Code
hydric soil	A soil that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop conditions of having no free oxygen available in the upper part
hydrophytic vegetation	Aquatic and wetland plants that have developed physiological adaptations allowing a greater tolerance to saturated soil conditions including with limited or absence of oxygen
IRP	Integrated Resource Plan
kV	Symbol for kilovolt (1 kV equals 1,000 volts)
L_{dn}	Day-night sound level
LEC	Lexington Electric System
load	That portion of the entire electric power in a network consumed within a given area; also synonymous with “demand” in a given area
NEPA	National Environmental Policy Act
NESC	National Electric Safety Code
NRHP	National Register of Historic Places
outage	An interruption of the electric power supply to a user
PEIS	Programmatic Environmental Impact Statement
riparian	Related to or located on the banks of a river or stream
ROW	Right-of-way, a corridor containing a transmission line
runoff	That portion of total precipitation that eventually enters a stream or river
SHPO	State Historic Preservation Officer
SMZ	Streamside management zone
STEMC	Southwest Tennessee Electric Membership Corporation
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

TDEC	Tennessee Department of Environment and Conservation
threatened species	A species likely to become endangered within the foreseeable future
TRAM	Tennessee Rapid Assessment Method developed to rapidly determine the condition of a wetland in the field based solely on hydrogeomorphic classification meant to be a “snapshot” of current condition based on on-site and external influences and variables relative to a reference standard. Information on the condition of the wetland is then used to evaluate a proposed impact justification and assess mitigation needs.
TRC	TRC Environmental, Inc.
TVA	Tennessee Valley Authority
US	United States Highway
USACE	United States Army Corps of Engineers
USCB	United States Census Bureau
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USGS	United States 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
WWC	Wet-Weather Conveyance. See definition above for ephemeral stream.

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CHAPTER 1 – PURPOSE AND NEED FOR ACTION

1.1 Proposed Action – Improve Power Supply

The Tennessee Valley Authority (TVA) proposes transmission improvements that would increase electric power reliability in the Lexington and Jacks Creek area of Henderson and Chester counties, Tennessee. This area is served by Lexington Electric System (LEC) and Southwest Tennessee Electric Membership Corporation (STEMC). TVA would build, operate, and maintain 15.83 miles of single-circuit, 161-kilovolt (kV) transmission line (Figure 1-1). The new line would begin at TVA's West Lexington 161-kV Metering Station located in Lexington and extend southwest to TVA's Jacks Creek 161-kV Metering Station located in Jacks Creek. The proposed project would require approximately 194 acres of new right-of-way (ROW). The proposed transmission line would be constructed using mostly single-pole structures centered on new, 100-foot-wide ROW.

Two switch structures are planned for each tap point. All four switch structures would require permanent access as well as 60- by 60-foot-wide fenced in gravel yards. With the addition of the new transmission line, the existing radial[1] transmission line Henderson–Jack's Creek would now serve as a networked line[2] requiring the spare breaker in the Henderson 161-kV Transmission Line be dedicated to this transmission line thus a new breaker would be installed to serve as the spare. The Bud Crockett–West Lexington 161-kV Transmission Line would also be converted from a radial to a networked line. The spare breaker at the Bud Crockett 161-kV Switching Station would be dedicated to this line and a new spare breaker would be installed at the station. Associated communication and protective equipment would be included on the new switches and breakers.

Additionally, TVA would also install new fiber optic ground wire on the new transmission line to facilitate communications with the TVA network. The TVA map board displays would be updated to reflect this work. The scheduled in-service date for this project is Fall 2025.

1.2 Need for the Proposed Action

TVA plans its transmission system according to industry-wide standards established by the North American Electric Reliability Corporation (NERC). Those standards state that the TVA transmission system must be able to survive NERC defined contingency events while continuing to serve customer loads[3] with adequate voltage and no overloaded facilities while maintaining adequate transmission line clearances as required by the National Electric Safety Code (NESC).

TVA's Bud Crockett-Lexington 161-kV Transmission Line is ranked high among radial lines prioritized for exposure and load. It is a single source line, meaning it has only one power source with no backup supply. The line has three customer connection points (North Lexington, West Lexington, and Lexington Metering Stations) and any outages would lead to significant load not served. The line between Bud Crockett and North Lexington consists of older, wooden poles, and any unplanned pole replacement would result in a 24-hour

[1] "Radial line" is defined as….
[2] "Networked line" is defined as….
[3] "Load" is defined as that portion of the entire electric power in a network that is consumed within a given area. The term is synonymous with "demand" in a given area.

outage. Any necessary maintenance outages would negatively impact several local industries that rely on the power from this transmission line.

To ensure the Lexington and Jacks Creek areas have continuous, reliable service, TVA needs to provide additional electric service. The proposed project would enhance reliability, reduce the number and length of outages from line exposure, and provide additional maintenance flexibility allowing TVA to meet NERC reliability criteria. Two customers would be removed from radial lines, LEC and STEMC. The Lexington Substation would no longer have to take outages for maintenance, and outage durations for sustained faults would be shortened. The proposed project would improve the reliability for Jack's Creek, Lexington, West Lexington, and North Lexington metering stations which would support the growing load in Henderson and Chester counties and 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 to LEC and STEMC's Lexington and Jacks Creek service areas by constructing a new 161-kV transmission line. If the proposed transmission line is to be built, other secondary decisions are involved. These include the following considerations:

- Timing of the proposed improvements;
- Most suitable route for the proposed transmission line; and
- Determination of any necessary mitigation and/or monitoring to meet TVA standards and to minimize the potential for damage to environmental resources.

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

1.4 Related Environmental Reviews or Documentation

In 2019, TVA completed the 2019 Integrated Resource Plan (IRP) and the associated environmental impact statement (EIS) (TVA 2019a). These documents provide direction on how TVA can best deliver clean, reliable, and affordable energy in the Valley over the next 20 years, and the associated EIS looks at the natural, cultural, and socioeconomic impacts associated with the IRP. TVA's IRP is based upon a "scenario" planning approach that provides an understanding of how future decisions would play out in future scenarios.

In 2019, TVA released a Transmission System Vegetation Management Programmatic EIS (PEIS), which is incorporated by reference (TVA 2019b). This review more broadly represented a comprehensive analysis of management activities and potential environmental impacts associated with TVA's vegetation management program within the TVA power service area. The analysis considered various vegetation management methods and tools. TVA issued a Record of Decision on October 18, 2019, identifying its preferred vegetation management program alternative as a condition-based control strategy with a goal of maintaining the ROWs in a meadow-like end-state (84 FR 55995).

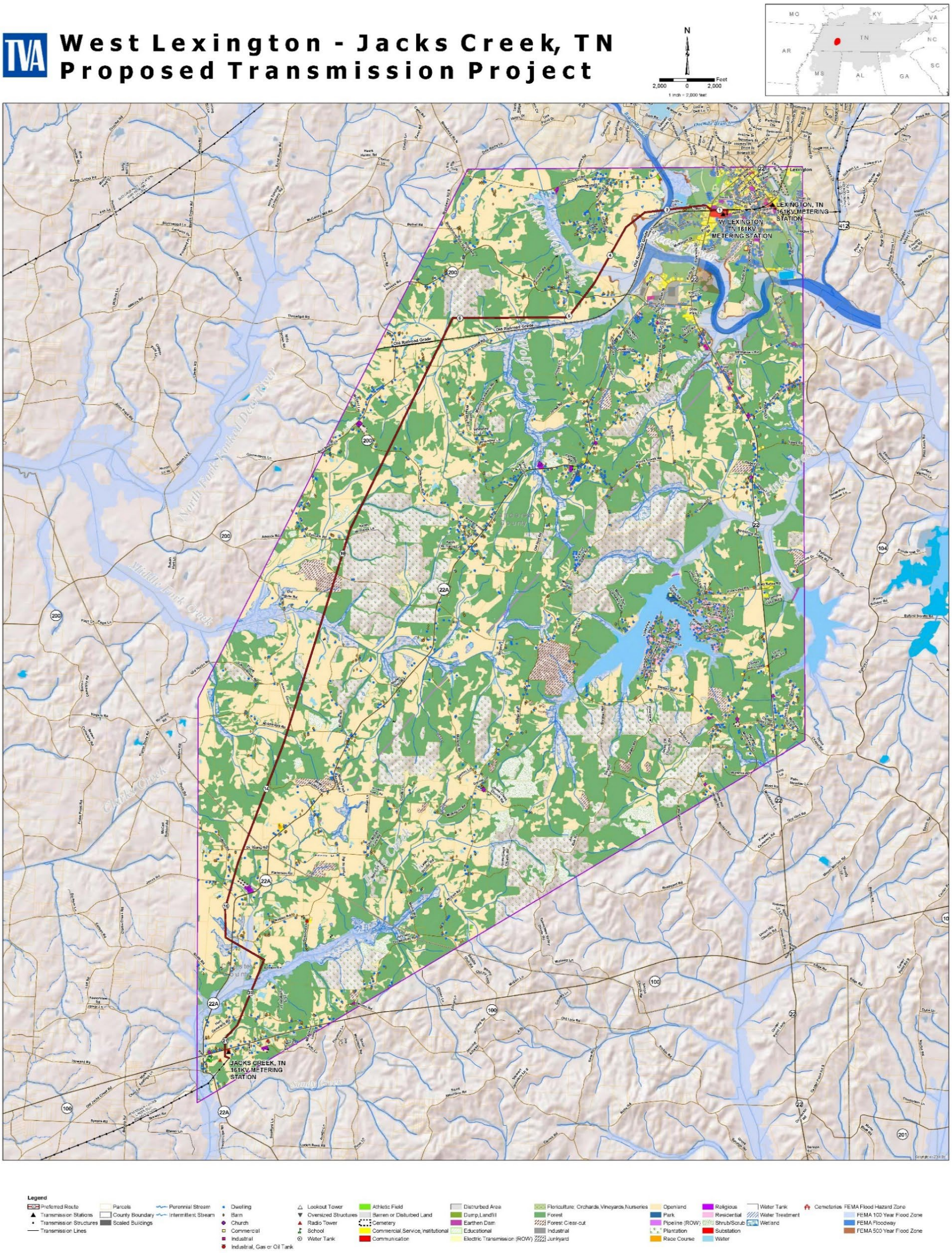

Figure 1-1 TVA's Preferred Transmission Line Route for the Bud Crockett-Henderson 161-kV Transmission Line in Henderson and Chester Counties, Tennessee

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On October 19, 2023, TVA issued a final EA and FONSI for its proposal to perform routine vegetation management on about one-third of the transmission system ROWs in Fiscal Year 2024 (TVA 2023a). TVA issued final EAs and FONSIs for similar proposals on November 9, 2020 (addressing Fiscal Year 2021) and on October 1, 2021 (addressing Fiscal Years 2022 and 2023) (TVA 2020; TVA 2021). The management of vegetation is needed to ensure the transmission system can continue to provide reliable power and to prevent outages related to incompatible vegetation. Site-specific effects were considered within twelve managed Sectors in areas that had been previously and continuously maintained on a recurring cycle. The EAs tiered from the PEIS which evaluated and analyzed TVA's vegetation management program (TVA 2019b).

1.5 Scoping Process and Public Involvement

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

- Absentee Shawnee Tribe of Indians of Oklahoma
- Cherokee Nation
- The Chickasaw Nation
- Eastern Shawnee Tribe of Oklahoma
- Jena Band of Choctaw Indians
- Kialegee Tribal Town
- The Osage Nation
- Shawnee Tribe
- Thlopthlocco Tribal Town
- United Keetoowah Band of Cherokee Indians in Oklahoma
- 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 route segments, and numerous feedback mechanisms for additional information or questions. A virtual open house was held from September 24 through October 24, 2020. Letters were sent to 222 property owners potentially affected by, or near to, any of the route alternative segments representing 321 parcels, as well as to elected officials. Ads were placed in local newspapers to notify other interested members of the public of the proposed project and open house. The virtual open house presentation provided project information and a map with a network of alternative transmission line routes, comprised of 41 different line segments, to the public for comment (see Figure 1-2). The virtual open house website was accessed by 127 people.

The virtual open house serves to effectively communicate TVA's proposed project and obtain information relevant to considering a preferred route. The virtual open house included differing stations for those that visited the site. The stations included the following:

- Station 1 - Welcome
- Station 2 - Need for Project
- Station 3 - Proposed Transmission Line Route Alternatives with 21 Segments and two Possible Routes (Project Maps, Structure Photo)

- Station 4 - Geographic information system (GIS) application to show how the route might affect the property owner
- Station 5 - Siting Process
- Station 6 - Environmental Review
- Station 7 - Easement Purchase
- Station 8 -Transmission Line Construction
- Station 9 - TVA's Mission
- Station 10 - Thank you and Ask for Comments

Multiple avenues for feedback were provided such as an email, a toll-free number, mailing addresses and comment forms. In general, public comments centered on impacts to environmental resources, timberland, future home sites, farming operations, creation of an avenue for trespassing, and health concerns.

At the conclusion of the 30-day comment period and after consideration of public input, the alternative route segments were evaluated, and TVA developed a preferred route. TVA announced its preferred route to the public in February 2021 (Figure 1-2). Letters were sent to affected property owners and elected officials, and information was provided to the public through TVA's website.

As a result of information obtained following the announcement of the preferred route from both public and agency comments, as well as from environmental field surveys, TVA made additional route adjustments to the preferred transmission line route (Figure 1-1). These adjustments are described in Section 2.4.3.

1.6 Issues to be Addressed

TVA prepared this EA to comply with the National Environmental Policy Act (NEPA) and regulations promulgated by the Council of Environmental Quality and TVA to implement NEPA. The EA will investigate the construction, operation, and maintenance of a new transmission line as well as the purchase of ROW for this purpose 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 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 and noise)
- Archaeological and historic resources
- Recreation, parks, and managed areas
- Socioeconomics and environmental justice

Figure 1-2 Proposed Transmission Line Routes for the Bud Crockett-Henderson 161-kV Transmission Line in Henderson and Chester Counties, Tennessee

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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, the Endangered Species Act (ESA), the Clean Air Act, 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 prime farmland, transportation, 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, further detailed analysis of the effects of these resources was not deemed necessary except as discussed in relation to other resource areas.

1.7 Necessary Permits or Licenses

Prior to construction, a permit would be required from the Tennessee Department of Environmental Conservation (TDEC) for the discharge of construction site storm water associated with the construction of the transmission line. TVA would prepare the required erosion and sedimentation control plans and coordinate them with the appropriate state and local authorities. A Section 401 Water Quality Certification or an Aquatic Resource Alteration Permit would be obtained as required for physical alterations to the waters of the State. A Section 404 Nationwide Permit would be obtained from the USACE if construction activities would result in the discharge of dredge or fill into waters of the United States (U.S.). A permit would be obtained from the Tennessee Department of Transportation for crossing state highways or federal interstates during transmission line construction.

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CHAPTER 2 – ALTERNATIVES INCLUDING THE PROPOSED ACTION

As described in Chapter 1, TVA proposes to construct a new, 15.83-mile long 161-kV transmission line from the West Lexington Metering Station and extend southwest to the Jacks Creek Metering Station. A description of the proposed action is provided below in Section 2.1.2. Additional background information about construction, operation, and maintenance of a transmission line is also provided in Section 2.2 and would be applicable regardless of the location of the proposed facilities.

This chapter has seven major sections:

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

2.1 Alternatives

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

2.1.1 The No Action Alternative – TVA Does Not Construct a New Transmission Line

Under the No Action Alternative, TVA would not construct the proposed transmission line. As a result, the TVA power system in the LEC and STEMC service areas would continue to operate under current conditions, two lines in the area would remain single source lines with no backup, outages would lead to significant load not served, maintenance whether planned or unplanned would require outages, all which will increase occurrences of violations of NERC reliability criteria.

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 New Transmission Line

Under the Action Alternative, TVA would construct, operate, and maintain an approximate 15.83-mile 161-kV transmission line starting at TVA's West Lexington 161-kV Metering Station and extending southwest to TVA's Jacks Creek 161-kV Metering Station to serve the LEC and STEMC service areas (Figure 1-1).

The new line would be centered on a new 100-foot-wide ROW, be built mostly of single-pole structures, and have fiber optic ground wire installed to facilitate communications with the TVA network. Two switch structures are planned at each tap point. The four new switch structures would require permanent gravel access roads and 60-foot-long by 60-foot-wide fenced in gravel yards. With the addition of the new transmission line, the two existing radial transmission lines (Henderson–Jack's Creek and Bud Crockett–W. Lexington) would be converted to network lines. Spare breakers in the Henderson 161-kV Switching Station and the Bud Crockett 161-kV Switching Station would now be dedicated to these existing lines and new spare breakers would be installed in the stations. Associated communication and protective equipment would be included on the new switches and breakers. The TVA map board displays would be updated to reflect the new facilities.

Temporary access roads would be required for construction and maintenance of the proposed transmission line.

Additional information describing implementation of the proposed Action Alternative and how the most suitable transmission line 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 Construct new Lexington-Chesterfield 161-kV Transmission Line

The first option would construct a 161-kV transmission line between Lexington and Chesterfield. A new breaker would have been installed at Bud Crockett and a new switching station would be installed at Chesterfield.

The benefits of this alternative would include removing LEC off of a radial line, outages would not be required for maintenance, and outage durations for sustained faults would be shortened. However, because this option would only remove a single customer off of the radial line, this alternative was eliminated from consideration.

2.1.3.2 Underground Utility Lines

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

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

Although buried transmission lines 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, they must be protected from flooding, which could cause an outage. Repairs of buried transmission lines may require excavation, and the precise location of problem areas can be difficult to determine.

The potential adverse environmental effects of constructing and operating a buried high-voltage transmission line would likely be greater overall than those associated with a traditional aboveground transmission line. In addition, the expense of a buried high-voltage transmission line would be prohibitive. For these reasons, burying the proposed transmission line 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

A ROW utilizes an easement that would be designated for a transmission line 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 transmission line, as well as remove “danger trees” adjacent to the ROW. Danger trees include any trees located beyond the cleared ROW, but that are tall enough to pass within five feet of a conductor or strike a structure should it fall toward the transmission line. The fee simple ownership of the land within the ROW would remain with the landowner, and many activities and land uses could continue to occur on the property. However, the terms of the easement agreement prohibit certain activities, such as construction of buildings and any other activities within the ROW that could interfere with the operation or maintenance of the transmission line or create a hazardous situation.

Because of the need to maintain adequate clearance between tall vegetation and transmission line conductors, as well as to provide access for construction equipment, 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[4]. 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

[4] 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.

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 2024). TVA transmission projects also utilize best management practices (BMPs) as identified in TVA (2022) 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 Construction and Maintenance Activities* (hereafter referred to as "TVA 2022")

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 Clean Air Act, 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 TVA (2022) 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, 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 transmission lines are located on the ROW wherever possible and are designed to avoid severe slope conditions and to minimize environmental resources such as stream crossings. Access roads are typically about 12 to 16 feet wide and are surfaced with dirt, mulch, or gravel.

Culverts and other drainage devices, fences, and gates would be installed as necessary. Culverts installed in any permanent streams would be removed following construction. However, in ephemeral[5] 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* and *Transmission Construction Guidelines Near Streams* (TVA 2024).

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 transmission line. TVA initially attempts to use or lease properties that require no site preparation. However, at times, the property may require some minor grading and installation of drainage structures such as culverts.

Likewise, the area may require graveling and fencing. Trailers used for material storage and office space would be parked on the site. Following completion of construction activities, all trailers, unused materials, and construction debris would be removed from the site. Removal of TVA-installed fencing and site restoration would be performed by TVA at the discretion of the landowner.

2.2.1.4 Structures and Conductors

The proposed transmission line would utilize single and double 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 80 and 120 feet above ground.

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

Figure 2-1 Typical Single and Double Steel-Pole Structures

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

Poles at angles (angle points) in the transmission line may require supporting screw, rock, or log-anchored guys. 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.

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

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 Operation and Maintenance

2.2.2.1 Inspection

Periodic inspections of 161-kV transmission lines 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.

2.2.2.2 Vegetation Management

Management of vegetation along the ROW would be necessary to ensure access to structures and to maintain an adequate distance between transmission line 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 NESC requirements. TVA uses a minimum ground clearance of 24 feet for a 161-kV transmission line and 30 feet for a 500-kV transmission line at the maximum line operating temperature. Vegetation management along the ROW would consist of two different activities: felling danger trees adjacent to the cleared ROW (as described in Section 2.2.1.1), and vegetation control within the cleared ROW total width. These activities occur on approximately 3-year cycles.

As referenced in Section 1.4, TVA completed the Transmission System Vegetation Management PEIS in 2019 which addresses tools and methods TVA will use to manage ROW vegetation. Subsequent site specific NEPA documents which tiered from the PEIS were also completed (TVA 2020; TVA 2021) to ensure resource impacts will be avoided, minimized, or mitigated. Management of vegetation within the cleared ROW would include an integrated vegetation management approach designed to encourage the low-growing plant species and discourage tall-growing plant species. A vegetation re-clearing plan would be developed for each transmission line connection, based on the results of the periodic inspections described above. The two principal management techniques are mechanical mowing (using tractor-mounted rotary mowers) and herbicide application. Herbicides are normally applied in areas where heavy growth of woody vegetation is occurring on the ROW and mechanical mowing is not practical. Herbicides would be selectively applied from the ground with backpack sprayers or vehicle-mounted sprayers, or, in rare cases, by helicopter.

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

2.2.2.3 Structure Replacement

Other than vegetation management, only minor maintenance work is generally required. The transmission line structure and other components typically last several decades. If a structure needs to be replaced, the structure would normally be lifted out of the ground by crane-like equipment, and the replacement structure would be inserted into the same hole or an adjacent hole. Access to the structures would be via existing roads. Replacement of

structures may require leveling the area surrounding the replaced structures, but additional area disturbance would be minor compared to the initial installation of the structure.

2.3 Siting Process

The Siting methodology is a process of weighing all relevant factors to achieve a balanced solution. The process of Siting the proposed transmission line followed the basic steps used by TVA to determine a preferred transmission line route. These include the following steps:

- Determine the potential existing power sources to supply the transmission line.
- Define the study area.
- Collect data to minimize potential impacts to social, engineering, and environmental (cultural and natural) features.
- Identify general route segments producing potential routes.
- Gather public input.
- Redefine general route segments.
- Incorporate public input into the final selection of the transmission line route.

2.3.1 Definition of the Study Area

The study area for the Bud Crockett-Henderson Transmission Line was determined primarily by the geographic boundaries of existing power system assets. This area encompassed approximately 72 square miles and covered portions in Henderson and Chester counties. The West Lexington metering station is in the Lexington area off Holley Street. The Jacks Creek Metering Station is located in the southern portion of the study area in the Jacks Creek area off of TN State Route 100 E. The limits of the study area were established to ensure that both metering stations were included, and several potential route corridors could be identified.

2.3.2 Description of the Study Area

The study area is rural. Farming is prevalent in the area. Residential homes are built along county roads in the area. See Figure 2-2 for map of study area.

The study area has a mix of flat and gently rolling terrain, much of which is utilized for timber production, agriculture, and residential areas. Remaining forested land is a combination of commercial timber and timberland. The farmland is a mixture of commercial farming and cattle pasture. The residential homes are built up around the main road systems.

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 transmission line study included design drawings for area transmission lines, data collected into a GIS, including U.S. Geological Survey (USGS) digital line graphs, National Wetland Inventory maps, wetland modelling results, photo-interpreted data including wetlands, and Henderson and Chester 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).

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 transmission line 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.

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 transmission line routes. These criteria include social, engineering, and environmental factors such as existing land use, ownership patterns, environmental features, cultural resources, and visual quality. Cost is also an important factor, with engineering considerations, materials, and ROW acquisition costs being important elements. Identifying feasible transmission line routes involves weighing and balancing these criteria. TVA can, and does, deviate from the criteria, adjusting as specific conditions dictate.

Specific criteria used to evaluate transmission line route options are described below. For each feature identified as occurring along a proposed route option, specific considerations related to these features were identified and scored. A higher score means a larger constraint or obstacle for locating a transmission line. For example, a greater number of streams crossed, a longer transmission line route length, or a greater number of historic resources affected would produce a higher, less favorable score.

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

- **Social Criteria** include the total acreage of new ROW, number of affected property parcels, issues raised in public comments, visual aesthetics, and proximity to schools, dwellings, 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, 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 total 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, and overall total. For each of these criteria, a ranking of each alternative route was calculated based on the relationship between the various route's scores.

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 ranked by their overall scores.

2.4 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 transmission line route segments that would best meet the project needs while avoiding or reducing conflict with constraints and by using identified opportunities.

2.4.1 Potential Transmission Line Corridors

Using the existing West Lexington and Jacks Creek metering stations and tools mentioned in the section C, alternative transmission line routes were defined. There were several general guidelines used when establishing the alternate route segments in the study area. These included the avoidance major constraints such as: existing major highway interchanges, commercial and residential developments, barns, chicken houses, and known airports (glide paths if possible and if not ensuring transmission line heights are below FAA imaginary surface elevations). Rivers and streams were to be crossed as close to 90 degrees where possible to reduce the amount clearing of the stream bank vegetative cover. Environmental, archaeological, and historic areas were also considered and outlined as constraints. Access to the line for construction and maintenance is typically a consideration as well. Other factors considered were engineering requirements, existing property lines), buffering around existing homes, avoiding daycare and school facilities, etc. Tax maps with parcel boundaries were also utilized to locate a route with minimum impact to the number of parcels as well as to individual owners. In addition, several site visits were made to observe any potential problem areas within the study area.

Two major route corridors were identified for the project (eastern and western route). A total of 21 route segments were developed. This created 64 alternative routes, which can be seen on the map at www.tva.com/power/projects/index.htm as well as in (see Figure 1-2). Routes range from 14.8 miles to 20.2 miles.

As mentioned above, there is an eastern and a western corridor that are located on either side of State Route 22A. The corridors traverse generally from north to south. In general, the routes avoid traversing directly along the state route due to numerous residences and smaller parcels. The routes take into consideration a vast number of wetlands, floodplains, and streams in the area. In general, parcels are large and traverse both farmland and some timber properties as well. There are three crossover segments to allow the possibility that alternative routes could utilize both the eastern and western corridor.

2.4.2 Identification of the Preferred Transmission Line Route

Each alternative offers different opportunities and constraints for transmission line construction. Opportunities include characteristics such as open land, areas less suitable for development, and lack of sensitive environmental areas and land use conflicts. The assessment of the opportunities and constraints for the alternative routes are evaluated by engineering, environmental, and social criteria. Some of the key considerations used in identifying and assessing alternative route locations are line length, amount of existing ROW, road/highway crossings, construction access, switching station location, amount of ROW needed, forest clearing, wetlands, sensitive stream and/or stream crossings, number of parcel/property tracts, development (both commercial and residential), historical areas and structures, archaeological, recreational, and airport flight zones.

Route 4, composed of alternative route Segments 1, 2, 4, 5, 6, 10, 14, 16, 20, and 21, had the lowest overall score and ranked as the best route option according to the scored siting criteria. As such, TVA chose Route Option 4 as the preferred alternative route for the proposed Bud-Crockett 161-kV Transmission Line.

The highest number of public comments were received on Segments 12 and 13. In general, comments were centered on impacts to future home sites, timberland, and farming operations, the creation of an avenue for trespassing, and health concerns. Lexington Utilities did comment on Segment 3 with concerns on the use of old railroad grade easement due to an existing 4-inch steel, high-pressure gas line and water main line plans.

Siting criteria include engineering and constructability considerations. Route Option 4 was identified as one of the shorter overall route lengths at 15.83 miles. Other engineering considerations included less highway crossings at four, an average length of route within 20 to 30 percent slope, and below average part of route within pipeline buffer.

Social criteria, as identified in Section 2.3.4, ranked Route Option 4 as having a below average number of negative public comments, a lower total ROW acreage, having two homes within 300 feet of route (average of 7), a below average number of parcels affected, a minimum number of commercial/industrial buildings affected (at four), and a lower number of tree plantation acreage affected.

Concerning environmental considerations, Route Option 4 had a below average acreage of forest that would require clearing, a below average number of floodplain crossings, four major stream crossings (as opposed to a maximum of eight), and a below average acreage of forested wetlands impacted.

2.4.3 Explanation of Changes to the Proposed Preferred Transmission Line Route

The following changes were made to the original preferred route after contacting owners for survey permission and field surveys.

- Segment 2 was changed at the request of the town of Lexington as the new line crossed town property. Two PIs were added shifting the line north and then cutting more perpendicular across a town access road.
- The PI between Segment 2 and 4 was eliminated and the transmission line was moved slightly to the east. Eliminating this PI allowed TVA to utilize single-pole structures through agricultural field, reducing cost and impacts to the field, a benefit to the property owner and TVA.

- Structure 141 on proposed Segment 6 was moved slightly to the east at the property owners request to move the line away from their home.
- The property owner with Structures 151 and 150 on Segment 10 requested the line be moved as far west on their property as possible. Neighboring property owners were agreeable with the change that moved the line slightly west on their properties.
- At the property owner's request, Segment 16 between Structures 192 and 201 was moved to avoid passing in front of the property owner's home. The line was moved to the east along property lines and the edge of agricultural fields and wooded areas and then cut back to the west to join back to the preferred route.
- Segment 16 was also adjusted between Structures 203 and 210 at the request of the property owner. The line was moved to the east to run along State Route 22A and allow future installation of pivot irrigation in an existing agricultural field.
- Segment 21 while passing the Jacks Creek Metering Station was swung out farther west to give more room around the metering station.

2.5 Comparison of Environmental Effects by Alternative

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

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

Resource Area	Impacts From No Action Alternative.	Impacts From Proposed Action Alternative
Groundwater and Geology	No effects to local groundwater quality or quantity are expected.	Impacts to groundwater quality or quantity are anticipated to be minor.
Surface Water	No changes in local surface water quality are anticipated.	Any impacts to surface waters in the project area are expected to be minor, temporary impacts with the proper implementation of standard BMPs (TVA 2022).
Aquatic Ecology	Aquatic life in local streams would not be affected.	With the implementation of SMZ and BMPs, impacts to aquatic animals resulting from the proposed project would not be significant.
Vegetation	Local vegetation would not be affected at the proposed transmission line ROW. Routine maintenance of existing transmission line vegetation would continue, but overall impacts to vegetation are considered minor.	Site preparation and clearing of approximately 98 acres of trees for the proposed transmission line ROW would have a minor effect on most local vegetation. No uncommon plant communities are known from the vicinity of the project area and no rare plant communities were observed in the project area during the field survey. Implementation of the proposed project would not affect unique or important terrestrial habitat.

Resource Area	Impacts From No Action Alternative.	Impacts From Proposed Action Alternative
Wildlife	Local wildlife would not be affected at the proposed transmission line ROW. Routine maintenance of existing transmission line vegetation would continue, but overall impacts to wildlife are considered minor.	Wildlife inhabiting onsite forest, early successional, and edge habitats within the proposed transmission line ROWs would be displaced. Because there are sufficient adjacent local habitats, any effects to wildlife are expected to be insignificant.
Endangered and Threatened Species	No effects to endangered or threatened species or any designated critical habitats are anticipated. Routine maintenance of existing transmission line vegetation would continue, but overall impacts to endangered or threatened species would be avoided.	With appropriate implementation of BMPs and procedures that are designed to avoid and minimize impacts to federally or state-listed species during site preparation, construction, and on-going maintenance activities, and adherence to guidelines in the programmatic biological assessment for bats (TVA 2017), the proposed TVA action is expected to have only minor effects on federally or state-listed species.
Floodplains	No changes in local floodplain functions are expected.	With the implementation of standard BMPs and mitigation measures, no significant impact on floodplains would occur. All actions would be consistent with EO 11988.
Wetlands	No changes in local wetland extent or function are expected.	The proposed project would clear and convert 3.74 acres of forested wetlands to be maintained as emergent or scrub-shrub wetlands for the life of the transmission line ROW. With appropriate permits, mitigation, and BMPs implemented wetland impacts would be minor on a watershed scale.
Visual Resources	Aesthetic character of the area is expected to remain virtually unchanged.	Minor visual discord above ambient levels would be produced during construction and maintenance activities. The proposed transmission line would present a minor, long-term visual effect.
Noise and Vibration	No noise or vibration impacts from construction or operation would occur because the proposed transmission line would not be constructed.	Overall, temporary, minor noise above ambient levels would be produced during construction, operation, and maintenance activities of the proposed transmission line would be short-term and minor.
Archaeological and Historic Resources	No adverse effects to archaeological or historic resources are anticipated.	TVA finds that the proposed undertaking would result in no adverse effects on historic properties.

Resource Area	Impacts From No Action Alternative.	Impacts From Proposed Action Alternative
Recreation, Parks, and Managed Areas	No changes in local recreation opportunities, managed areas, natural areas, or ecologically significant sites are expected.	No significant impacts are anticipated to managed areas, natural areas, or ecologically significant sites from construction or operation of the proposed transmission line.
Socioeconomics and Environmental Justice	No change in local demographics, socioeconomic conditions, community services, or environmental justice populations. Potential for power reliability issues as an inadequate power supply would be realized in the surrounding area.	Any adverse impacts to low income or minority communities in the project area would be similarly experienced by all people living along the proposed transmission line corridor. However, any adverse impacts would be minor due to the distance between residences and the proposed project area. These impacts are similar to impacts experienced by communities (Environmental Justice and non-Environmental Justice communities) living along TVA's transmission line network across the Valley. No noticeable adverse social or economic effects, including changes in local property values, are likely. Increased power reliability benefits resulting from an additional power source in the project area would be realized by the local communities, including minority and low-income populations. Thus, overall, any impacts would be minor and would be largely offset by beneficial economic impacts.
Transmission Line Upgrades Post-Construction	There would be no transmission line constructed, therefore no impacts.	Public exposure to Electromagnetic fields (EMF) would be minimal, and no significant impacts from EMFs are anticipated. National Electric Safety Code standards are strictly followed when installing, repairing, or upgrading TVA transmission lines or equipment. Therefore, touching a structure supporting a transmission line poses no inherent shock hazard. The proposed structures do not pose any significant physical danger.

2.6 Identification of Mitigation Measures

TVA employs standard practices when constructing, operating, and maintaining transmission lines, structures, and the associated ROW and access roads. These can be found on TVA's Transmission organization's website (TVA 2024). Some of the more specific routine measures which would be applied to reduce the potential for adverse environmental effects during the construction, operation, and maintenance of the proposed transmission line and access roads are as follows:

- TVA would utilize standard BMPs, as described in Transmission's BMP guidance (TVA 2022), 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 as amended by 13751 (Invasive Species) for revegetating with noninvasive plant species as defined in the BMP guidance (TVA 2022).

- Wetlands would be protected by the implementation of standard BMP's as identified in Transmission's BMP guidance (TVA 2022).

- Ephemeral streams, also called wet-weather conveyances (WWC), that could be affected by the proposed construction would be protected by implementing standard BMPs as identified in Transmission's BMP guidance (TVA 2022).

- Perennial and intermittent streams, both classified as "streams" in this document, would be protected by the implementation of standard stream protection (Category A) as defined in Transmission's BMP guidance (TVA 2022).

- Vegetation would be managed as outlined in TVA's Transmission System Vegetation Management PEIS (TVA 2019b) and according to TVA's *Transmission Environmental Protection Procedures Right-of-Way Vegetation Management Guidelines* (see Appendix B).

- During vegetation clearing activities, marketable timber would be salvaged where feasible; otherwise, woody debris and other vegetation would be piled, chipped, or taken off site. In some instances, vegetation may be windrowed along the edge of the project site to serve as sediment barriers. Implementation of *TVA ROW Clearing Specifications*, *Environmental Quality Protection Specifications for Transmission Line Construction*, *Transmission Construction Guidelines Near Streams*, and *Environmental Quality Protection Specifications for Transmission Substation or Communications Construction* (TVA 2024), and Transmission's BMP guidance (TVA 2022) would provide further guidance for clearing and construction activities.

- During construction of access roads, culverts and other drainage devices, fences, and gates would be installed, as necessary. Culverts installed in any perennial streams would be removed following construction. However, in ephemeral streams/WWCs, 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.

- Pesticide/herbicide use as part of construction or maintenance activities would comply with the TDEC General Permit for Application of Pesticides, which also requires a pesticide discharge management plan. In areas requiring chemical treatment, only EPA-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 (Appendix B).

- Integration of BMPs during construction and maintenance to minimize potential impacts to bat foraging habitat as described and in accordance with TVA's Programmatic Consultation on Bats and routine actions (TVA 2017; TVA 2023b).

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

- Construction would adhere to the TVA subclass review criteria for transmission line location in floodplains (TVA 1981).

- Any road improvements for access roads constructed within 100-year floodplains but not floodways (Structures 104, 106, 109, 110, 111, 115, 116, 170-171, 211-212, 218, 121, 122, 128, 137, and 196-197), would be done in such a manner that upstream flood elevations would not be increased by more than 1.0 foot (44 Code of Federal Regulations [CFR] § 60.3).

- For access roads to constructed in floodways (Structures 102 and 105), (1) any fill, gravel or other modifications in the floodway that extend above the pre-construction road grade will be removed after completion of the project; (2) this excess material will be spoiled outside of the published floodway; and (3) the area will be returned to its pre-construction condition.

2.7 The Preferred Alternative

The Action Alternative—that TVA constructs a new transmission line—is TVA's preferred alternative for this proposed project. TVA would purchase ROW easements and any associated access road easements to accommodate the construction of a new 161-kV transmission line.

TVA's preferred route alternatives for the Action Alternative are alternative route Option 4 for the Bud Crockett-Henderson 161-kV Transmission Line, comprised of alternative route Segments 1, 2, 4, 5, 6, 10, 14, 16, 20, and 21. The total length of the transmission line and ROW would be approximately 15.83 miles.

CHAPTER 3 – AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

The existing condition of environmental resources that could be affected by the proposed Action Alternative during construction, operation, or maintenance of the proposed 161-kV transmission line is described in this chapter. The descriptions below of the potentially affected environment are based on field surveys conducted between November and December 2022 and between August and September 2023, 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 endangered and threatened species and their habitats included records of occurrence within a 3-mile radius for terrestrial animals, a 5-mile radius for plants, and a 10-mile radius for aquatic animals. The analysis 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 transmission line 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.

Potential effects related to prime farmland, transportation, air quality, global climate change, solid waste, hazardous and nonhazardous wastes, and health and safety were considered. Potential effects on these resources were found to be minimal or absent because of the nature of the action.

3.1 Groundwater and Geology

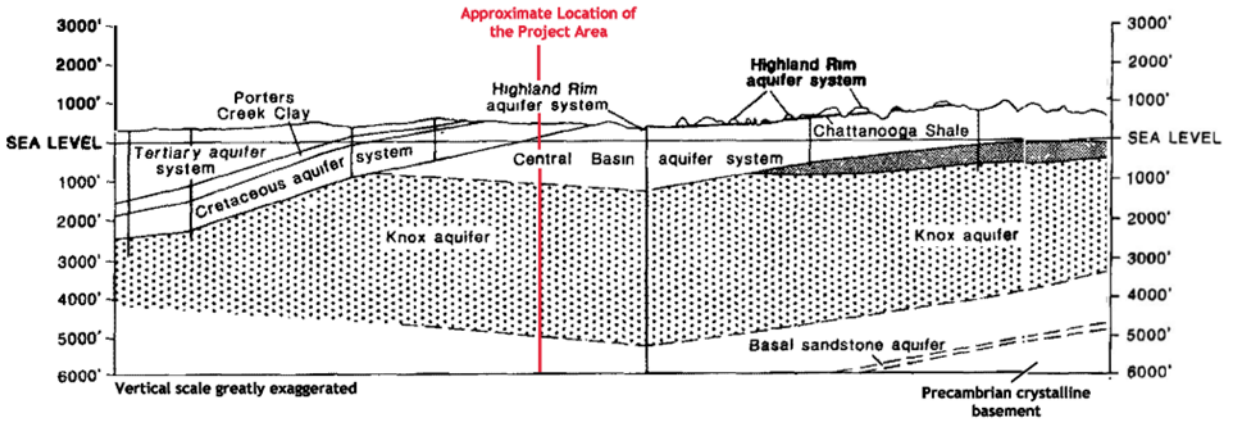
3.1.1 Affected Environment

The project area is in the Coastal Plain physiographic province and according to available mapping is underlain by Cretaceous-aged McNairy Sand (Hardeman et al. 1966). The formations of the Cretaceous age are relatively unconsolidated compared to those of the older Paleozoic age and primarily consist of sand and clay. Loose sand is the most common type of deposit within the Cretaceous formations of the site, with limestone almost entirely lacking. These Cretaceous formations are a prolific source of groundwater. Henderson and Chester Counties are comprised of seven geologic formations including Clayton, Eutaw, Selma, Ripley, Porters Creek, Holly Springs, and Pliocene gravel. All but the Selma and Porters Creek formations can provide access to groundwater due to their sandy and unconsolidated nature. Selma and Porters Creek formations are high in clay and are not conducive to the movement or retention of ground water. Clayton formations are known to contain grains of glauconite which contribute to high iron levels in water. Ultimately, the Ripley and Eutaw formations are the principal water-bearing beds consisting of sand with varying grain sizes that allow for the yield of large quantities of water (Wells 1933).

3.1.1.1 Composition and Movement of Ground Water through Aquifers

There are a total of three aquifer systems that lie beneath the project area including the Cretaceous aquifer system, the Central Basin aquifer system, and the Knox aquifer. Figure 3-X

shows the horizontal cross section of these aquifers across the western half of the State of Tennessee with the approximate location of the project area indicated with a red vertical line. The Cretaceous aquifer system contains sediments that are composed primarily of sands and gravels with interbedded clays and marls resulting in a highly permeable groundwater reservoir in which confined, intergranular flow predominates. The Cretaceous formations were deposited from the Mississippi Embayment which has subsequently led to the Cretaceous aquifer system being thicker on the western and southern edges of the state, as opposed to the northern and eastern edge of the aquifer, which are thinner. The Cretaceous aquifer system is recharged in the outcrop area which is located on the eastern edge of the system, west of the Tennessee River. Porters Creek Clay is the upper confining unit for the system with Coon Creek, Demopolis, and Sardis formations separating the McNairy Sand and Coffee sand Aquifers in the middle of the system. Clays in Eutaw and Tuscaloosa formations restrict vertical movement in the system, isolating the sands from each other and making lateral flow the predominant flow components of this system. Water levels in the Cretaceous aquifer system vary seasonally in response to natural recharge and discharge within the outcrop area. The Cretaceous aquifer system is used for domestic and public water supplies throughout the outcrop area (Brahana et al. 1986).



Source: Brahana and Bradley 1985

Figure 3-X. Horizontal Geohydrologic Cross-Section of Western Tennessee Showing Aquifer Layers Beneath the Project Area

The Central Basin aquifer system contains almost all carbonate rocks, primarily limestone, which originated in Devonian to Ordovician ages. Some areas of shale, phosphatic-rich layers, and bentonite beds exist within this aquifer system, which strongly influence the hydrology of the system. The Central Basin aquifer system was formed by the erosion of the Nashville Dome, a low dome structural feature located within Rutherford County. The top of the Central Basin Aquifer system is defined by the base of the Chattanooga Shale, whereas the bottom of the system is defined by the top of the Knox Group. Groundwater within the Central Basin aquifer system is found in solution channels in the outcrop area of the system. These solution channels are a shallow flow system, generally limited to 300 feet or less below the ground surface, of irregularly distributed openings that occur along the joints and bedding planes of otherwise solid rock masses. The joints and bedding planes are enlarged by the solution of limestone, contributing to their secondary porosity and permeability within nonporous, impermeable rock.

Bentonite layers play a significant role in the flow of groundwater vertically through the aquifer system. In areas where the bentonite layers are breached by open joints or stream valleys, solution openings can form in the underlying limestone, contributing to the groundwater recharge through these openings from precipitation. When Bentonite layers are not breached, downward movement is restricted, and flow is isolated to the shallow dynamic flow system. Ultimately, based on water quality data, the flow of water through the Central Basin aquifer system is made up of many isolated cells. Drinking water from the Central Basin aquifer system is withdrawn from its outcrop area in the Central Basin, Sequatchie Valley, parts of the western Highland Rim, and parts of the western valley of the Tennessee River. The aquifer is not used for drinking water beneath the northern, eastern, and southern Highland Rim or beneath the Cumberland Plateau. The project area is located just inside the western edge of the Central Basin aquifer system within the western valley of the Tennessee River, which is an area known to be used for drinking water (Brahana and Bradley 1986)

The Knox Aquifer system is composed of rocks known as the Knox Group, a thick sequence of limestone and dolomite of the Cambrian and Ordovician age present in the subsurface of the western two-thirds of the State of Tennessee. The stretching of rocks during the formation of the Nashville Dome resulted in the formation of systematic joints within the Knox Group. These joints are parallel sets of vertical fractures along which no relative displacement has occurred, making them a primary avenue for vertical groundwater movement through the rocks of the Knox Group. The upper part of the Knox aquifer system is a deep aquifer formed from extensive dissolution with a dynamic flow system and the ability to yield significant amounts of water. Beneath the zone of active flow are rocks that are fully saturated but with much slower groundwater flow velocities, creating a separation from the active flow system above. The depth of the Knox aquifer system ranges from 330 feet to several thousand feet in areas outside of the central basin, including the project area. Water levels in the aquifer respond to regional recharge and discharge, with recharge occurring in areas with fractures and faults in the overlying limestones of the Central Basin aquifer system. The underlying shale of the Conasauga Group is the lower confining layer of the Knox Aquifer System. Water from this system can be withdrawn throughout its range, however, suitable quality for drinking is generally limited to the Central Basin, and western Highland Rim (Brahana and Bradley 1985).

3.1.1.2 Groundwater Quality

Generally, throughout all three aquifer systems, the ground water quality is suitable for drinking with dissolved solids concentrations less than 1,000 milligrams per liter (mg/L). Water tends to be more mineralized with higher dissolved solids concentrations in the lower formations of each aquifer system, as well as in zones formed by lithologic and formational boundaries. In the Cretaceous and Central aquifer systems, zonation occurs from variations in vertical leakage between formations (Brahana et al. 1986; Brahana and Bradley 1986). The Cretaceous aquifer system contains formations that are more layered than those of the Central Basin aquifer system, which has formations that are more pocketed. The Cretaceous aquifer system contains four major water-bearing formations including McNairy sand, Coffee sand, Eutaw formation, and Tuscaloosa formation. Henderson and Chester counties contain the McNairy, Coffee, and Eutaw formations which are all low in dissolved solids (less than 1,000 mg/L) within outcrop areas. McNairy and Coffee sands tend to have higher iron concentrations and Coffee sands may contain hardness (Brahana et al. 1986). Water throughout the Central Basin aquifer system is commonly hard and contains detectable levels of hydrogen sulfide gas. The shallow dynamic flow system of the aquifer contains less dissolved solids than the deeper and more isolated reaches of the aquifer (Brahana and Bradley 1986). Due to its thickness, water quality conditions within the Knox aquifer system can vary considerably throughout its depths.

Generally, however, dissolved solids concentrations increase with increasing depth. Additionally, the Knox aquifer is known to have high fluoride concentrations within the upper 300 feet (Brahana and Bradley 1985). Water quality conditions within each aquifer system may be influenced by adjacent systems due to hydrologic connectivity. The underlying paleozoic formations may introduce water with higher dissolved solids to the Cretaceous aquifer system (Brahana et al. 1986), whereas leakage from the Knox Group or Chattanooga shale may cause the introduction of water with higher dissolved solids to the Central Basin aquifer system (Brahana and Bradley 1986).

Both the Cretaceous and Central Basin aquifer systems are particularly vulnerable to groundwater contamination, the Cretaceous aquifer system due to its unconfined sand formations and the Central Basin aquifer system due to its shallow nature and dynamic flow system. Additionally, the Knox aquifer system is also susceptible to contamination through injection wells and improper well-related practices (TDEC 2020).

3.1.1.3 Karst Features

Karst terrain is an area underlain by carbonate bedrock, such as limestone, that creates unique subsurface and topographic features due to its dissolution. This terrain is characterized by sinkholes, springs, disappearing streams, and caves. Karst systems have rapid and highly directional groundwater flow throughout channels and conduits (TDEC 2020). Karstic units in the Coastal Plain province are few in number and limited to the area near the Mississippi border; therefore, karst areas or sinkholes, springs, or caves are not likely to occur within Henderson and Chester counties (Weary 2008; TDEC 2020).

3.1.1.4 Public Water Supply

Tennessee's groundwater utilization is highest as a percentage of total withdrawals in west Tennessee (TDEC 2020). Public water supplies within Henderson and Chester counties are provided by the Lexington Water Division and Henderson Utility Department (City of Lexington 2023; City of Henderson 2023). Lexington Water Division sources public drinking water from Beech Lake, whereas the Henderson Utility Department obtains drinking water from groundwater wells (TDEC 2003). The State of Tennessee has developed a Wellhead Protection Program to protect public water systems from contaminated groundwater by designating official wellhead protection areas to monitor groundwater (TDEC 2023a). Additionally, Henderson and Chester County residents and privately owned businesses may rely on private wells for water supply (TDEC 2022a). There are a total of 199 wells within a one-mile radius of the proposed transmission line; 165 of the wells are registered for residential usage, 19 are registered for farm usage, two are designated for irrigation usage, and five are registered for commercial usage (TDEC 2023b).

3.1.1.5 Sole Source Aquifers

The Safe Drinking Water Act of 1974 established the sole source aquifer protection program that regulates certain activities in areas where the aquifer (water-bearing geologic formations) provides at least half of the drinking water consumed in the overlying area. No sole source aquifers exist in Tennessee (EPA 2023a).

3.1.2 Environmental Consequences

3.1.2.1 Alternative A – No Action

Under the No Action Alternative, TVA would not acquire new ROW to construct the proposed transmission line, expand existing ROW, or construct new access roads. Therefore, no impacts to groundwater or geologic resources would occur because of TVA actions associated with the proposed project.

3.1.2.2 Alternative B – Action Alternative

Under the Action Alternative, construction activities would entail localized ground disturbance and shallow excavation. Depth of excavation would be approximately 10 percent of the pole structure height plus an additional two feet. Because proposed structures would range from 61 to 106 feet in height, excavation depth would be approximately eight to 13 feet below ground surface. These construction activities would be limited to the transmission line ROW. Potential water quality impacts to shallow groundwater can also occur at the construction site due to releases of contaminants such as petroleum fuels, lubricants, and hydraulic fluids associated with the operation and maintenance of construction equipment. However, the use of appropriate BMPs would prevent and minimize the potential for such releases. These BMPs include the proper maintenance of vehicles, restriction of maintenance and fueling activities to appropriate offsite areas, measures to avoid spills, and immediate management of incidental and accidental releases in accordance with standard practice and regulatory requirements.

If groundwater is encountered during any construction activities, dewatering processes would be used to control groundwater infiltration into the excavation site and all state and federal requirements relating to groundwater protection would be followed. BMPs as described in *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Construction and Maintenance Activities* (TVA 2022) would be used to control sediment infiltration from storm water runoff to minimize impacts to groundwater. The proposed construction activities and below ground excavation would be localized and limited to the construction phase of the proposed project; therefore, any impacts to groundwater would be minor.

3.2 Surface Water

3.2.1 Affected Environment

The Federal Water Pollution Control Act, commonly known as the CWA, is the primary law that affects surface water quality. It establishes standards for the quality of surface waters and prohibits the discharge of pollutants from point sources unless a National Pollutant Discharge Elimination System permit is obtained.

Several other environmental laws contain provisions aimed at protecting surface water, including Resource Conservation and Recovery Act, the Comprehensive Environmental Response, Compensation and Liability Act and the Federal Insecticide, Fungicide, and Rodenticide Act.

The proposed project area lies within the Beech River (0604000108), South Fork Forked Deer River (0801020501), and North Fork Forked Deer River (0801020502) hydrologic unit code (HUC)-10 watersheds, all of which are in the Lower Tennessee-Beech and South Fork Forked Deer HUC-8 watersheds (USGS 2023a). The Beech Reservoir, located on the Beech River, is upstream of the project area and is managed by TVA for recreational uses (TVA 2023c).

Field surveys conducted in November 2022 and August 2023 identified 83 watercourses including 32 streams, 47 WWC/ephemeral streams, and four ponds, that cross the proposed transmission line ROW and associated access roads. The surface water streams (excluding WWC/ephemeral streams) within the project area are listed in Appendix C.

Precipitation in the general vicinity of the project area averages about 51 inches per year. The wettest month is December with approximately 4.9 inches of precipitation, and the driest month is August, receiving approximately 3.1 inches of precipitation. The annual air temperature ranges from a monthly average low of 48 degrees Fahrenheit to a monthly average high of 71 degrees Fahrenheit (U.S. Climate Data 2023). Stream flow varies with rainfall and averages about 21.2 inches of runoff per year (USGS 2023b).

Water quality standards are established for individual waterbodies by identifying the most stringent criteria for each assigned use and considering the antidegradation status. Seven designated uses for the waterways of the State are defined in Rules of Tennessee Department of Environment and Conservation, Chapter 0400-40-04. Table 3-1 provides a listing of streams in the project area with their state designated use classifications (TDEC 2019).

Table 3-1. Use Classifications for Streams Crossed by the Proposed Bud Crockett-Henderson 161-kV Transmission Line and Associated Access Roads

Stream	Use Classification[1]						
	DOM	IWS	FAL	REC	LWW	IRR	NAV
Beech River	X	X	X	X	X	X	-
Wolf Creek	-	-	X	X	X	X	-
Little Wolf Creek Branch	-	-	X	X	X	X	-
North Fork Forked Deer River	-	-	-	-	-	-	-
Middle Fork Creek	-	-	X	X	X	X	-
South Fork Forked Deer River	-	-	-	-	-	-	-
Jacks Creek	-	-	X	X	X	X	-

[1] Codes: DOM = Domestic Water Supply, ISW = Industrial Water Supply, FAL = Fish and Aquatic Life, REC = Recreation, LWW = Livestock Watering and Wildlife, IRR = Irrigation, NAV = Navigation
Note: North Fork Forked Deer River and South Fork Forked Deer River are not crossed by the transmission line but are included in the table for organizational purposes of associated tributaries.
Source: Tennessee Department of Environment and Conservation 2019

The CWA under Section 303(d) requires all states to identify all waters in which required pollution controls are not sufficient to attain or maintain applicable water quality standards and to establish priorities for the development of limits based on the severity of the pollution and the sensitivity of the established uses of those waters. In addition, the state assigns a priority for development of Total Maximum Daily Loads based on the severity of the pollution and the sensitivity of the uses, among other factors (EPA 2023b). States are required to submit reports to the EPA. The term “303(d) list” refers to the list of impaired and threatened streams and water bodies identified by the state. The Beech River and its tributary, Wolf Creek, are listed on the 2022 303(d) list by TDEC as impaired due to *E. coli* within the Beech River and for physical substrate habitat alterations in Wolf Creek (Table 3-2).

Table 3-2. Tennessee Department of Environment and Conservation 303(d) Listed Streams Crossed by the Proposed Bud Crockett-Henderson 161-kV Transmission Line and Associated Access Roads

303(d) Impaired Stream	Use Impairment	Cause	Source
Beech River	Recreation	*Escherichia coli*	Grazing in Riparian or Shoreline Zones
Wolf Creek	Fish and Aquatic Life	*Physical Substrate Habitat Alterations*	Channelization

Sources: Tennessee Department of Environment and Conservation 2022b, Environmental Protection Agency 2022

3.2.2 Environmental Consequences

3.2.2.1 No Action Alternative

Under the No Action Alternative, TVA would not acquire new ROW to construct the proposed transmission line, expand existing ROW, or construct new access roads. Therefore, no impacts to surface water systems would occur because of TVA actions associated with the proposed project. However, changes to surface water systems are anticipated to continue to occur from the cumulative effects of surrounding land use practices and development.

3.2.2.2 Action Alternative

Surface Runoff

Construction activities associated with the proposed transmission line would involve ground disturbance for the installation of transmission line structures, resulting in the potential for increased erosion and sediment release, which may temporarily affect local surface waters due to stormwater runoff. Soil erosion and sedimentation can contaminate and block small streams and threaten aquatic life. Appropriate BMPs would be followed to ensure the proposed action would minimize erosion and sedimentation impacts and possible introduction of pollutants into surface waters.

A general construction storm water permit would be needed if more than 1 acre is disturbed. This permit also requires the development and implementation of a Storm Water Pollution Prevention Plan (SWPPP). The SWPPP would identify specific BMPs to address construction-related activities that would be adopted to minimize storm water impacts. Additionally, applicable Aquatic Resource Alteration Permits and USACE Section 404 Permits would be obtained for impacts to jurisdictional wetlands, stream channels, or other waters of the United States within the project area.

TVA expects to utilize existing access roads to the extent possible and, as such, potential impacts to streams will be minimized through avoidance (if practical) and the implementation of erosion and sediment BMPs identified in the SWPPP, to reduce potential sediment-laden runoff into adjacent or downgradient streams. However, temporary stream crossings may be required. Temporary stream crossings and other construction activities would comply with appropriate state and federal permit requirements and TVA requirements as described in *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Construction and Maintenance Activities* (TVA 2022). Additionally, BMPs as described in the *Tennessee Erosion and Sediment Control Handbook* (TDEC 2012) would be used to avoid contamination of surface waters in the project area. Proper implementation of these controls would be expected to result in only minor, temporary impacts to surface waters. See Section 3.3 Aquatic Ecology and Appendix C for buffer zone sizes and additional stream crossing details.

Changes in the perviousness of ground cover may alter the percolation rates of rain through the soil resulting in additional runoff of water and pollutants into storm drains, ditches, and streams. Clearing of vegetation and ground cover and the addition of gravel yards under this alternative would alter the current stormwater flows on the site(s). This flow would be properly treated through implementation of the proper stormwater BMPs or an engineered discharge drainage system that could handle any increased flows prior to discharge into the outfall(s).

Domestic Sewage
During the construction phase, portable toilets would be provided for the construction workforce as needed. These toilets would be provided by a licensed vendor, 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.

Equipment Washing and Dust Control
Equipment washing and dust control discharges would be handled in accordance with BMPs described in the SWPPPP for water-only cleaning. TVA routinely includes precautions in the design, construction, and maintenance of its transmission line projects to minimize these potential impacts. Permanent stream crossings that cannot be avoided are designed to not impede runoff patterns and the natural movement of aquatic fauna. Temporary stream crossings and other construction and maintenance activities would comply with appropriate state permit requirements and TVA requirements as described in *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Construction and Maintenance Activities* (TVA 2022). 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.

Design and construction of the Bud Crockett-Henderson 161-kV Transmission Line would abide by all federal, state, and local guidelines and all applicable permits and requirements for protective measures to surface water including the implementation of BMPs; therefore, there would be no impacts to surface waters.

Transmission Line Maintenance
Improper use of herbicides to control vegetation within transmission line ROW has the potential to result in runoff to streams and impact resident aquatic biota. 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 EPA-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.

Maintenance of vegetation within transmission line ROW will also be consistent with TVA's Transmission System Vegetation Management Final PEIS (TVA 2019) and *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Construction and Maintenance Activities* (TVA 2022). TVA would use BMPs specifically directed toward avoiding or minimizing adverse impacts on SMZs and the waterbodies to minimize erosion and transport of sediments in the streams along the transmission line ROW. TVA guidance for environmental protection and BMPs limit the broadcast application of fertilizers and herbicides within the SMZs, including the spraying of herbicides other than those labeled for aquatic use (TVA 2019).

Summary

Construction and maintenance of the proposed transmission line and ROW would increase septic output, solid wastes, the potential for sediment, herbicides, and other pollutants to enter waterways. Appropriate BMPs would be followed to minimize impacts associated with soil disturbance and all proposed project activities. Additionally, all construction and operation activities would be conducted in a manner to ensure that waste materials are contained and managed appropriately (e.g., refueling, maintenance activities, and storage of equipment) to ensure that the introduction of pollutants to the receiving waters would be minimized (TVA 2022).

Proposed project activities that result in unavoidable direct impacts to surface water resources would be mitigated as appropriate in conjunction with agency consultation. Additionally, BMPs would be used that would further reduce indirect impacts to surface water. Therefore, both direct and indirect impacts to surface water resources are anticipated to be minor.

3.3 Aquatic Ecology

3.3.1 Affected Environment

The analysis of potential effects to aquatic resources included the local watersheds but was focused on the location of the proposed project (herein referred to as the proposed project area) which included the watercourses within or immediately adjacent to the proposed Bud Crockett–Henderson 161-kV Transmission Line ROW and associated access roads. The proposed project area lies within the Beech River (0604000108), South Fork Forked Deer River (0801020501), North Fork Forked Deer River (0801020502) HUC-10 watersheds, in the Southeastern Plains and Hills level IV sub-ecoregion of the greater Southeastern Plains level III ecoregion. The Southeastern Plains and Hills ecoregion is characterized by sandy, irregular plains with low rolling hills, covered in a mix of row crop agriculture and patches of oak-hickory forest (Chapman et al. 2004). Field surveys conducted in November 2022 and August 2023 identified 83 watercourses including 32 streams, 47 WWC/ephemeral streams, and 4 ponds.

Because transmission line construction and maintenance activities primarily affect riparian conditions and instream habitat, TVA evaluated the existing condition of these factors at each stream crossing along the proposed transmission line route. Hydrologic determinations were made using the Tennessee Division of Water Pollution Control's Version 1.5 field forms by Tennessee Qualified Hydrologic Professionals In-Training. These forms evaluate the geomorphology[6], hydrology[7] , and biology of each stream. Linear watercourses were classified as stream or WWC/ephemeral stream. Streams according to the 2020 TDEC Division of Water Pollution Guidance for Making Hydrologic Determinations are "a surface water that is not a wet-weather conveyance [Rule 0400-4-3-.04(20)]. A WWC is a "man-made or natural watercourses, including natural watercourses that have been modified by channelization: that flow only in direct response to precipitation runoff in their immediate locality: whose channels are at all times above the ground water table: that are not suitable for drinking water supplies: and in which hydrological and biological analysis indicate that, under normal weather conditions, due to naturally occurring ephemeral or low flow there is not sufficient water to support fish, or multiple populations of obligate lotic aquatic organisms whose life cycle includes an aquatic phase of at least two months [Rule 1200—3.04(25)].

[6] The branch of geology that studies the form of the earth's surface.

[7] The scientific study of the properties, distribution, and effects of water on the earth's surface, in the soil and underlying rocks, and in the atmosphere.

A listing of perennial and intermittent stream and pond crossings within the proposed ROW and associated access roads, excluding WWC/ephemeral streams, is provided in Appendix C. Additional information regarding water courses located in the vicinity of the project area can be found in Section 3.2 Surface Water.

During the field surveys in November 2022 and August 2023, streams encountered were mostly low-gradient, sandy-bottomed ephemeral seeps and occasional larger tributaries to the Beech River (a tailwater section below the TVA Beech Reservoir) and the Deer River. Streams were observed in primarily forested cover with some agricultural and urban influences. Substrates were primarily cobble or sand bottoms. Watercourses in higher gradient areas were far more erosive and many had incised deeply through the soil profile.

Three classes were used to indicate the current condition of streamside vegetation along streams encountered during field surveys, as defined below, and accounted for in Table 3-3.

- Forested - Riparian area is mostly 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.

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

Table 3-3. Riparian Condition of Streams Crossed by the Proposed Bud Crockett–Henderson 161-kV Transmission Line and Associated Access Roads

Riparian Condition	Streams Within Right-of-Way
Forested	12
Partially forested	17
Non-forested	6
Total	**35**

TVA assigns appropriate SMZs and BMPs based on field observations and other considerations (i.e., State 303(d) listing and presence of endangered or threatened aquatic species). Appropriate application of the SMZs and BMPs would minimize the potential for impacts to water quality and in-stream habitat degradation which could limit impacts on aquatic organisms. 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. TVA would be obliged to adhere to state and federal permit requirements and to commit to any required mitigation provisions as a result of adverse modifications made to the project area.

3.3.2 Environmental Consequences

3.3.2.1 Alternative A – No Action

Under the No Action Alternative, the transmission line and associated access roads would not be built. Thus, no changes to aquatic resources within these areas would result from TVA's actions. However, as described in Section 3.1.2.1, changes to aquatic life would likely continue to occur from the cumulative effects of surrounding land use practices and development.

3.3.2.2 Alternative B – Action Alternative

Aquatic life could be affected by the proposed Action Alternative. The proposed project includes the short-term construction of a new transmission and structures within the ROW easement and long-term ROW vegetation management. As such, it is foreseeable that the proposed ROW grading and clearing as well as future vegetation management processes could result in associated stream impacts.

Impacts would either occur directly by the alteration of habitat conditions within the stream or indirectly due to modification of the riparian zone and storm water runoff resulting from construction and maintenance activities associated with the vegetation removal efforts.

Potential impacts due to removal of streamside vegetation within the riparian zone 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).

Watercourses that convey only surface water during storm events (e.g., WWC/ephemeral streams and ponds) and that could be affected by the construction, operation, or maintenance of the proposed transmission line would be protected by TVA's standard BMPs as identified in TVA (2022) and/or standard 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 or ponds.

For any alterations to perennial or intermittent streams, TVA would require SMZs to be implemented. TVA also identifies a SMZ and provides additional categories of protection to perennial or intermittent watercourses directly affected by an Action Alternative based on the variety of species and habitats that exist in the streams, as well as the state and federal requirements to avoid harming certain species (Appendix C). The width of the SMZs is determined by the type of watercourse, primary use of the water resource, topography, or other physical barriers (TVA 2022).

Applicable permits would be obtained prior to any construction for any stream alterations located within the proposed ROW. The terms and conditions of these permits would be followed including any required mitigation from the proposed activities. All perennial or intermittent watercourses and ponds identified in Appendix C within the proposed ROWs or crossed by proposed access roads would be protected by Standard Stream Protection (Category A) as defined in TVA (2022). While historically present downstream in these watersheds, habitat for two aforementioned species of conservation concern is no longer present near the proposed project area. Therefore, Category A protection would be sufficient to protect all streams. This standard (basic) level of protection for streams and the habitats around them is aimed at

minimizing the amount and length of disturbance to the water bodies without causing adverse impacts on the construction work.

Because appropriate BMPs and SMZs would be implemented during construction, operation, and maintenance activities, any impacts to aquatic ecology would be temporary and insignificant because of implementing the proposed Action Alternative.

Cumulative impact analysis of the aquatic ecology effects considers stream loss at a watershed-level scale and includes current actions or those that would occur within the reasonable and foreseeable future. Since the transmission line conductors would span any watercourse within the ROW, no stream loss is anticipated because of the construction, operation, or maintenance of the proposed transmission line or access roads.

3.4 Vegetation

3.4.1 Affected Environment

The proposed project would occur in the Southeastern Plains and Hills level IV ecoregions (Griffith et al. 1998). The Southeastern Plains and Hills level IV ecoregion is characterized as having bands of alternating clay and sand formations that extend north to south from Kentucky into Tennessee. Some of the larger hill's characteristic of this ecoregion reach upwards of 650 feet and offer more relief than the western Loess Plains ecoregion. The characteristic land vegetation type for this ecoregion is oak-hickory forest that grades into oak-hickory-pine forest as you move south. Land cover is a mixture of cropland, mixed forest, pasture, and some pine plantations and land use is rural residential, urban, and industrial.

Field surveys were conducted in November 2022 to document plant communities, infestations of invasive plants, and to search for possible threatened and endangered plant species in areas where work would occur. Most areas along the proposed upgrades and new ROW were visited during the surveys. Using the National Vegetation Classification System (Grossman et al. 1998), vegetation types observed during field surveys can be classified as a combination of deciduous forest and herbaceous vegetation. No forested areas in the proposed project area had structural characteristics indicative of old growth forest stands (Leverett 1996). The plant communities observed on-site are common and well represented throughout the region.

Deciduous forest, where deciduous trees account for more than 75 percent of total canopy cover, occupies 51 percent of the proposed project area. This habitat type is found between large swaths of agricultural fields and urban development and is dominated by American beech, American Holly, black cherry, post oak, Southern red oak, shagbark hickory, tulip poplar, and white oak. The understory consisted of American hornbeam, blueberry, Christmas fern, ebony spleenwort, green briar, Japanese honey suckle, mayapple, persimmon, sassafras, sensitive fern, Southern lady-fern, summer grape, and winged elm. Most deciduous forests in the proposed project area have trees that average between 6- and 18-inches diameter at breast height. Forested wetlands were found in several locations of the proposed ROW. Forested wetlands are described in detail in Section 3.8.

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 and occurs on about 49 percent of the proposed project area. Most of this habitat type occurs along roadsides, cropland, hayfields, recent clear-cuts, and heavily manipulated pastures also support herbaceous vegetation. Most of these sites are dominated by plants indicative of early successional habitats including many non-native species. Early successional areas with naturalized vegetation contain herbaceous

species like American pokeweed, annual ragweed, blackberry, broomsedge, bristle thistle, bearded beggarticks, common elephant's-foot, dog fennel, giant ragweed, Johnson grass, kudzu, meadow-grass, silver plume grass, stinging nettle, Venus's looking-glass and white clover. Areas of emergent wetlands were present in the proposed project area. See the wetland section 3.8 for species indicative of those areas.

EO 13112 (Invasive Species) directed TVA and other federal agencies to prevent the introduction of invasive species (both plants and animals), control their populations, restore invaded ecosystems, and take other related actions. EO 13751 amends EO 13112 and directs actions by federal agencies to continue coordinated federal prevention and control efforts related to invasive species. This order incorporates considerations of human and environmental health, climate change, technological innovation, and other emerging priorities into federal efforts to address invasive species; and strengthens coordinated, cost efficient federal action.

Some invasive plants have been introduced accidentally, but most were brought here as ornamentals or for livestock forage. Because these robust plants arrived without their natural predators (insects and diseases) their populations spread quickly across the landscape displacing native species and degrading ecological communities or ecosystem processes (Miller 2010).

No federal-noxious weeds were observed, but many non-native invasive plant species were observed throughout the proposed project area. Invasive species present across significant portions of the landscape include Callery pear, Chinese privet, Japanese honeysuckle, Japanese stilt grass, Johnson grass, sericea lespedeza, tall fescue, and wild garlic. During field surveys, invasive plants were prevalent in sections of herbaceous vegetation types.

3.4.2 Environmental Consequences

3.4.2.1 Alternative A – No Action

Under the No Action Alternative, areas within the proposed project and access roads would remain in their current condition. Thus, adoption of the No Action Alternative would not affect plant life because no project-related work would occur. Changes to local plant communities resulting from natural ecological processes and human-related disturbance would continue to occur, but the changes would not result from the proposed project. Therefore, there would be no direct, indirect, or cumulative impacts to plant life under the No Action Alternative.

3.4.2.2 Alternative B – Action Alternative

Implementing the Action Alternative would involve clearing the ROW (to accommodate the transmission line and structures) and access roads. 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.

Adoption of the Action Alternative would not significantly affect the terrestrial ecology of the region. Clearing and converting forested land for the construction of the proposed transmission line and upgrades would be long-term in duration, but insignificant. Adoption of this alternative would require clearing of approximately 98 acres of mostly deciduous forest. Vegetation would then be routinely, periodically maintained in a meadow-like state for the life of the transmission line ROW. Virtually all forests in the proposed project area have been previously cleared and plant communities found there are common and well represented throughout the region.

Cumulatively, project-related effects to forest resources would be negligible when compared to the total amount of forested land found 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.

Nearly the entire proposed project area currently has a substantial component of invasive terrestrial plants. Adoption of the Action Alternative would not significantly affect the extent or abundance of these species at the county, regional, or state level. The use of TVA standard operating procedures for revegetating with noninvasive species (TVA 2022) would serve to minimize the potential introduction and spread of invasive species in the proposed project area.

3.5 Wildlife

3.5.1 Affected Environment

Habitat assessments for terrestrial animal species were conducted in December 2022 and August 2023. The project area is a mixture of forest, pastures, crop fields, and residential/developed areas. Fourteen wetlands, five ponds, and thirty-two streams occur in the project footprint. Small herbaceous areas are present between forest fragments and along edges of roads and agricultural fields. Overall, wildlife communities present in the project area are common to the region as habitats are not unique or uncommon.

Forested areas occupy 98 acres and make up approximately 51 percent of the proposed ROW and access roads (hereafter referred to as the project footprint). Forests present within the project footprint are primarily deciduous. These forests provide habitat for an array of terrestrial animal species. Birds observed in this habitat include white-throated sparrow, downy woodpecker, golden crowned kinglet, northern flicker, red bellied woodpecker, pileated woodpecker, Carolina wren, and tufted titmouse. These areas also provide foraging and roosting habitat for several species of bat, particularly in areas where the forest understory is partially open. Common bat species likely found within this habitat include big brown bat, eastern red bat, evening bat, and silver-haired bat. Eastern chipmunk, southern flying squirrel, white-footed deermouse, gray fox, and raccoon are other common forest mammals in this region. Eastern box turtle, gray tree frog, red cornsnake, green anole, eastern fence lizard, and little brown skink are amphibians and reptiles that can be found in forests in this region (Conant and Collins 1998).

Pastures and agricultural crop fields make up approximately 49 percent of the project footprint (94 acres). Early successional habitats containing native species are less common and are present in some fragmented areas between forests and in small parcels along roadsides and field edges. Common inhabitants observed in early successional habitat include eastern meadowlark, red-tailed hawk, song sparrow, turkey vulture, killdeer, northern harrier, American kestrel, field sparrow, northern bobwhite, and eastern phoebe. White-tailed deer, nine-banded armadillo, bobcat, coyote, hispid cotton rat, and red fox are mammals observed or commonly found in open fields and cultivated land in this region (Kays and Wilson 2002). Reptiles including copperhead, eastern hog-nosed snake, common kingsnake, and North American racer are also known to occur in this habitat type (Conant and Collins 1998).

Developed areas were present at road crossings and residential areas within the project footprint and are home to a number of common species. American crow, blue jay, northern cardinal, eastern towhee, European starling, and northern mockingbird are birds observed along road edges, parks, farms, and yards. Mammals observed or commonly found in this community type include eastern gray squirrel, eastern mole, woodchuck, striped skunk, and Virginia

opossum (Kays and Wilson 2002). Roadside ditches provide potential habitat for amphibians including American toad, southern cricket frog, and spring peeper. Reptiles potentially present include common five-lined skink, Dekay's brownsnake and common gartersnake (Conant and Collins 1998).

Forested wetlands, emergent wetlands, riparian areas and ponds occur within the project area (see Sections 3.8 Wetlands and 3.3 Aquatics for more details). Bald eagle, pied billed grebe, gadwall, American wigeon, great blue heron, swamp sparrow, and red-winged blackbird were observed at wetlands and water bodies during field survey. Beaver, golden mouse, southern short-tailed shrew, and muskrat are common mammals in emergent wetland and aquatic communities (Kays and Wilson 2002). Pond slider, smooth softshell, spiny softshell, common watersnake, and rough green snake are common reptiles likely present within this habitat (Conant and Collins 1998). Amphibians likely found in wetlands in this area include Mississippi slimy salamander, three-lined salamander, eastern newt, marbled salamander, spotted salamander, green treefrog, Fowler's toad, and southern leopard frog (Conant and Collins 1998).

Review of the TVA Regional Natural Heritage database in September 2023 indicated that no caves have been documented within three miles of the project area or within Chester or Henderson counties. No other unique or important terrestrial habitats were identified within the project area during a field survey. A wading bird rookery was observed approximately 0.3 miles from the project area. No additional aggregations of migratory birds have been documented within three miles of the project area.

No bald eagle or osprey nests have been previously recorded within three miles of the project area and none were observed during field surveys of the proposed ROWs in December 2022 or August 2023. A wading bird colony was observed approximately 0.3 miles from the project footprint but project actions would not impact the nests at this distance. Review of the USFWS's Information for Planning and Consultation website in September 2023 resulted in thirteen migratory bird species of conservation concern (American kestrel, bald eagle, brown-headed nuthatch, cerulean warbler, chimney swift, eastern whip-poor-will, Kentucky warbler, lesser yellowlegs, prairie warbler, prothonotary warbler, red-headed woodpecker, rusty blackbird, and wood thrush) identified as having the potential to occur in the project area. Suitable foraging habitat exists in the proposed ROWs for each of these species except for lesser yellowlegs. Suitable nesting habitat was observed in the proposed ROWs for each of these species except lesser yellowlegs and rusty blackbird which breed elsewhere (National Geographic 2002).

3.5.2 Environmental Consequences

3.5.2.1 Alternative A – No Action

Under the No Action Alternative, TVA would not build the proposed transmission line or the associated access roads. Tree clearing and earth moving would not occur. Trees, soil, and vegetation would remain in their current state. Terrestrial animals and their habitats would not be affected under the No Action Alternative. However, as described in Section 3.1.2.1, potential effects from anticipated changes to the project area are likely to occur over the long-term due to factors such as population growth and land use changes.

3.5.2.2 Alternative B – Action Alternative

Most wildlife currently using the project area would be temporarily displaced by habitat removal or alteration. Construction-associated disturbances and habitat removal would disperse mobile wildlife into surrounding areas. Less mobile individuals may be directly impacted by construction, particularly if clearing activities take place during breeding/nesting seasons. Approximately 94 acres of early successional, herbaceous habitat (pastures, cultivated fields, and residential areas) are within the project footprint. In these areas, impacts to wildlife habitat would be limited to locations where structure installation would cause ground disturbance. Species adapted to early successional habitat would return after construction has ended and vegetation has returned. Approximately 98 acres of forest would be removed and maintained as early successional habitat for the life of the transmission line. Species that require forested habitat would have to find new food and shelter sources and reestablish territories. However, the actions are not likely to affect populations of species common to the area, as similar forested habitat exists in the surrounding landscape.

Thirteen species of migratory birds of conservation concern identified by the USFWS could be present in Chester or Henderson counties. Foraging habitat for twelve of these species exists in the project area. Should mature individuals occur on site, they are expected to flush if disturbed. No direct mortality to adult birds is anticipated. Suitable nesting areas may be present for any of these except lesser yellowlegs and rusty blackbird which breed elsewhere (National Geographic 2002). Bald eagle nests are easily identified and would be avoided should any be established before project construction begins. Proposed actions are in compliance with the National Bald Eagle Management Guidelines (USFWS 2007). Individual nests, eggs, and juveniles of the remaining ten species may be directly impacted by project actions, but migratory bird populations would not be impacted.

3.6 Endangered and Threatened Species

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

The State of Tennessee provides legal protection for species considered threatened, endangered, or deemed in need of management within the state other than those federally listed under the ESA. The legal listing is handled by TDEC; however, the Tennessee Heritage Program and TVA both maintain databases of species that are considered threatened, endangered, or special concern, or tracked in Tennessee. Species listed under the ESA or by the State (see Table 3-4) are discussed in this section.

Table 3-4. Federally and State-listed Species From and/or Within Chester and Henderson Counties, Tennessee and other species of conservation concern for the Proposed Bud Crockett-Henderson 161-kV Transmission Line[1]

Common Name	Scientific Name	Federal Status[2]	State Status[2]	State Rank[3]
Aquatic Animals				
Fishes[4]				
Firebelly Darter	*Etheostoma pyrrhogaster*		NMGT	S2
Flame Chub	*Hemitremia flammea*		NMGT	S3
Crustaceans[4]				
Hatchie Burrowing Crayfish	*Fallicambarus hortoni*	UR	END	S1
Terrestrial Plants				
Whorled Sunflower	*Helianthus verticillatus*	END	END	S1
Terrestrial Animals				
Birds				
Whooping crane[4]	*Grus americana*	EXPN		SX
Insects				
Monarch butterfly[5]	*Danaus plexippus*	C		S4
Mammals				
Gray bat[5]	*Myotis grisescens*	END	END	S2
Northern long-eared bat[4]	*Myotis septentrionalis*	END	THR	S1S2
Tricolored bat[4]	*Perimyotis subflavus*	PE	THR	S1S3
Reptiles				
Coal skink	*Plestiodon anthracinus*	-	NMGT	S1
Alligator snapping turtle[4]	*Macrochelys temminckii*	PT	THR	S2S3

[1] Sources: TVA Regional Natural Heritage database and Mississippi Natural Heritage database (accessed July and September 2023); U.S. Fish and Wildlife Service (USFWS) Ecological Conservation Online System (http://ecos.fws.gov/ecos/home.action) extracted 9/20/2023.

[2] Status Codes: C = Candidate Species; END = Endangered; EXPN = Experimental Population; NMGT = Deemed in Need of Management; NOST = No Status; PE = Proposed Endangered; PT = Proposed Threatened; SPCO = Special Concern; THR = Threatened; TRKD = Tracked; UR = Status Under Review by USFWS

[3] State Ranks: SX = Believed Extirpated from the State; S1 = Critically Imperiled; S2 = Imperiled; S3 = Vulnerable; S4 = Apparently Secure

[4] Federally listed species that has not been documented within three miles of the project area or from Chester or Henderson counties, Tennessee; USFWS has determined this species could occur in the project area.

[5] Candidate species for listing under the Endangered Species Act. Historically this species has not been tracked by state or federal heritage programs.

3.6.1 Affected Environment

3.6.1.1 Aquatic Animals

A query of the TVA Regional Natural Heritage database and USFWS's Information for Planning and Conservation database indicated no federally listed species as known to occur within the potentially affected 10-digit HUC watersheds of the proposed project area. However, three state-listed species (two fish and one crayfish) are considered extant within these drainages (Table 3-4).

Species Accounts

Flame chubs inhabit spring-fed tributaries of the Tennessee River, most of which have been heavily impacted by hydrological alteration thereby reducing their range by half (Stallsmith 2010).

Firebelly darters inhabit similar headwater streams in these watersheds and have been greatly impacted by channel alterations and silt from habitat degradation. This has greatly restricted their range, leaving firebelly darters susceptible to further habitat alterations (Carney and Burr 1989).

The Hatchie burrowing crayfish is currently under federal review and have been found approximately 2 miles away from the project area within an extremely restricted range. This species burrows in wetland drainages and is often confused with other similar crayfish species due to misidentification (Jeff Simmons personnel communication).

3.6.1.2 Vegetation

A review of the TVA Regional Natural Heritage database indicated there are no federally listed plant species previously reported within a 5-mile vicinity of the proposed project area; however, there has been one state-listed plant species (Table 3-4). One federally listed plant species has been previously reported from Chester County. No federally listed plant species are known from Henderson County. No federally or state-listed plants were observed in the proposed project area during field surveys. No designated critical habitat for plants occurs in the proposed project area.

3.6.1.3 Wildlife

A review of terrestrial animal species in the TVA Regional Natural Heritage database in September 2023 indicated one state-listed species (coal skink) has been documented within three miles of the proposed ROW (Table 3-4). Additionally, the USFWS has determined that five federally listed species and a candidate for federal listing, the monarch butterfly, have the potential to occur in Chester and Henderson counties (Table 3-4). Thus, habitat suitability and potential impacts to each of these species have been addressed in the sections below. TVA's programmatic agreement with USFWS ensures compliance with Section 7 ESA regarding impacts to federally listed bats (TVA 2023b). The proposed actions are in compliance with the National Bald Eagle Management Guidelines (USFWS 2007). With the use of BMPs (TVA 2022) and identified conservation measures such as those identified in the TVA bat strategy form and National Bald Eagle Management Guidelines, the proposed actions likely would have no effect on federally or state-listed species.

Species Accounts

Monarch butterflies are a highly migratory species, with eastern U.S. populations overwintering in Mexico. Summer breeding habitat in the U.S. requires milkweed plant species, on which adults exclusively lay eggs for larvae to develop and feed on. Adults will drink nectar from other blooming wildflowers when milkweeds are not in bloom. Suitable early successional habitat is present in the proposed ROW. No records are known within Chester or Henderson counties, but this species has not traditionally been tracked by heritage programs. This species is currently listed under the ESA as a candidate species and is not subject to Section 7 consultation under the ESA.

Coal skinks are most often found along stream edges and often shelter under rocks, logs, or other cover. When disturbed, coal skinks often dive into water and hide beneath rocks or other aquatic debris. Their habitat generally consists of humid wooded areas with abundant leaf litter and loose rocks. Often the lizard occurs in the vicinity of springs, swamps, and bogs, but it also inhabits clearcuts, highway and powerline ROWs, rocky bluffs above creek valleys, dry, rocky, south-facing hillsides, and dry shale barrens. One record of this state-listed species is known approximately 1.0 miles from the project area.

Alligator snapping turtles are state-listed as threatened by Tennessee, and proposed threatened by USFWS. This highly aquatic reptile emerges from water only for nesting, and rarely for basking. This species is restricted to river and stream drainages which flow into the Gulf of Mexico. These turtles are found in floodplain swamps and oxbow lakes associated with large rivers but do not occur in isolated wetlands and ponds. Most nesting occurs from May to July. USFWS has determined that alligator snapping turtles may occur in Chester and Henderson counties, but no records are known, and no suitable habitat was observed in the proposed project area during field survey.

Whooping cranes are large birds that migrate long distances between breeding areas and winter range. Their migration habitat includes marshes, shallow lakes, lagoons, and grain fields. This species once existed throughout midwestern North America and is presumed to be extirpated from Tennessee. A small number of whooping cranes introduced beginning in 2001 migrate through Tennessee on their route between Wisconsin and Florida. USFWS has determined that whooping cranes may occur in Chester and Henderson counties, but no records are known. Suitable habitat for this species is present within the action area in agricultural fields and a complex of large shallow ponds and wetlands.

Gray bats are associated with caves year-round, migrating between different roosts in winter and summer. This species emerges at dusk to forage for insects along waterways. There are no documented caves within 3 miles of the project area, and none were observed during field surveys. Foraging habitat is present in the project action area over the Beech River, ponds, streams, and wetlands. USFWS has determined that gray bats may occur in Chester and Henderson counties, but no records are known.

Tricolored bats roost in trees among clumps of live and dead leaves, in tree cavities, caves, mines, buildings, bridges, and rock crevices in summer. In the winter they roost in caves, mines, or other cave-like structures including box culverts and dams. They forage in forested areas and over water. This species is known throughout the TVA region but has seen dramatic population declines in recent years due to the introduction of a novel fungus that causes white-nose syndrome. USFWS has proposed this species for listing as endangered. There are no documented caves within 3 miles of the project area, and none were observed during field surveys. Suitable forest habitat is abundant in the project area, but no records of this species are known in Chester or Henderson counties.

The northern long-eared bat predominantly overwinters in large hibernacula, such as caves and abandoned mines. During the fall and spring, this species utilizes entrances of caves and surrounding forested areas for swarming and staging. There are no documented caves within 3 miles of the project area, and none were observed during field surveys. In the summer, northern long-eared bats roost individually or in colonies beneath exfoliating bark or in crevices of both live and dead trees greater than 3 inches in diameter. This species is also known to roost in abandoned buildings and under bridges. 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. All of these habitat types are abundant within the proposed project area. Assessment of the project area for presence of summer roosting habitat for the northern long-eared bat followed USFWS survey guidelines (USFWS 2023) and resulted in the identification of 44 suitable forested areas, totaling 62.3 acres. USFWS has determined that northern long-eared bats may occur in Chester and Henderson counties although no records are known.

3.6.2 Environmental Consequences

3.6.2.1 Alternative A – No Action

Under the No Action Alternative, there would be no direct, indirect, or cumulative effects to federally or state-listed endangered or threatened species or critical habitats by TVA project-related actions. Changes to the area would nonetheless occur over time, as factors such as population trends, land use and development, quality of air/water/soil, recreational patterns, and cultural, ecological, and educational interests change within the area. The status and conservation of any potentially affected listed species would continue to be determined by the actions of others similar to those described in Section 3.1.2.1.

3.6.2.2 Alternative B – Action Alternative

3.6.2.2.1 Aquatic Animals

As indicated in Section 3.2.2.2 Surface Water, adverse water quality impacts can potentially result from the implementation of the proposed project, which could have direct and indirect impacts to aquatic biota within watercourses in the project area.

The Hatchie burrowing crayfish, which is state-listed and under federal review, is extant within the Forked Deer River watershed. This species has an extremely restricted range of less than 80 square kilometers. The closest records are two miles away and the main population occurs in the Hatchie River system. While it's possible this crayfish's habitat is present within the project area, it is unlikely to be present given the geographic separation and its limited range. Furthermore, no designated critical habitat for aquatic species occurs within the Beech River, South Fork Forked Deer River, North Fork Forked Deer River 10-digit HUC watersheds in Henderson and Chester counties.

As described in Section 3.2.2.2 Surface Water and 3.3.2.2 Aquatic Ecology, streams documented within the proposed project area would be protected by standard BMPs and additional categories of protection measures as described in TVA (2022), or as required by standard permit conditions. These BMPs are designed in part to minimize disturbance of riparian areas, and subsequent erosion and sedimentation that can be carried to streams. These categories of protection are based on the variety of species and habitats that exist in the streams as well as the state and federal requirements to avoid harming certain species. No federally designated critical habitat is known from the potentially affected 10-digit HUC watersheds of the proposed project area. Therefore, with appropriate implementation of BMPs during construction, operation, and maintenance of the transmission line and ROW, no impacts to federally or state-listed aquatic species are anticipated to occur as a result of the proposed Action Alternative.

3.6.2.2.2 Vegetation

Adoption of the Action Alternative would have no effect on federally listed plant species because no federally listed plant species occur in the proposed project area. Also, no populations of state-listed species were observed during field surveys of the proposed project area. Therefore, no direct, indirect, or cumulative impacts on endangered and threatened species and their critical habitats are anticipated as a result of implementing the Action Alternative.

3.6.2.2.3 Wildlife

Monarch butterfly eggs and larvae may be directly impacted during construction. ROW vegetation management is ultimately beneficial to this species because it maintains early successional habitat that is essential to their life cycle. Monarchs are currently listed under the ESA as a candidate species and are not subject to Section 7 consultation.

Individual coal skinks may be directly impacted if they are in the project area during construction, however, protection of SMZs may mitigate direct impacts to their primary habitat. This species uses a variety of habitats, including ROWs. Project activities may cause minor impacts to coal skinks but would not permanently impact their populations.

Alligator snapping turtles are not present in the project area due to absence of large water bodies. With the use of BMPs to prevent sedimentation and herbicide inputs to streams, proposed actions would not impact alligator snapping turtles.

A small number of whooping cranes introduced beginning in 2001 migrate through Tennessee on their route between Wisconsin and Florida. This population has been designated Experimental and Non-Essential by USFWS and is not subject to Section 7 consultation under the ESA. Project actions would be limited to temporary disturbance near potential foraging sites and would not impact whooping crane populations.

Gray bat foraging habitat is present over various streams, wetlands, and ponds within the project area and water quality would be protected by BMPs. No caves are known within Chester or Henderson counties or within 3 miles of the project footprint and none were observed during field survey.

Northern long-eared bat and tricolored bat foraging habitat exists over ponds, streams, and wetlands within the proposed ROW. BMPs would be utilized in SMZs around these bodies of water, thus minimizing impacts to water quality. Additional foraging habitat for both species exists within forests. Foraging habitat within the proposed ROW would be removed in association with the proposed actions. However, similarly suitable foraging habitat is plentiful in the surrounding landscape. No caves, cave-like structures, or other winter hibernacula for these species exist in the project footprint or would be impacted by the proposed actions. Summer roosting habitat is present within the proposed ROW and either species may be impacted if they are roosting in trees at the time of clearing. Loss of a maternity colony, if present, could impact the populations of these declining species.

Activities associated with this approval were addressed in TVA's programmatic consultation with the U.S. Fish and Wildlife Service on routine actions and federally listed bats in accordance with ESA Section 7(a)(2), originally completed April 2018, and updated in May 2023. For those activities with potential to affect bats, TVA committed to implementing specific conservation measures when impacts to federally listed bat species are expected (e.g., the loss of potential roosting habitat). Relevant conservation measures to this project are identified in the bat strategy form and must be reviewed and implemented as part of the approved project. With the

use of identified conservation measures and BMPs, proposed actions would not significantly impact gray bats or northern long-eared bats. In addition, proposed actions would not jeopardize the continued existence of the tricolored bat.

3.7 Floodplains

3.7.1 Affected Environment

A floodplain is the relatively level land area along a stream or river that is subjected to periodic flooding. The area subject to a one-percent chance of flooding in any given year is normally called the 100-year floodplain. The area subject to a 0.2-percent chance of flooding in any given year is normally called the 500-year floodplain. It is necessary to evaluate development in the floodplain to ensure that the project is consistent with the requirements of EO 11988 (Floodplain Management).

Based upon 1:24,000 USGS topographic maps and a review of Henderson County, Tennessee, FEMA Flood Insurance Rate Map (FIRM) panel numbers 47077C0143D, 47077C0144D, 47077C0217D, 47077C0220D, 47077C0230D, 47077C0235D, and 47077C0236D, all effective 4/16/2008, and Chester County, Tennessee, FEMA FIRM panel number 47023C0050E, effective 5/4/2009, portions of the transmission line and portions of several access roads would cross the 100-year floodplains of Jacks Creek and one tributary, Wolf Creek and several tributaries, and Middle Fork Creek, in Chester and Henderson counties.

3.7.2 Environmental Consequences

3.7.2.1 Alternative A – No Action

Under the No Action Alternative, TVA would not construct the proposed transmission line or associated access roads. Therefore, there would be no impacts to floodplains.

3.7.2.2 Alternative B – Action Alternative

As a federal agency, TVA adheres to the requirements of EO 11988. 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" (EO 11988, Floodplain Management). 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 (U.S. Water Resources Council 1978). The EO requires that agencies avoid the 100-year floodplain unless there is no practicable alternative.

EO 13690, Establishing a Federal Flood Risk Management Standard and a Process for Further Soliciting and Considering Stakeholder Input, was reinstated by President Joe Biden in May 2021. However, implementation of EO 13690 is still in development at the national level. TVA is working with other federal agencies to develop consistent implementing plans for these EO requirements and may update its implementing plan when federal guidance is finalized. TVA currently incorporates floodplain analyses with respect to the 500-year floodplain in alignment with EO 13690, in addition to EO 11988.

Consistent with EO 11988, overhead transmission lines and related support structures are considered repetitive actions in the 100-year floodplain that should result in minor impacts. The conducting wires of the transmission line would be located well above the 100-year flood elevation. The support structures for the transmission line 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 transmission line location in floodplains are followed (TVA 1980). Based on topographic maps, the switches at either end of the transmission line would be located outside 100-year floodplains and tens of feet above an unnamed intermittent tributary of Jacks Creek as shown on the Jacks Creek TN topographic map at the south end and an unnamed perennial tributary of Wolf Creek as shown by the Lexington TN topographic map at the north end.

New access roads would be constructed, or existing access roads modified. Portions or all of access roads to Structures 102, 104, 105, 106, 109, 110, 111, 115, 116, 170-171, 211-212, 218, 121, 122, 128, 137, and 196-197 are or would be located within 100-year floodplains. Consistent with EO 11988, access roads are considered repetitive actions in the 100-year floodplain that should result in only minor impacts (TVA 1981). To minimize adverse impacts, any road improvements in 100-year floodplains but not floodways would be done in such a manner that upstream flood elevations would not be increased by more than 1.0 foot.

Henderson County participates in the National Flood Insurance Program and any development must be consistent with its floodplain regulations. As shown in Figures 1 and 2, portions of access roads to Structures 102 and 105 would be located within the floodway of an unnamed tributary of Beech River. To prevent an obstruction in the floodway: (1) any fill, gravel or other modifications in the floodway that extend above the pre-construction road grade would be removed after completion of the project; (2) this excess material would be spoiled outside of the published floodway; and (3) the area would be returned to its pre-construction condition.

By implementing the following routine mitigation measures, the proposed transmission line, switches, and access roads would have no significant impact on floodplains and their natural and beneficial values:

- Standard BMPs would be used during construction activities (TVA 2022).
- Construction would adhere to the TVA subclass review criteria for transmission line location in floodplains (TVA 1980).
- For access roads to Structures 104, 106, 109, 110, 111, 115, 116, 170-171, 211-212, 218, 121, 122, 128, 137, and 196-197, any road improvements would be done in such a manner that upstream flood elevations would not be increased by more than 1.0 foot.
- For access roads to Structures 102 and 105, (1) any fill, gravel or other modifications in the floodway that extend above the pre-construction road grade would be removed after completion of the project; (2) this excess material would be spoiled outside of the published floodway; and (3) the area would be returned to its pre-construction condition.

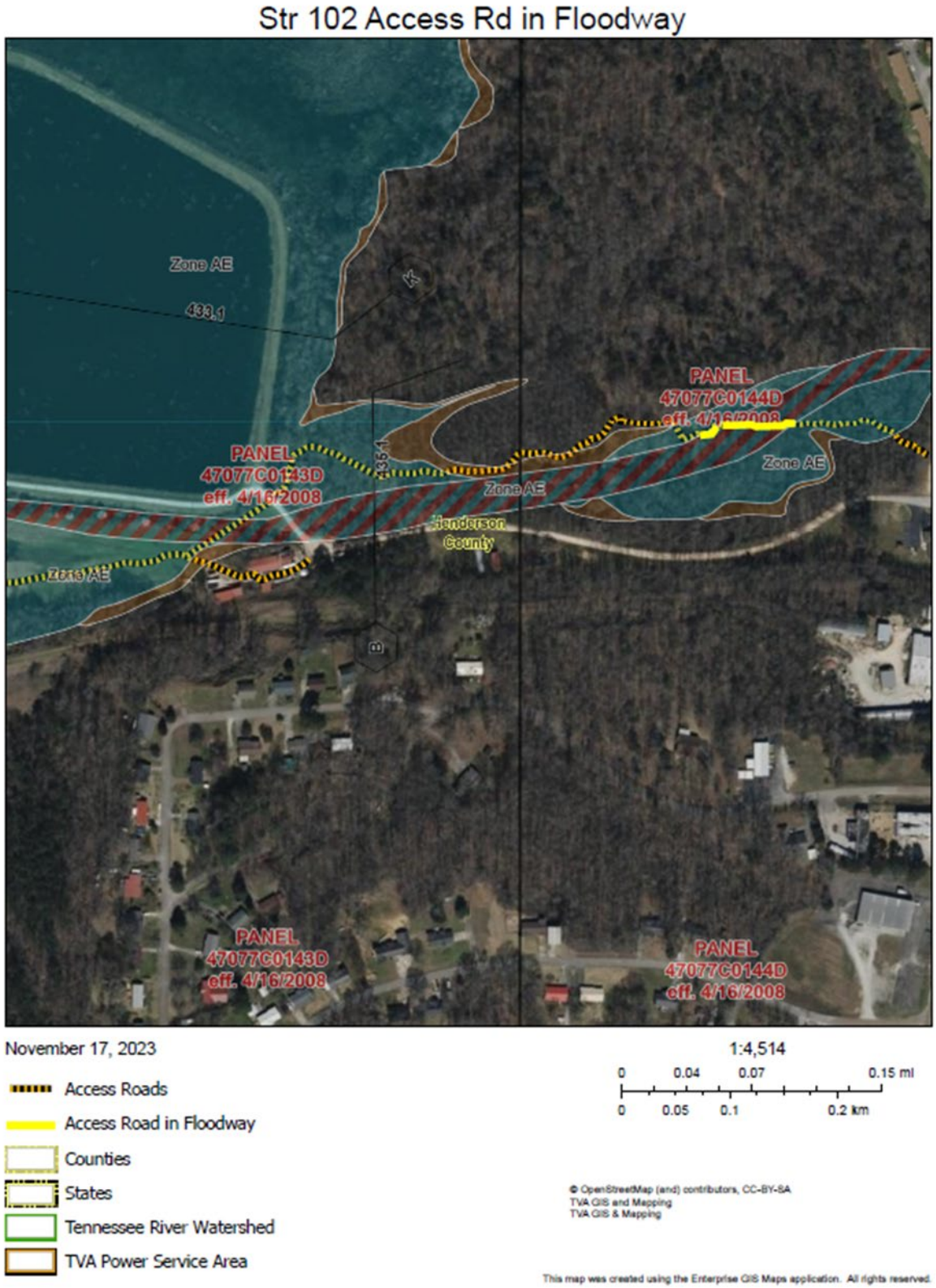


Figure 3-1. Portion of Access Road to Structure 102 in Beech River Unnamed Tributary Floodway

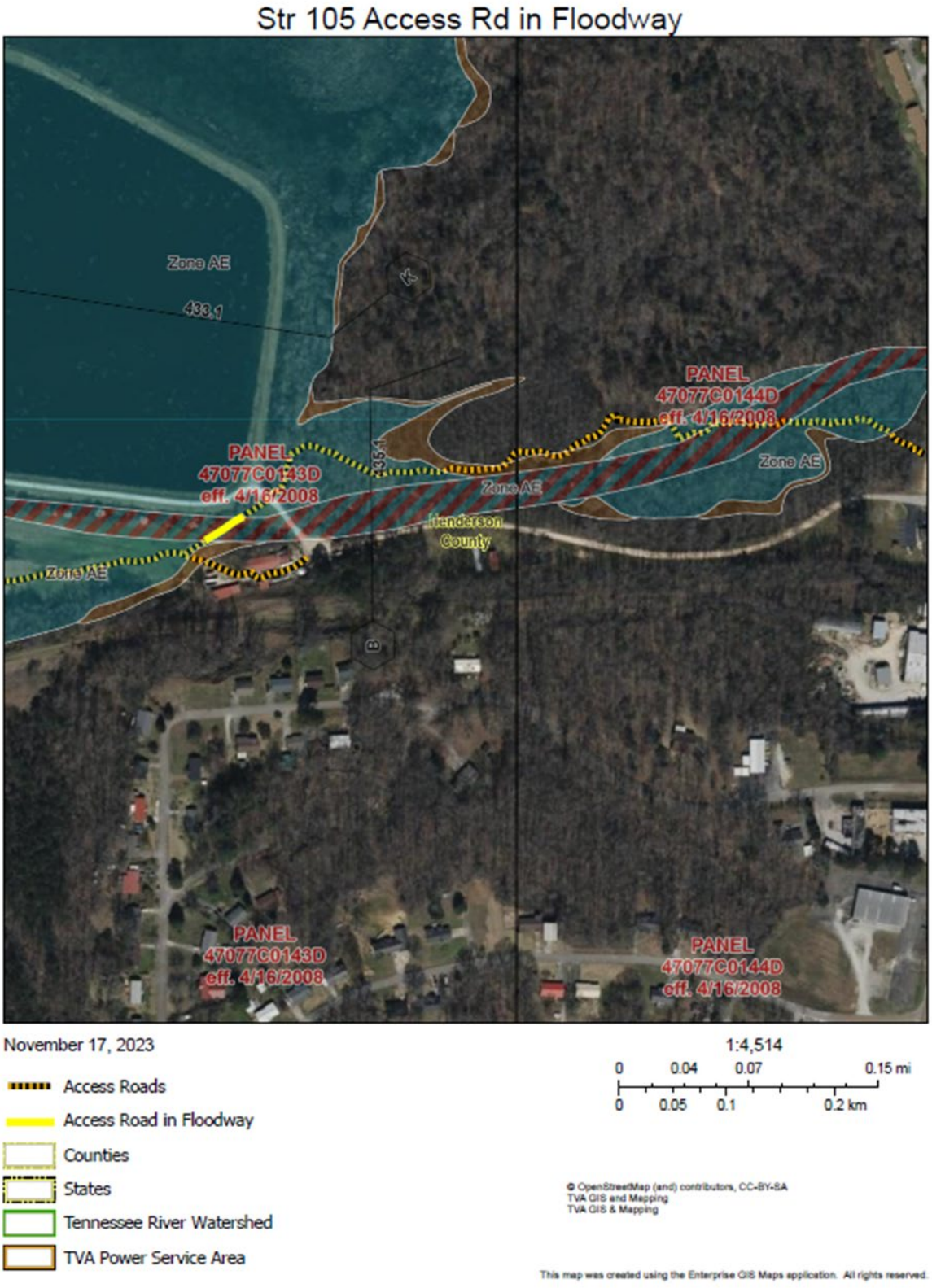


Figure 3-2. Portion of Access Road to Structure 105 in Beech River Unnamed Tributary Floodway

3.8 Wetlands

3.8.1 Affected Environment

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

Therefore, wetland assessments were performed to ascertain wetland presence, condition, and extent to which wetland functions are provided within the proposed project area. Field surveys were conducted in November 2022 and in August and September 2023 to delineate wetland areas along the proposed ROW.

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 2010). Using the Tennessee Rapid Assessment Method (TRAM), wetlands were evaluated by their functions and classified into three categories: low, moderate quality, or exceptional resource value (Table 3-5) (TDEC 2015).

- Low quality - wetlands are degraded aquatic resources which may exhibit low species diversity, minimal hydrologic input, and connectivity, recent or on-going 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 than low quality wetlands due to less 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 a reasonable potential for restoration.

- Exceptional resource value - wetlands offer high functions and values within a watershed or are of regional/statewide concern. These wetlands may exhibit little to no recent disturbance, provide substantial large scale stormwater storage, sediment retention, and toxin absorption, contain mature vegetation communities, or offer habitat to rare species. Conditions in superior quality wetlands often represent restoration goals for wetlands functioning at a lower capacity.

Table 3-5. Wetlands Located Within Proposed Bud Crockett-Henderson 161-kV Transmission Line Rights-of-Way Within Chester and Henderson Counties, Tennessee

Wetland Identifier	Wetland Type[1]	TRAM[2] Functional Capacity (score)	Wetland Acreage within the Right-of-Way	Forested Wetland Acreage in ROW
W001	PFO	Moderate (63)	0.01	0.01
W002	PEM	Low (40)	0.49	
W003	PEM	Low (41)	1.00	
W004	PEM	Low (32)	0.10	
W005	PSS	Low (43)	0.44	
W006	PEM	Low (36)	0.49	
W007	PEM	Low (34)	0.08	
W008	PEM	Moderate (46)	0.001	
W009	PEM	Low (39)	0.03	
W010	PFO	Low (37)	0.14	0.14
W011	PEM	Low (37)	0.30	
W012	PFO	Exceptional (75)	2.19	2.19
W013	PFO	Moderate (55)	1.35	1.35
W014	PFO	Moderate (45)	0.05	0.05
Total Acres			**6.67**	**3.74**

[1]Classification codes as defined in Cowardin et al. (1979): EM = Emergent, persistent vegetation; FO=Forested, broadleaf deciduous vegetation; P=Palustrine; SS=Scrub Shrub.
[2]TRAM = Tennessee Rapid Assessment Method that categorizes wetland quality by their functional capacity

The proposed project traverses a rural landscape, dominated by agricultural fields, forested uplands and bottomlands in Chester and Henderson counties. The project area is located across the Beech River (0604000108), North Fork Forked Deer River (0801020502) and the South Fork Forked Deer River (0801020501) HUC-10 watersheds. Fourteen wetlands, totaling 6.67 acres, were identified within the proposed project area (Table 3-5). Of this, approximately 3.74 acres are forested wetlands that would be cleared and maintained as shrub-scrub/emergent for the life of the transmission line.

Wetlands W001 through W011 are located in the Beech River watershed; W012 is located in the North Fork Forked Deer River watershed, and W013 and W014 are located in the South Fork Forked Deer River watershed. The combination of land-use practices and landscape position dictates the wetland habitat type, wetland functional capacity, and wetland value. The identified wetlands consisted of emergent, scrub-shrub and forested habitat, exhibiting both low, moderate, and exceptional condition, thus providing poor to suitable wetland value to the surrounding landscape (Tables 3-6 and 3-7).

- Trees/Forest stratum are considered: Woody plants, excluding woody vines, approximately 20 feet or more in height and 3 inches or larger in diameter at breast height.

- Shrub stratum are considered: Woody plants, excluding woody vines approximately 3 to 20 feet in height.

- Herb/emergent stratum are considered: All herbaceous (non-woody) plants, including herbaceous vines, regardless of size, and woody plants, except woody vines, less than approximately 3 feet in height.

Table 3-6. Acreage of Wetlands Representing Low, Moderate, or Exceptional Resource Value Within the Proposed Bud Crockett-Henderson 161-kV Transmission Line Rights-of-Way and Relative to the Total Mapped Wetland Occurrence Within the Watersheds

Watershed (10- Hydrologic Unit Code)	NWI Estimated Total Wetland Acres in Watershed[1]	Delineated Wetland Acreage in Project Area			
		Low Value	Moderate Value	Exceptional Value	TOTAL
Beech River (0604000108)	**686**	3.07	0.01	0	**3.08**
North Fork Forked Deer River (0801020502)	**602**	0	0	2.19	**2.19**
South Fork Forked Deer River (0801020501)	**829**	0	1.4	0	**1.4**

[1]National Wetlands Inventory (U.S. Fish and Wildlife Service 1982)

Table 3-7. Acreage of Wetlands by Habitat Type Within the Proposed Bud Crockett-Henderson 161-kV Transmission Line Rights-of-Way and Relative to the Total Mapped Wetland Occurrence Within the Watersheds

Watershed (10- Hydrologic Unit Code)	NWI Estimated Total Wetland Acres in Watershed[1]	Delineated Total Wetland Acreage in Proposed Project			
		Emergent	Scrub-Shrub	Forested	TOTAL
Beech River (0604000108)	**686**	2.49	0.44	0.15	**3.08**
North Fork Forked Deer River (0801020502)	**602**	0	0	2.19	**2.19**
South Fork Forked Deer River (0801020501)	**829**	0	0	1.40	**1.40**

[1]National Wetlands Inventory (U.S. Fish and Wildlife Service 1982)

Emergent wetlands within the project footprint totaled 2.49 acres across eight delineated wetland areas. Emergent wetlands are generally devoid of woody vegetation with predominant cover by non-woody species across areas periodically saturated and/or inundated. Emergent wetlands in this general vicinity are often found where land-use practices or inundation deter growth of woody species. Emergent wetlands encountered included saturated farmed/agricultural fields, recently cleared areas, and vegetated swales. These wetland areas contained indicators of wetland hydrology influencing soil physiology such that coloration indicative of wetland conditions was evident in the soil profile. Emergent wetlands were dominated by common emergent wetland vegetation including soft rush, sallow sedge, and deer-tongue. All emergent wetland habitat encountered scored as low or moderate quality using TRAM, indicating poor to moderate wetland quality, due to small size, surrounding land use, and evidence of disturbance (e.g., mowing, excavation, farming, etc.) (Table 3-5; Table 3-7).

Forested/Scrub-shrub wetlands in general have deeper root systems and contain greater biomass (quantity of living matter) per acre than emergent wetlands, which do not grow as tall. As a result, these wetlands provide higher levels of wetland functions, such as sediment retention, carbon storage, and pollutant retention and transformation (detoxification), storm water storage, and flood attenuation, all of which support better water quality and protection of downstream infrastructure (Ainslie et al. 1999; Scott et al. 1990; Wilder and Roberts 2002). Field surveys delineated a total of 3.74-acres of forested wetlands across five wetland areas. Additionally, 0.44 acre of scrub-shrub wetland was delineated across one wetland area. All of these wetland areas contained indicators of wetland hydrology influencing soil physiology such that coloration indicative of wetland conditions was evident in the soil profile. Forested wetlands identified were dominated by common wetland vegetation including sweetgum, American sycamore, and cherrybark oak. Forested wetland habitat encountered scored as low, moderate, and exceptional quality using TRAM (Table 3-5; Table 3-8). Scrub-shrub wetlands identified were dominated by common wetland vegetation including sweetgum, sallow sedge, and soft rush. Scrub-shrub wetland habitat encountered scored as moderate quality using TRAM (Table 3-5; Table 3-8).

Table 3-8. Acreage of Low, Moderate, and Exceptional Resource Value Forested Wetlands by Watershed Within the Proposed Bud Crockett-Henderson 161-kV Transmission Line Rights-of-Way

Watershed (10- Hydrologic Unit Code)	NWI Estimated Forested Wetland Acres in Watershed[1]	Delineated Forested Wetland Acreage In Proposed Project Area			
		Low Value	Moderate Value	Exceptional Value	TOTAL
Beech River (0604000108)	**640**	0.14	0.01	0	**0.15**
North Fork Forked Deer River (0801020502)	**562**	0	0	2.19	**2.19**
South Fork Forked Deer River (0801020501)	**800**	0	1.4	0	**1.40**

[1]National Wetlands Inventory (U.S. Fish and Wildlife Service 1982)

The Beech River watershed contains wetlands W001 to W011 within the project area. Of an estimated total 640 forested wetland acres in this watershed, the proposed project area includes 0.15 acres proposed for clearing and conversion to emergent/shrub-scrub, or 0.02 percent (Table 3-8). Of the 2.49 acres of emergent wetland located in this watershed, 0.33 acres would experience temporary impacts to accommodate access during construction. The single forested wetland identified in this watershed scored as moderate quality due to size, hydrological influence, and surrounding land use (Table 3-5). Wetland hydrology indicators, such as inundation, saturation, high water table, drainage patterns, and geomorphic position were exhibited within these wetlands. These hydrology parameters influenced the soil profile, and hydric soil coloration was evident. Hydrophytic forested vegetation was dominant and included sweetgum, red maple and slippery elm.

The North Fork Forked Deer River includes wetland W012 within the project area. Of an estimated total 562 forested wetland acres in this watershed, the proposed project area contains 2.19 acres proposed for clearing and conversion to emergent/shrub-scrub, or 0.39 percent (Table 3-8). The forested wetland identified in this watershed scored as moderate quality due to size, hydrological influence, and surrounding land use (Table 3-5). Wetland hydrology indicators, such as inundation, saturation, high water table, drainage patterns, and geomorphic position were exhibited within these wetlands. These hydrology parameters influenced the soil

profile, and hydric soil coloration was evident. Hydrophytic forested vegetation was dominant and included sweetgum, red maple, and cherrybark oak.

The South Fork Forked Deer River contains wetlands W013 and W014 within the project area. Of an estimated total 800 forested wetland acres in this watershed, the proposed project area contains 1.4 acres proposed for clearing and conversion to emergent/shrub-scrub, or 0.18 percent (Table 3-8). Forested wetlands identified in this watershed scored as low, moderate, and exceptional quality (Table 3-5). Wetland hydrology indicators, such as inundation, saturation, high water table, drainage patterns, and geomorphic position were exhibited within these wetlands. These hydrology parameters influenced the soil profile, and hydric soil coloration was evident. Hydrophytic forested vegetation was dominant and included sweetgum, American sycamore, and sugarberry.

3.8.2 Environmental Consequences

3.8.2.1 Alternative A – No Action

Under the No Action Alternative, the proposed project would not proceed. As such, no project related disturbance to wetlands within the proposed project footprint would occur. Therefore, no wetlands would be affected by TVA project-related activities. However, as described in Section 3.1.2.1 Surface Water, potential effects from anticipated changes to the project area are likely to occur over the long-term due to factors such as population growth and land use changes.

3.8.2.2 Alternative B – Action Alternative

Activities in wetlands are regulated by state and federal agencies to ensure no net loss of wetland resources. Under CWA Section 404, activities resulting in the discharge of dredge, fill, and associated secondary impacts to waters of the U.S., including wetlands, must be authorized by the USACE through a Nationwide, Regional, or Individual Permit. This project is in the Memphis District USACE. CWA Section 401 mandates state water quality certification for projects requiring USACE approval. In Tennessee, TDEC certifies CWA Section 404 permits and impacts to intrastate wetland resources through a general or individual aquatic resources alteration permit. In Tennessee, this permit is required for any alteration to the physical, chemical, or biological properties of any waters of the state, including wetlands, pursuant to the Tennessee Water Quality Control Act (§69-3-108, 0400-40-07). TDEC's permit process ensures compliance with Tennessee's anti-degradation policy as well (§69-3-108, 0400-40-04). Lastly, EO 11990 requires federal agencies to minimize wetland destruction, loss, or degradation, avoid new construction in wetlands wherever there is a practicable alternative, while carrying out agency responsibilities.

Efforts were made during project Planning and Siting processes to avoid wetlands to the extent practicable. However, because of project and topographic constraints, and because of the goal of minimizing impacts to other resources, no practicable alternative was available that would allow complete avoidance of wetlands. Section 2.2 describes TVA's process for detecting and avoiding wetland resources identified during the office level review, prior to field surveys.

Under the Action Alternative, the proposed transmission line would be constructed. The proposed ROW contains a total of 6.67 acres of wetlands. This total includes 2.49 acres of emergent wetland, 0.44 acres of scrub-shrub wetland, and 3.74 acres forested wetland. Approximately 0.33 acres of emergent wetlands within the proposed ROW corridors would experience temporary impacts to accommodate access during construction (Table 3-9). All emergent wetlands would be maintained long-term in their current state and functional capacity, due to their existing height being compatible and consistent with transmission line ROW

vegetation management objectives (TVA 2019). The 3.74 acres of forested wetland area within the proposed project area would be cleared and converted to emergent, meadow-like wetland habitat for the perpetuity of the transmission line's existence (Table 3-9).

Table 3-9. Impacts to Forested Wetlands Within the Proposed Bud Crockett-Henderson 161-kV Transmission Line Rights-of-Way

Wetland Identifier	Impact Type	Forested Wetland Clearing (Acres)	Temporary Wetland Impacts for Access (Acres)	Fill for Structure Installation (Acres)
W001	Clearing for transmission line construction	0.01	-	-
W002	Temporary impacts for access	-	0.06	-
W003	No Impacts - Avoid	-	-	-
W004	Temporary impacts for access	-	0.01	-
W005	No Impacts - Avoid	-	-	-
W006	Temporary impacts for access	-	0.04	-
W007	Temporary impacts for access	-	0.001	-
W008	Temporary impacts for access	-	0.01	-
W009	No Impacts - Avoid	-	-	-
W010	Clearing for transmission line construction	0.14	-	-
W011	Temporary impacts for access	-	0.05	-
W012	Clearing for transmission line construction	2.19	-	-
W013	Clearing for transmission line construction	1.35	-	-
W014	Clearing for transmission line construction	0.05	-	-
	TOTAL ACRES	**3.74**	**0.17**	**-**

As described in Section 2.2.2.2, adequate clearance between tall vegetation and transmission line conductors would require trees within the proposed ROWs to be cleared. Establishing transmission line corridors would require vegetation clearing within the full extent of the ROW, and future maintenance of low stature vegetation to accommodate clearance and abate interference with overhead wires. Woody vegetation would be removed initially with a feller buncher which involves a grip and blade attachment on a mechanized tracked or wide tire (low ground pressure) vehicle. The grip holds the tree trunk while the blade cuts below the grips. This method allows for removal of the cut aerial portion of a tree to an upland location for deposition, while leaving less than 12-inch stumps and the below ground root system entirely intact with minimal soil disturbance.

Wooded wetland (forested and scrub-shrub) conversion to emergent habitat results in reduction in wetland function. Due to the rate of water uptake, extensive root system, and structural integrity of trees and shrubs relative to herbaceous plants, wooded wetlands function at a greater capacity to impede and hold storm water, absorb toxins, retain sediment, and provide the shaded forage and spawning habitat necessary for its aquatic and terrestrial inhabitants to exist. Therefore, conversion of this community type to a habitat devoid of woody vegetation would result in a reduction of existing functional capacity.

Wetland fill associated with structure placement results in total loss of wetland function within the impact area and is subject to USACE/TDEC jurisdiction, per the directives of the CWA. Likewise, forested wetland conversion to accommodate structure locations and transmission line spans is considered a secondary impact under Section 404b of the CWA. Therefore, forested wetland loss is subject to the authority of the regulatory agencies to ensure no net loss of wetland functions

and values, per the directive of the CWA and the federal no net loss of wetland policy (EPA 1990). The CWA authorizes regulatory oversight for these impacts. The USACE and TDEC exert this oversight through an established permit process that ensures maintenance of the physical, biological, and chemical integrity of national and state waters, including wetlands, and the objectives of the CWA are upheld. The permitting process involves a demonstration of wetland avoidance, minimization of disturbance, and compensation for loss of wetland functions and values. In compliance with the CWA and EO 11990, TVA has considered all options to avoid and minimize wetland impacts, resulting in the least wetland disturbance practicable (Section 2-1).

Wetland habitat located in areas proposed for heavy equipment travel could experience minor and temporary impacts during transmission line construction or long-term asset and vegetation management. TVA would minimize wetland disturbance through adherence to standard wetland BMPs for all work necessary within the delineated wetland boundaries (TVA 2022). This includes the use of low ground-pressure vehicles, mats, or other wetland crossings to minimize rutting to less than 12 inches, erosion control techniques to deter indirect impacts through siltation into adjacent wetland areas, dry season work, etc. Vehicular traffic would be limited to narrowed access corridors along the ROWs for structure and conductor placement, fiber installation, and long-term maintenance.

With wetland avoidance and wetland minimization techniques in place, TVA would comply with all USACE/TDEC mitigation requirements to compensate for the proposed loss of wetland resources, functions, and values resulting from this Action Alternative. TVA would obtain the necessary Section 404/401 CWA permits and required compensatory mitigation to ensure the proposed wetland impacts are compensated/mitigated to the extent deemed appropriate such that wetland functions and values remain at the current capacity within the larger affected watershed. Required compensatory mitigation would be purchased through an approved wetland mitigation bank per the directive of the USACE and TDEC to ensure no more than minimal impacts to the aquatic environment result and the objectives of the CWA anti-degradation policy are upheld.

Cumulative impact analysis of wetland effects considers wetland loss and habitat conversion at a watershed scale currently and within the reasonable and foreseeable future. Loss of wetland habitat due to wetland fill would be compensated through wetland mitigation banking, resulting in no cumulative wetland impacts. Loss of wetland functions and values from forested wetland clearing would be compensated for at the discretion of the TDEC/USACE engineer. Forested wetland conversion for this project would take place across three watersheds: Beech River (0.15 acres), North Fork Forked Deer River (2.19 acres), and the South Fork Forked Deer River (1.4 acres). This would equate to 0.02, 0.39, and 0.18 percent of mapped forested wetland within these watersheds.

Similarly, general trends in wetland impacts resulting from development within the watershed would be subject to CWA, USACE, and TDEC mandates, and these regulatory requirements are in place to ensure wetland impacts do not result in cumulative loss. In this context, the proposed wetland impacts should be kept to a minimum on a cumulative scale due to the avoidance, minimization, and compliance measures in place. Therefore, in compliance and accordance with the CWA and the directives of USACE and TDEC ensuring no more than minimal adverse effects on the aquatic environment, the Action Alternative’s impacts to wetland would be insignificant.

3.9 Aesthetics

3.9.1 Visual Resources

3.9.1.1 Affected Environment

This assessment provides a review and classification of the visual attributes of existing scenery, along with the anticipated attributes resulting from the proposed action. The classification criteria used in this analysis are adapted from a scenic management system developed by the U.S. Forest Service (USFS) and integrated with planning methods used by TVA (USFS 1995). Potential visual impacts to cultural and historic resources are not included in this analysis as they are assessed separately in Section 3.11 Archaeological and Historic Resources.

The visual landscape of an area is formed by physical, biological, and man-made features that combine to influence both landscape identifiability and uniqueness. The scenic value of a particular landscape is evaluated based on several factors that include scenic attractiveness, scenic integrity, and visibility. Scenic attractiveness is a measure of scenic quality based on human perceptions of intrinsic beauty as expressed in the forms, colors, textures, and visual composition of each landscape. Scenic attractiveness is expressed as one of the following three categories: distinctive, common, or minimal. Scenic integrity is a measure of scenic importance based on the degree of visual unity and wholeness of the natural landscape character. The scenic integrity of a site is classified as high, moderate, low, or very low. The subjective perceptions of a landscape's aesthetic quality and sense of place are dependent on where and how it is viewed.

Views of the landscape are described in terms of what is seen in the foreground, middleground, and background distances. In the foreground, an area within 0.5 mile of the observer, details of objects are easily distinguished. In the middleground, from 0.5 mile to 4 miles from the observer, objects may be distinguishable, but their details are weak and tend to merge into larger patterns. In the distant part of the landscape, the background, details, and colors of objects are not normally discernible unless they are especially large, standing alone, or have a substantial color contrast. In this assessment, the background is measured as 4 to 10 miles from the observer. Visual and aesthetic impacts associated with an action may occur because of the introduction of a feature that is not consistent with the existing viewshed. Consequently, the visual character of an existing site is an important factor in evaluating potential visual impacts.

For purposes of this visual assessment, the project area is defined as the area encompassing the proposed transmission line servicing the Lexington and Jacks Creek communities. The new line would be approximately 16 miles long, beginning at TVA's West Lexington 161-kV Metering Station located in Lexington and extending southwest to TVA's Jacks Creek 161-kV Metering Station located in Jacks Creek. As stated in Section 1.1, the proposed transmission line would be constructed using mostly steel, single-pole structures centered on new, 100-foot-wide ROW and would require approximately 194 acres of new ROW.

The proposed transmission line would cross through level to gently rolling terrain in Henderson and Chester counties, in southwestern Tennessee. The landscape is characterized by rural development including agricultural fields and pastures, roadways, existing utility corridors, and scattered residences, with pockets of dense forest. The foreground is comprised of additional agricultural land and fragmented forested areas. Thus, the project vicinity consists of a combination of natural elements, such as rolling fields and forested areas, with human development, such as commercial and residential development and transportation corridors.

The composition and patterns of vegetation are the prominent natural features of the landscape within the project area. Apart from crop fields and pasture, vegetation within the project area consists of a variety of brush and trees, which are predominantly deciduous. The forms, colors, and textures of the natural features of the project area are typical of southwestern Tennessee and are not considered to have distinctive visual quality. Therefore, scenic attractiveness of the project area is considered common, due to the ordinary or common visual quality in the foreground, middleground, and background (Table 3-10). The scenic integrity is considered moderate due to noticeable human alteration, including commercial, residential, agricultural, and transportation uses. The scenic value class of a landscape is determined by combining the levels of scenic attractiveness, scenic integrity, and visibility and can be excellent, good, fair, or poor. Based on the criteria used for this analysis, the overall scenic value class for the project area is good.

Table 3-10. Visual Assessment Ratings for Project Area

	Exiting Landscape	
View Distance	**Scenic Attractiveness**	**Scenic Integrity**
Foreground	Common	Moderate
Middleground	Common	Moderate
Background	Common	Moderate

In a visual impact assessment, sensitive receptors generally include any scenic vistas, scenic highways, residential viewers, and public facilities or recreational areas located in the project's viewshed. The proposed transmission line would be visible to passing motorists from TN-22, TN-200, State Route 459, State Route 104, Highway 100, and various local roads along the route. Other sensitive visual receptors in the foreground include scattered residences and farmsteads, as well as recreationists on portions of Beech River. In addition, as shown in Figure 3-3, there are a number of schools, churches, cemeteries, a park, and a natural/recreational area (the TVA Beech River Reservoir) within the viewshed of the proposed transmission line. There are two schools, ten churches, and five cemeteries located within the foreground of the project area. The closest of these is the Church of God, located approximately 190 feet north of the northern terminus of the proposed Bud Crockett-Henderson 161-kV Transmission Line.

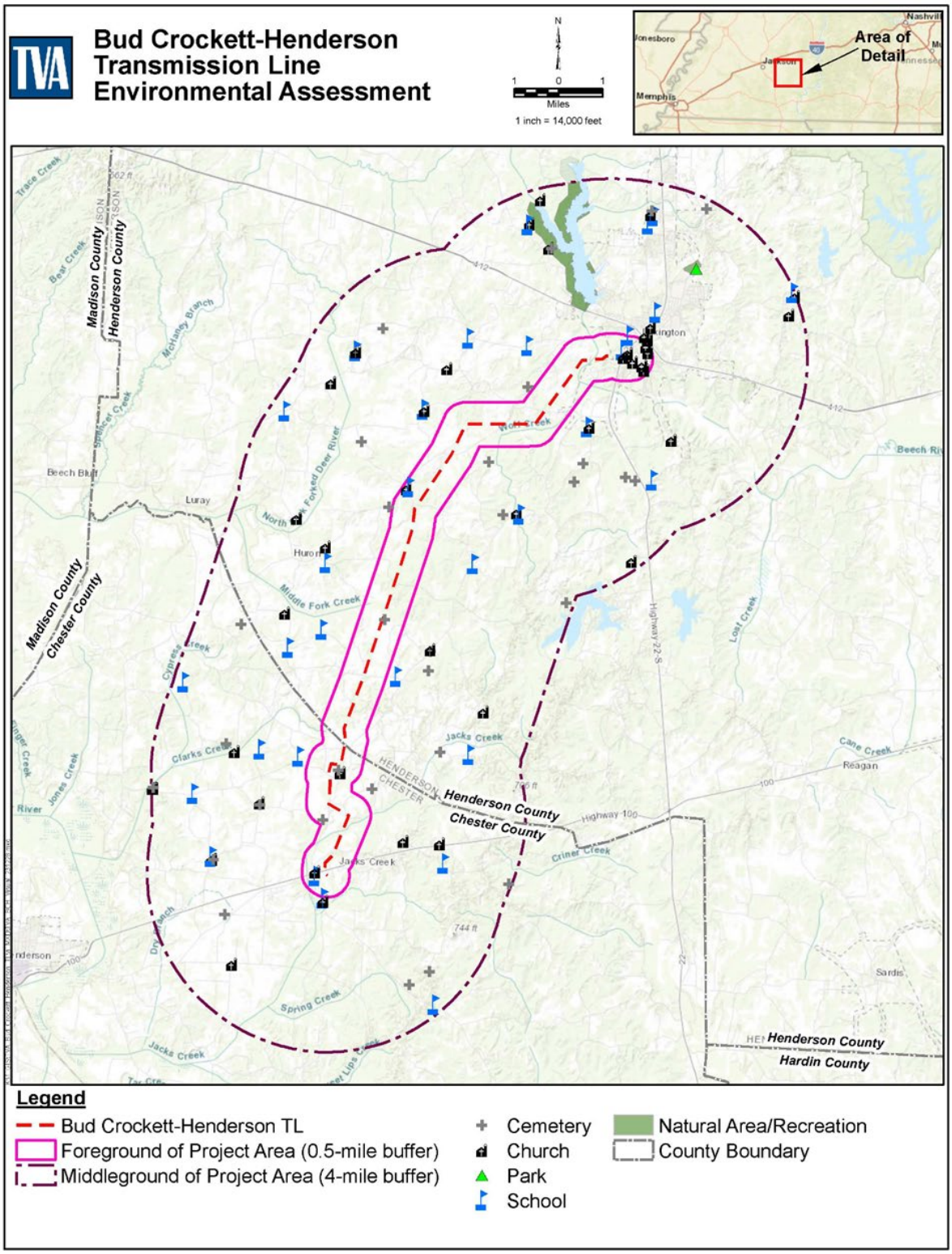


Figure 3-3. Sensitive Visual Receptors Within the Foreground and Middleground of the Proposed Bud Crockett-Henderson 161-kV Transmission Line

3.9.1.2 Environmental Consequences

The potential impacts to the visual environment from a given action are assessed by evaluating the potential for changes in the scenic value class ratings based upon landscape scenic attractiveness, integrity, and visibility. Sensitivity of viewing points available to the public, their viewing distances, and visibility of the proposed action are also considered during the analysis. These measures help identify changes in visual character based on commonly held perceptions of landscape beauty and the aesthetic sense of place. The extent and magnitude of visual changes that could result from the proposed alternatives were evaluated based on the process and criteria outlined in the scenic management system as part of the environmental review required under NEPA.

3.9.1.2.1 Alternative A – No Action Alternative

Under the No Action Alternative, TVA would not acquire new ROW to construct the proposed transmission line or construct new access roads. Thus, landscape character and integrity would remain in its current state and there would be no impact to visual resources associated with TVA's activities. However, changes to visual resources are anticipated to continue to occur from the cumulative effects of surrounding land use development.

3.9.1.2.2 Alternative B – Action Alternative

Under the Action Alternative, construction of the proposed Bud Crockett-Henderson 161-kV Transmission Line would result in both short-term and long-term impacts to visual resources. During the construction period (about 13 months), there would be some visual discord from existing conditions due to an increase in personnel and equipment coupled with disturbances of the current site characteristics. However, this would be contained within the immediate vicinity of the construction activities and would only last until all project activities have been completed and the disturbed areas have been seeded and restored using TVA's standard BMPs (TVA 2022). Because of their temporary nature, construction-related impacts to local visual resources are expected to be minor.

In addition, there may be some visual discord associated with clearing and construction of access roads. Most of the required access roads would be temporary to support construction activities. Where possible, existing roadways and utility ROW access roads would be utilized. Two new roads would be permanently established to support the construction and maintenance of the transmission line and ROW; however, they would be located within the ROW. Sensitive visual receptors located along the access roads would experience some minor visual discord during construction and maintenance activities. These impacts would be greater in areas with new access roads, compared to access established on existing roads and utility ROW. The access roads would mainly be utilized during the short-term construction period and then periodically utilized for maintenance of the transmission line and structures, or to maintain the vegetation along the ROW. Given the rural but residential development of the area, and that permanent access roads would be located within the ROW, construction and utilization of the access roads would have a minor impact on sensitive receptors and scenic quality.

Long-term impacts consist of the visible alterations associated with new transmission structures, overhead wires, ROW clearing, and access road maintenance and use. The most visible elements of the transmission system are the structures and the permanent removal of woody vegetation within the proposed ROW that creates a visible corridor. However, the addition of lines on or near existing structures or within existing utility or transportation ROW increases compatibility with the landscape and minimizes visual impacts. Therefore, on the portions of the transmission line near the existing substations and highways, where the proposed project would parallel existing ROW, changes to the viewshed would be minimized, as the project would

slightly expand the existing corridor feature rather than create a new visible corridor. The removal of forested areas and the installation of single, steel-pole structures (ranging between 80 and 120 feet above ground) and overhead wires would add discordantly contrasting elements and colors to the environment. Although much of the proposed transmission line would not be visible to the public due to the distance from developed areas and presence of forested buffers, it would be visible in the foreground to visitors of Lexington, motorists on nearby roadways, a number of residences, and recreationists on portions of Beech River at the proposed crossing. However, as existing transmission lines are present in the populated areas of Lexington and near Jacks Creek near the existing substations at the northern and southern portions of the proposed project area, the construction of the new transmission line would be noticeable but would not significantly alter the visual integrity near these areas.

As noted above, several residents reside near the proposed transmission line ROW. Areas where a new ROW is being introduced would create a new visible corridor and would be visible in the foreground to a number of these residences and to motorists. Although tree and wooded vegetation removal would occur, much of the proposed ROW is located in previously disturbed areas and located near major roadways and existing commercial development. As a portion of the proposed ROW is adjacent to existing transmission line ROW and transportation development, the introduction of the proposed transmission line would be minor. While the proposed transmission line would add discordant visual elements to the existing landscape, the view of these elements would be partially limited by existing transmission line ROW and human development adjacent to sensitive receptors and residential receptors in the immediate foreground. The transmission line is anticipated to be somewhat absorbed into the overall landscape character near existing utility corridors and roadways.

In addition to nearby residents, motorists, and recreationists, there are sensitive visual receptors, including two schools, ten churches, and five cemeteries, located within the foreground of the project area (Figure 3-3). The Church of God and Hope Ministries are the closest sensitive visual receptors to the transmission line. The presence of an existing transmission line ROW, which runs adjacent to these facilities near the existing West Lexington 161-kV Metering Station, increases the visual compatibility for the construction of a new transmission line and prevents significant changes to the viewshed. The remaining churches and cemeteries within the foreground are located 500 feet or more from the proposed transmission line ROW and are either shielded from view by dense vegetation and/or topography or have views of existing transmission line ROW and transportation corridors. For visual receptors located at further distances, in the middleground and background, the proposed transmission line would be less visible and obtrusive as it would largely fall into an observer’s view where objects are less distinguishable.

The human alterations already in place within the project area, including commercial development, roadways, and existing transmission system elements, currently contribute some visual discord with the natural landscape. These elements contribute to the landscape’s ability to absorb negative visual change. Therefore, while the forms, colors, and textures of the landscape that make up the scenic attractiveness would be affected by the construction of the transmission line, it would still remain common or ordinary (Table 3-11). Impacts to scenic integrity are anticipated to be greatest in the foreground along the proposed transmission line. At this distance, scenic integrity would be reduced from moderate to low, as visual alterations associated with the proposed transmission line (transmission structures, conductor, and clear-cut ROW corridors that disrupt the tree canopy) would be dominant features on the landscape.

Table 3-11. Visual Assessment Ratings for the Project Area Resulting from the Action Alternative

	Resulting Landscape	
View Distance	**Scenic Attractiveness**	**Scenic Integrity**
Foreground	Common	Low
Middleground	Common	Moderate
Background	Common	Moderate

However, there would be no change in the ratings for the middleground and background as the alterations associated with the transmission line would not be substantive enough to dominate the view from these distances (Table 3-11). Based on the criteria used for this analysis, the scenic value class for the affected environment after the proposed modifications would be reduced to fair in the foreground along the length of the proposed transmission line but would remain classified as good in the middleground. While the Action Alternative would contribute to a minor decrease in visual integrity of the landscape, the existing scenic class would not be reduced by two or more levels, which is the threshold of significance of impact to the visual environment. Therefore, visual impacts resulting from the implementation of the Action Alternative would be minor.

3.9.2 Noise

3.9.2.1 Affected Environment

Noise is unwanted or unwelcome sound usually caused by human activity and added to the natural acoustic setting of a locale. It is further defined as sound that disrupts normal activities or that diminishes the quality of the environment. Community response to noise is dependent on the intensity of the sound source, its duration, the proximity of noise-sensitive land uses, and the time of day the noise occurs (i.e., higher sensitivities would be expected during the quieter overnight periods).

Sound is measured in logarithmic units called decibels (dB). Given that the human ear cannot perceive all pitches or frequencies of sound, noise measurements are typically weighted to correspond to the limits of human hearing. This adjusted unit of measure is known as the A-weighted decibel (dBA) which filters out sound in frequencies above and below human hearing. A noise level change of 3 dBA or less is barely perceptible to average human hearing. However, a 5 dBA change in noise level is clearly noticeable. The noise level associated with a 10 dBA change is perceived as being twice as loud; whereas the noise level associated with a 20 dBA change is four times as loud and would therefore represent a “dramatic change” in loudness.

To account for sound fluctuations, environmental noise is commonly described in terms of the equivalent sound level. The equivalent sound level is the constant noise level that conveys the same noise energy as the actual varying instantaneous sounds over a given period. Fluctuating levels of continuous, background, and/or intermittent noise heard over a specific period are averaged as if they had been a steady sound. The day-night sound level (L_{dn}), expressed in dBA, is the 24-hour average noise level with a 10-dBA correction penalty for the hours between 10 p.m. and 7 a.m. to account for the increased sensitivity of people to noises that occur at night. Typical background day-night noise levels for rural areas are anticipated to range between an L_{dn} of 35 and 50 dB, whereas higher-density residential and urban areas background noise levels range from 43 dB to 72 dB (EPA 1974). Common indoor and outdoor noise levels are listed in Table 3-12.

Table 3-12. Common Indoor and Outdoor Noise Levels

Common Outdoor Noises	Sound Pressure Levels (dB)	Common Indoor Noises
	110	Rock Band at 5 m (16.4 ft)
Jet Flyover at 300 m (984.3 ft)		
	100	Inside Subway Train (New York)
Gas Lawn Mower at 1 m (3.3 ft)		
	90	Food Blender at 1 m (3.3 ft)
Diesel Truck at 15 m (49.2 ft)		Garbage Disposal at 1 m (3.3 ft)
	80	Shouting at 1 m (3.3 ft)
Gas Lawn Mower at 30 m (98.4 ft)	70	Vacuum Cleaner at 3 m (9.8 ft)
Commercial Area		Normal Speech at 1 m (3.3 ft)
	60	Large Business Office
	50	Dishwasher Next Room
Quiet Urban Daytime		
	40	Small Theater, Large Conference Room
Quiet Urban Nighttime		Library
Quiet Suburban Nighttime		
	30	Bedroom at Night
Quiet Rural Nighttime		Concert Hall (Background)
	20	Broadcast and Recording Studio
	10	
		Threshold of Hearing
	0	

Source: Federal Highway Administration 2018

The EPA noise guideline recommends outdoor noise levels do not exceed Ldn of 55 dBA, which is sufficient to protect the public from the effect of broadband environmental noise in typical outdoor and residential areas. These levels are not regulatory goals but are “intentionally conservative to protect the most sensitive portion of the American population” with “an additional margin of safety” (EPA 1974). The U.S. Department of Housing and Urban Development considers an Ldn of 65 dBA or less to be compatible with residential areas (U.S. Department of Housing and Urban Development 1985).

3.9.2.2 Environmental Consequences

3.9.2.2.1 Alternative A – No Action

Under the No Action Alternative, TVA would not construct the proposed transmission line, access roads, or make associated modifications to the existing transmission system. Therefore, there would be no impacts from noise under this alternative from TVA activities. 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 the potential for development to occur in the area.

3.9.2.2.2 Alternative B – Action Alternative

Under the Action Alternative, construction activities would last about 13 months and would generally be limited to daytime hours. During construction, noise would be generated by a variety of equipment including standard pick-up trucks, dump trucks, concrete trucks, feller-bunchers, bulldozers, excavators, graders, pile-drivers, augers, and rollers. Typical noise levels are expected to be 85 dBA or less at 50 feet from the construction equipment, except for pile-drivers which may produce noise levels of up to 95 dBA at 50 feet (Federal Highway Administration [FHWA] 2016). The actual observed noise would likely be lower in the field where vegetation and topography would cause further noise attenuation. Thus, typical construction noise would fall below the recommended EPA outdoor noise guideline of 55 dBA at all sensitive receptors. Additionally, pile driver use would be a short-term and relatively infrequent occurrence that would not contribute to typical background noise levels.

There is also a potential for indirect noise impacts associated with a temporary increase in traffic related to the workforce vehicle traffic, transport of construction equipment, and transport of spoil and borrow material. Roadway traffic noise is not usually a serious problem for people who live more than 500 feet from heavily traveled freeways or more than 100 to 200 feet from lightly traveled roads (FHWA 2011).

Due to the nature of the decibel scale and the attenuating effects of noise with distance, a doubling of traffic volume would result in an approximately 3 dBA increase in noise level, which would not normally be a perceptible noise increase (FHWA 2011).

During construction, operation, and maintenance of the proposed transmission line, equipment could generate noise above ambient levels (Appendix D). As all construction noise would be temporary in nature and limited to daytime hours, noise impacts from construction of the proposed transmission line would be minor.

For similar reasons, noise related to periodic line maintenance is also expected to be insignificant. Transmission lines may produce minor noise during operation under certain atmospheric conditions.

Under certain wet weather conditions high-voltage transmission lines may produce an audible low-volume hissing or crackling noise from corona discharge (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. Under normal conditions, corona-generated noise is not audible, and during rain showers, the corona noise would likely not be readily distinguishable from background noise. During very moist, non-rainy conditions, such as heavy fog, the resulting corona noise may produce a very minor increase in background noise levels in the vicinity of the transmission line, but due to distance, it is not expected to result in perceptible changes in noise level at the closest sensitive receptors. Off the ROW, corona noise is below the level that would interfere with speech.

3.10 Archaeological and Historic Resources

3.10.1 Affected Environment

Federal agencies are required by Section 106 of the National Historic Preservation Act and by NEPA to evaluate the potential effects of their proposed actions (or undertakings) on historic properties (36 CFR Part 800). The term “historic property” includes any historic or precontact site, district, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places (NRHP) maintained by the U.S. National Park Service.

To determine an undertaking’s possible effects on historic properties, a four-step review process is conducted.

These steps include:

- Initiation (defining the undertaking and the APE and identifying the parties to be consulted in the process).
- Identification of historic properties within the APE.
- Assessment of effects to historic properties.
- Resolution of adverse effects by avoidance, minimization, or mitigation.

To be eligible for listing on the NRHP if the cultural resource meets one of the following criteria:

- Criterion A: made a significant contribution to American history; for example, literature, ethnic heritage, health/medicine, and transportation.
- Criterion B: related to the life of significant persons; examples of NRHP properties nominated under Criterion B include George Washington’s Mt. Vernon estate.
- Criterion C: embodied distinctive characteristics of a type, period, or method of construction including works of a master or buildings that possess high artistic value.
- Criterion D: yielded important information about history or prehistory. This category is typically the most relevant criterion for archaeological resources. “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.

During the Section 106 process, the agency must consult with the appropriate SHPO, federally recognized Indian tribes that have an interest in the undertaking, and any other party with a vested interest in the undertaking. If avoidance or minimization are not feasible, measures to mitigate the adverse effect must be taken.

TVA recommends that the APE for the current undertaking includes the following:

- The approximate 15.8 miles, 100-feet-wide of planned ROW occupying about 194 acres and six miles (about 19.72 acres) of planned access routes.
- All areas in which the project would be visible within a half-mile radius of the proposed transmission line.

3.10.1.1 Archaeological Resources

A background and literature search found no archaeological resources within the APE. Three cemeteries: HS-15/Hamlet Cemetery, HS-22/Unity Missionary Baptist Church and Cemetery, andHS-35/Chapel Hill Baptist Church and Cemetery, are documented within the half-mile background study area. TVA contracted with TRC Environmental, Inc., to conduct a cultural resources survey of the 15.8-mile-long transmission line corridor (Davies and Karpynec 2023) and access routes (Stephens 2023) to be used during construction.

TRCs archeological survey resulted in the identification and evaluation of a single non-site cultural resource (IF1/ Native American) (Davies and Karpynec 2023). TVA recommends the single non-site cultural resource as ineligible for NRHP listing under Criteria A, B, and C.

3.10.1.2 Architectural Resources

During the cultural resources study of the transmission line corridor, TRC Environmental, Inc., also conducted an architectural assessment of the APE. According to NRHP records, there are two NRHP-listed properties in Chester County and three in Henderson County. Two of the Henderson County NRHP-listed properties, Montgomery High School and Thompsie Edwards House, are located within the half-mile background study area. Furthermore, five previously recorded architectural resources are located within the APE in Chester County (CS-48, CS-49, CS-50, CS-51, and CS-52) and one previously recorded architectural resource within Henderson County (HE-1132). None of the previously identified architectural resources are within the viewshed of the proposed ROW or transmission line structures, and therefore are outside of the architectural APE (Davies and Karpynec 2023).

TRC recorded 26 architectural resources in Chester County (HS1 to HS-26) and 45 architectural resources in Henderson County (HS-27 to HS-71) (Table 3-13). None warranted further investigation due to the lack of historical and/or architectural. Based on this, TRC recommended that none of the 71 properties are considered eligible for the NRHP (Davies and Karpynec 2023).

Table 3-13. List of Recorded Architectural Resources within the Area of Potential Effect

TRC Environmental, Inc. Survey #/Name	Date/Architectural Style	National Register of Historic Places Recommendation
HS-1	1955 1-story concrete block commercial building	Not Eligible
HS-2/Jacks Creek Church of Christ	Ca. 1940 gable-front church and ca. 1955 manse	Not Eligible
HS-3	1950 Ranch house	Not Eligible
HS-4	1955 Minimal Traditional house	Not Eligible
HS-5	1970 Ranch house	Not Eligible
HS-6	1950 Minimal Traditional house	Not Eligible
HS-7	1959 hipped-roof house	Not Eligible
HS-8	1964 Ranch house	Not Eligible
HS-9	1940 gable-front house	Not Eligible
HS-10	1956 Ranch house	Not Eligible
HS-11	1950 Minimal Traditional house	Not Eligible
HS-12	1940 side-gabled house	Not Eligible
HS-13	1950 Ranch house	Not Eligible
HS-14	1960 side-gable house	Not Eligible
HS-15/Hamlet Cemetery	19th century rural cemetery	Not Eligible
HS-16	1963 Minimal Traditional house	Not Eligible
HS-17	1958 Ranch house	Not Eligible
HS-18	1967 Ranch house	Not Eligible

TRC Environmental, Inc. Survey #/Name	Date/Architectural Style	National Register of Historic Places Recommendation
HS-19	1961 Ranch house	Not Eligible
HS-20	1960 Ranch house	Not Eligible
HS-21	1964 Ranch house	Not Eligible
HS-22/Unity Missionary Baptist Church and Cemetery	Ca. 1950 Neoclassical church	Not Eligible
HS-23	1964 Ranch house	Not Eligible
HS-24	1920 massed-plan, side-gabled house	Not Eligible
HS-25	1958 Ranch house	Not Eligible
HS-26	1960 Ranch house	Not Eligible
HS-27	1950 massed-plan, side-gabled house	Not Eligible
HS-28	1920 gable-front house	Not Eligible
HS-29	1930 gable-front house	Not Eligible
HS-30	1950 Minimal Traditional house	Not Eligible
HS-31	1971 Minimal Traditional house	Not Eligible
HS-32/Garrett Cemetery	Late 19th/Early 20th century rural cemetery	Not Eligible
HS-33	1961 Ranch house	Not Eligible
HS-34	1969 Ranch house	Not Eligible
HS-35/Chapel Hill Baptist Church and Cemetery	Ca. 1950 gable-front church	Not Eligible
HS-36	1937 gable-front house	Not Eligible
HS-37	1970 gable-front house	Not Eligible
HS-38	1970 Ranch house	Not Eligible
HS-39	1957 Minimal Traditional house	Not Eligible
HS-40	Ca. 1930 side-gabled house	Not Eligible
HS-41	1965 Ranch house	Not Eligible
HS-42	1949 gable-front house	Not Eligible
HS-43	1946 gable-front house	Not Eligible
HS-44	1959 gambrel-roof house	Not Eligible
HS-45	1973 Ranch house	Not Eligible
HS-46	1973 Neocolonial house	Not Eligible
HS-47	1973 Minimal Traditional house	Not Eligible
HS-48	1970 Minimal Traditional house	Not Eligible
HS-49	1966 commercial warehouse	Not Eligible
HS-50	1967 school	Not Eligible
HS-51	1960 commercial building	Not Eligible
HS-52	1964 Ranch house	Not Eligible
HS-53	1960 Ranch house	Not Eligible
HS-54	1962 Ranch house	Not Eligible
HS-55	1952 Minimal Traditional house	Not Eligible
HS-56	1952 Minimal Traditional house	Not Eligible
HS-57	1905 1.5-story hipped-roof house	Not Eligible
HS-58	1951 Tudor Revival house	Not Eligible
HS-59	1973 gable-front church and manse	Not Eligible
HS-60	1943 gable-front house	Not Eligible
HS-61	1959 Minimal Traditional house	Not Eligible
HS-62	1958 Minimal Traditional house	Not Eligible
HS-63	1953 gable-front house	Not Eligible
HS-64	1953 side-gabled house	Not Eligible
HS-65	1953 Minimal Traditional house	Not Eligible
HS-66	1953 Ranch house	Not Eligible
HS-67	1938 hipped-roof house	Not Eligible
HS-68	1956 gable-front house	Not Eligible
HS-69	1972 Ranch house	Not Eligible
HS-70	1963 Ranch house	Not Eligible
HS-71	1933 Craftsman/bungalow house	Not Eligible

3.10.2 Environmental Consequences

3.10.2.1 Alternative A – No Action

Under the No Action Alternative, the existing land use would be expected to remain unchanged. Ground disturbing agricultural practices at the project site would continue to potentially impact intact cultural resources at the surface or within the first 8 to 10 inches of soil. Therefore, no significant impacts to cultural resources would be anticipated as project area would not be developed as a transmission line, associated ROW, and access routes.

3.10.2.2 Alternative B – Action Alternative

TVA, in consultation with the Tennessee SHPO and federally recognized Indian tribes, found that the project would not impact any listed or eligible NRHP-listed archaeological or architectural sites. The Tennessee SHPO concurred with TVA's finding in letters dated October 3, 2023 (for the transmission line ROW) and December 15, 2023 (for the access roads) (see Appendix A). TVA received comments from two federally recognized Indian tribes. Of the Indian tribes who were consulted, TVA received concurrence for no effect from Chickasaw Nation for the transmission line ROW on September 29th, 2023, and concurrence for no adverse effect from the Eastern Shawnee Tribe on the access road portion on February 13, 2024.

Should previously undiscovered cultural resources be identified during Project Site construction or operations, a TVA archaeologist and consulting parties will be consulted before any further action is taken. TVA, therefore, finds that the undertaking i.e., implementing the Action Alternative, would have no adverse effect to historic properties.

3.11 Recreation, Parks, and Managed Areas

3.11.1 Affected Environment

Managed areas include lands held in public ownership that are managed by an entity (e.g., TVA, U.S. Department of Agriculture [USDA], USFS, State of Tennessee) to protect and maintain certain ecological and/or recreational features. Natural areas include ecologically significant sites; federal, state, or local park lands; national or state forests; wilderness areas; scenic areas; wildlife management areas; recreational areas; greenways; trails; Nationwide Rivers Inventory streams; and wild and scenic rivers. Ecologically significant sites are either tracts of privately owned land that are recognized by resource biologists as having significant environmental resources or identified tracts on TVA lands that are ecologically significant but not specifically managed by TVA's Natural Areas program.

A review of the TVA Regional Natural Heritage database identified three managed and natural areas within three miles of the proposed project area (Table 3-14). The Wetlands Reserve Program is the USDA's Natural Resources Conservation Service voluntary program for landowners to offer opportunities to protect, conserve, and enhance wetlands on their property.

Table 3-14. Managed and Natural Areas Within 3 Miles of the Proposed Project Area

Natural Area	Acres	Distance and Direction From Proposed Project Area (Miles)
Wetland Reserve Program	84	2.3 miles north
Wetland Reserve Program	31.59	0.1 miles southwest
Middle Fork Creek Stream Mitigation Site	11.53	2.3 miles east

Source: TVA Regional Natural Heritage database queried October 2022

There are no developed parks or outdoor recreation areas within or near the boundaries of this project and associated access roads. However, some dispersed recreational activities such as hunting could occur in some locations within or near the project area.

3.11.2 Environmental Consequences

3.11.2.1 Alternative A – No Action

Under the No Action Alternative, TVA would not construct the proposed transmission line. There would be no change in management of or access to managed and natural areas in the project area and vicinity.

Under the No Action Alternative, existing patterns of occasional dispersed outdoor recreation activities such as hunting would be expected to continue.

3.11.2.2 Alternative B – Action Alternative

Under the proposed Action Alternative, TVA would construct, operate, and maintain the proposed 14-mile transmission line between the West Lexington Station and the Jack's Creek tap point areas. Of the three managed and natural areas located within 3 miles of the proposed project area, one could be affected from the proposed project during the construction phase of this project. A 31.59-acre Wetlands Reserve Program parcel is located within 0.1 mile south of the proposed transmission line route. Impacts could include construction noise and visual intrusions which would be minimized using standard BMPs (TVA 2022) and coordination with the landowner/manager. Given the distance of the remaining two natural areas from the project area and the nature of the proposed project, no direct impacts are expected. Project related actions could cause some shifts in nearby dispersed recreational activity, but any impacts should be minor and temporary.

3.12 Socioeconomics and Environmental Justice

3.12.1 Affected Environment

As detailed in Section 3.13.2.2, impacts associated with the proposed project consist of temporary disturbances during construction (i.e., noise, traffic, and fugitive dust) as well as long-term visual and property value impacts, all of which are limited to communities in the immediate vicinity of the project footprint. There would be no emissions or releases of air pollutants or hazardous materials that would impact human health or welfare in the surrounding area. Thus, the study area for the socioeconomic and environmental justice analysis is limited to the 14 census block groups located in a 1-mile radius of the centerline of the new transmission line (see Figure 3-4). As the study area is located within Chester and Henderson counties, these counties and the state of Tennessee are included as appropriate secondary geographic areas of reference. Comparisons at multiple spatial scales provide a more detailed characterization of populations that may be affected by the proposed actions, including any environmental justice populations (e.g., minority and low-income). Demographic and economic characteristics of populations within the study area were assessed using the most recent U.S. Census Bureau (USCB) data available, including 2020 Decennial Census counts (USCB 2020) for total population and racial characteristics, and 2018-2022 American Community Survey 5-year estimates (USCB 2022) for the remaining datasets.

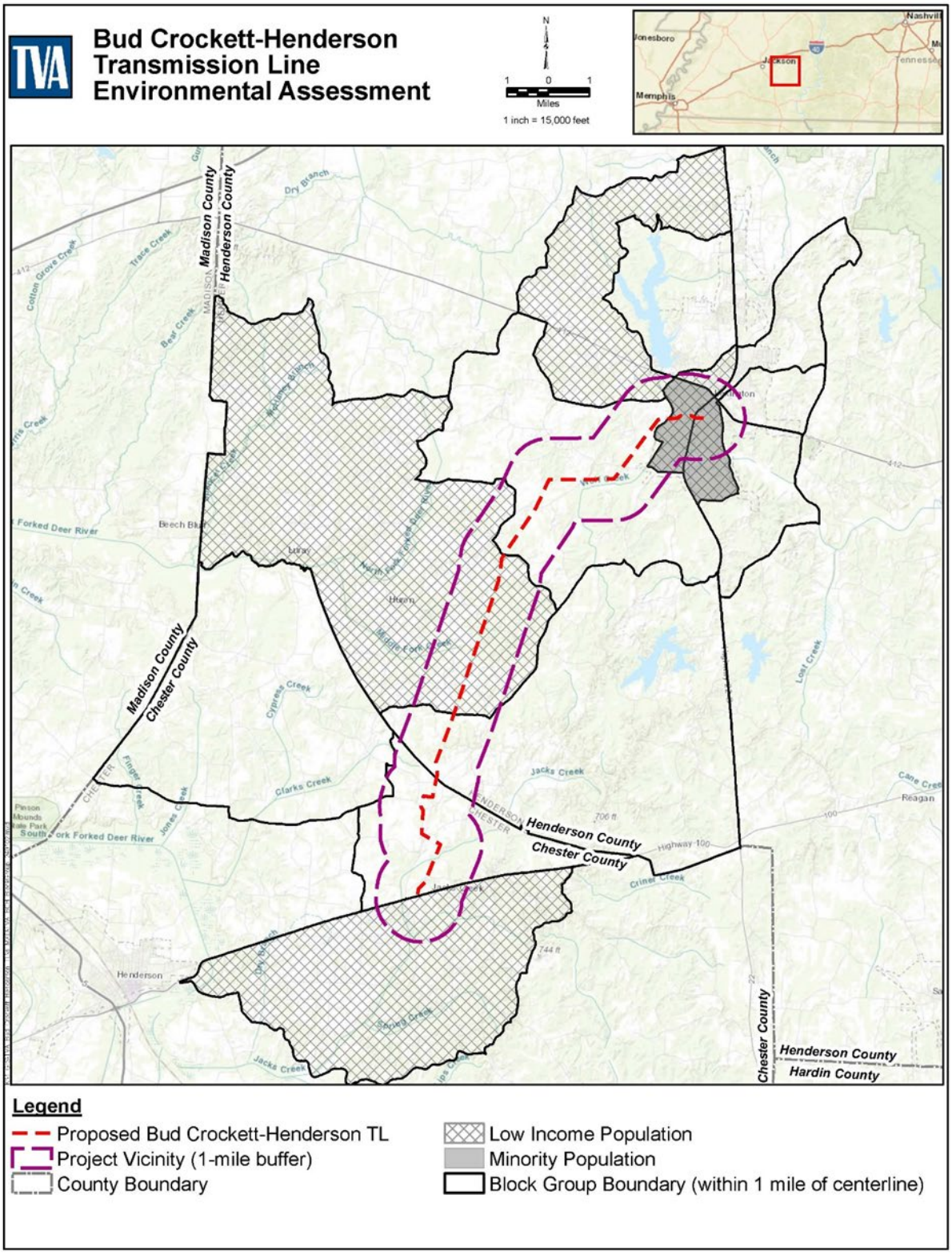


Figure 3-4. Environmental Justice Populations Within the Study Area

3.12.1.1 Demographic and Economic Conditions

Demographic and economic characteristics of the block groups that make up the study area and of the secondary reference geographies are summarized in Table 3-15.

The study area has a resident population of 16,798 and is characterized by low-density residential and suburban development associated with the communities of Jacks Creek and Lexington. Since 2010, the study area population has decreased by approximately 15.2 percent, in contrast to the population growth in Chester County of approximately 1.2 percent, the population growth in Henderson County of approximately 0.3 percent, and the population growth rate of almost 9 percent experienced at the state level. Note that a portion of this decrease in study area population is attributable to the revision of census block group boundaries, some of which were redrawn between the 2010 and 2020 censuses.

The majority of the population within the study area (approximately 83 percent) is white; correspondingly, minority populations in the study area are relatively small (17 percent). Minorities in the study area include: Black or African American (8.6 percent), persons who identified as two or more races (4.3 percent); Hispanic or Latino (3.1 percent); and small numbers who are American Indian and Alaska Native, Asian, Native Hawaiian and other Pacific Islander, and persons who identify as some other race. Minority population percentages in the study area are similar to those of Chester County (16.6 percent) and Henderson County (14.2 percent), and they are lower than those of the state of Tennessee (29.0 percent).

The average per capita income within the study area is $25,845, which is similar to both Chester County ($24,788) and Henderson County ($25,873) and lower than Tennessee ($36,040). The percentage of the study area population falling below the poverty level (20.0 percent) is higher than that of Chester County (15.8 percent), Henderson County (18.0 percent), and the state (14.0 percent). The civilian labor force within the study area is 7,468 with the unemployment rate at 5.2 percent. This unemployment rate is slightly lower than the unemployment rates of Chester County (6.9 percent), Henderson County (5.4 percent), and slightly higher than the state of Tennessee (5.0 percent) (Table 3-15).

3.12.1.2 Community Facilities and Services

Community facilities and services include public or publicly funded facilities such as police protection and other emergency services (ambulance/fire protection), schools, hospitals and other health care facilities, libraries, schools, churches, recreation areas and parks, community centers, and airports. To identify facilities and emergency services that could be potentially impacted by proposed project activities or emergency incidents along the length of the transmission line, the study area is identified as the service area of various providers, where applicable, or the area within a 1-mile radius of the proposed project.

Based on a review of aerial imagery and online information including the USGS Geographic Names Information System database (USGS 2023c), community facilities and services available within a 1-mile radius of the proposed transmission line include approximately four schools, four preschools, a community living center, a senior center, an urgent care, a post office, fifteen churches, and one hospital. Additionally, the project is also served by the Lexington Police Department, and the Henderson and Chester County Fire Departments.

Table 3-15. Demographic and Socioeconomic Characteristics

	Study Area (14 Census Block Groups within 1 mile of Proposed transmission line)	Chester County, Tennessee	Henderson County, Tennessee	State of Tennessee
Population[1,2,3]				
Population, 2020	16,798	17,341	27,842	6,910,840
Population, 2010	13530	17131	27,769	6,346,105
Percent Change 2010-2020	24.2%	1.2%	0.3%	8.9%
Persons under 18 years, 2022	24.1%	21.6%	22.9%	22.0%
Persons 65 years and over, 2022	16.8%	17.3%	18.5%	16.7%
Racial Characteristics[1]				
Not Hispanic or Latino				
White alone, 2020[(a)]	83.0%	83.4%	85.8%	70.9%
Black or African American, 2020[(a)]	8.6%	8.6%	6.9%	15.7%
American Indian and Alaska Native, 2020[(a)]	0.2%	0.3%	0.2%	0.2%
Asian, 2020[(a)]	0.5%	1.9%	0.3%	1.9%
Native Hawaiian and Other Pacific Islander, 2020[(a)]	0.0%	0.0%	0.0%	0.1%
Some Other Race alone, 2020[(a)]	0.4%	0.4%	0.3%	0.3%
Two or More Races, 2020	4.3%	3.8%	3.9%	3.9%
Hispanic or Latino, 2020	3.1%	3.0%	2.6%	6.9%
Income and Employment[3]				
Per capita income, 2022	$25,845	$24,788	$25,873	$36,040
Persons below poverty level, 2022	20.0%	15.8%	18.0%	14.0%
Persons below low-income threshold, 2022[(b)]	44.0%	36.7%	39.3%	32.6%
Civilian Labor Force, 2022	8,094	7,561	12,257	3,430,845
Percent Employed, 2022	95.2%	93.1%	94.6%	95.0%
Percent Unemployed, 2022	4.8%	6.9%	5.4%	5.0%

Source: 1. U.S. Census Bureau (USCB) 2011, 2. USCB 2020, 3. USCB American Community Survey 2022
(a) Includes persons reporting only one race.
(b) Low-income threshold is defined as two times the poverty level

3.12.1.3 Environmental Justice

TVA's activities reflect the TVA commitment to carrying out a statutory mission that benefits all the people of the Valley, including environmental justice and disadvantaged communities. Consistent with TVA's mission to serve the people of the Valley, TVA directs substantial resources to provide opportunities for disadvantaged communities within the TVA region to benefit from a variety of programs including Home Uplift, School Uplift, Small Business Uplift, Strategic Energy Management, Workforce Development, Generating Justice, and Connected Communities. Environmental Justice has been defined as the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation and enforcement of environmental laws, regulations, and policies (EPA 2023c) and seeks to ensure that minority and low-income populations do not bear disproportionately high and adverse human health or environmental effects from federal programs, policies, and activities. On February 11, 1994, President Clinton signed EO 12898 Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations. EO 12898 mandates some federal-executive agencies to consider environmental justice as part of the NEPA process. On January 27, 2021, President Biden issued EO 14008 Tackling the Climate Crisis at Home and Abroad. Amongst other objectives, the EO calls for the federal government to make the climate crisis and environmental justice essential elements of domestic policy by developing programs, policies, and activities to address current and historic injustices, and by investing and building a clean energy economy that spurs economic opportunity for disadvantaged communities. In addition, President Biden issued EO 14096, Revitalizing Our Nation's Commitment to Environmental Justice for All, on April 21, 2023, to supplement the foundational efforts of EO 14096 and pursue a comprehensive governmental approach to environmental justice.

Guidance for addressing environmental justice is provided by the Council on Environmental Quality (CEQ) Environmental Justice Guidance under NEPA (CEQ 1997). The CEQ defines minority as any race and ethnicity, as classified by the USCB, that is: Black or African American; American Indian or Alaska Native; Asian; Native Hawaiian and Other Pacific Islander; some other race (not mentioned above); two or more races; or a race whose ethnicity is Hispanic or Latino (CEQ 1997).

Identification of minority populations requires analysis of individual race and ethnicity classifications as well as comparisons of all minority populations in the region. Minority populations exist if either of the following conditions is met:

- The minority population of the impacted area exceeds 50 percent of the total population.
- The ratio of minority population is meaningfully greater (i.e., greater than or equal to 20 percentage points) than the minority population percentage in the general population or other appropriate unit of geographic analysis (CEQ 1997).

The nationwide poverty level is determined annually by the USCB and varies by the size of family and number of related children under 18 years of age. The 2022 USCB Poverty Threshold for an individual under the age of 65 is an annual income of $15,225, and for a family of four with two children, it is an annual income of $26,678 (USCB 2023). For the purposes of this assessment, low-income individuals are those whose annual household income is less than two times the poverty level. More encompassing than the base poverty

level, this low-income threshold, also used by the EPA in their delineation of low-income populations, is an appropriate measure for environmental justice consideration because current poverty thresholds are often too low to adequately capture the populations adversely affected by low-income levels, especially in high-cost areas (EPA 2019). According to EPA, the effects of income on baseline health and other aspects of susceptibility are not limited to those below the poverty thresholds. For example, populations having an income level from one to two times the poverty level also have worse health overall than those with higher incomes (Centers for Disease Control and Prevention 2011). A low-income environmental justice population exists if either of the following two conditions is met:

- The low-income population exceeds 50 percent of the total population.
- The ratio of low-income population significantly exceeds (i.e., by greater than or equal to 20 percentage points) that of the general population or other appropriate geographic areas of analysis.

Based on a review of the EPA's EJSCREEN tool, the study area consists of a mixture of communities that meet the criteria for consideration as minority and/or low-income populations and those that do not. TVA conducted a more detailed evaluation using 2020 USCB Decennial Census data and 2018-2022 American Community Survey data to identify specific block groups within the study area that exceed environmental justice thresholds. Figure 3-4 identifies the block groups within the study area that meet the specified criteria as environmental justice low-income populations.

Total minority populations (i.e., all non-white and Hispanic or Latino racial groups combined) comprise approximately 29 percent of the population of Tennessee, which is comparatively higher than the total minority population percentage of Chester County (approximately 17 percent) and Henderson County (approximately 14 percent). The study area has a total minority percentage of approximately 17 percent, with percentages for individual block groups ranging from 5.6 to 37.6 percent of the population. Two out the fourteen block groups have minority populations that either exceed 50 percent of the total population or significantly exceed the minority percentage of one or more of the reference geographies. Figure 3-4 identifies these block groups determined to meet the criterion for consideration as minority population groups subject to environmental justice considerations.

The percentage of the population of Tennessee living below the low-income threshold is 32.6 percent while the percentages in Chester and Henderson counties are higher at 36.7 percent and 39.3 percent, respectively. Approximately 44 percent of people living within the study area are considered low-income, with percentages for individual block groups ranging from 18.9 percent to 71.1 percent. Six block groups have low-income populations that either exceed 50 percent of the total population or significantly exceed the low-income percentage of one or more of the reference geographies. Figure 3-4 identifies these block groups determined to meet the criterion for consideration as low-income population groups subject to environmental justice considerations.

3.12.2 Environmental Consequences

3.12.2.1 Alternative A – No Action Alternative

Under the No Action Alternative, TVA would not acquire new ROW to construct the proposed transmission line, expand existing ROW, or construct new access roads. Therefore, there would be no change in local demographics, socioeconomic conditions, or community services, and there would be no impacts to environmental justice populations in association with the proposed action.

3.12.2.2 Alternative B – Action Alternative

3.12.2.2.1 Demographic and Economic Impacts

Under the Action Alternative, the proposed transmission line construction activities would occur over approximately 13 months and would entail the use of mobile crews comprised of contractors and/or full-time TVA staff. The construction workforce would total 40 workers at a given time for the transmission line, and it is anticipated that most of these workers would be drawn from the labor force that currently resides in the region; however, some specialty workers and laborers not available within the area may be needed to support construction activities. Following construction, work crews would be present in the study area for occasional operation and maintenance activities. In both cases, given the relatively small workforce and that the majority of workers needed would likely be drawn from the existing labor force, impacts to demographics and local employment would be minor.

Potential economic impacts associated with the proposed project relate to direct and indirect effects of property acquisition, construction, and operations. Under the Action Alternative, TVA would acquire approximately 194 acres across 71 parcels for the development of the transmission line ROW. These easements would give TVA the right to construct, operate, and maintain the transmission system across the property owners' lands. New temporary or permanent access roads on privately-owned land is required to access the ROW. In each case, landowners are compensated for the value of such rights and easements. Additionally, there are no known displacements required for development of the ROW easements and access roads. Construction and maintenance activities would also result in minor but beneficial impacts to the local economy through the purchases of materials and supplies, potential procurement of contract workers or additional services, and expenditure of the wages earned by the transient workforce in the local communities.

There is also the potential for a decrease in property value for those parcels in the vicinity of the transmission line. However, most of the new construction would take place in agricultural or forested areas; residential properties have been avoided to the greatest extent possible. As most homes in the area are located a significant distance from the proposed ROW or are separated from these structures by a vegetated buffer, any effects to local property values would be minor.

As described in Section 1.2, the implementation of the Action Alternative would provide additional power sources in the Lexington and Jacks Creek communities to alleviate loading concerns and increase power reliability. Any necessary unplanned maintenance outages would negatively impact several local industries that rely on the power from this transmission line. The proposed alternative would enhance reliability, reduce the number and length of outages, and allow for additional maintenance flexibility, resulting in long-term indirect economic benefits to the area.

3.12.2.2.2 Community Facilities and Services

Direct impacts to community facilities occur when a community facility is displaced or access to the facility is altered. Neither the construction or operation of the transmission line nor associated access roads would result in the displacement of community facilities or impede access to any facilities. Therefore, there would be no direct impacts to community facilities or services under the Action Alternative.

Indirect impacts occur when a proposed action or project results in a population increase that would generate greater demands for services and/or affect the delivery of such services. As the transmission line construction and maintenance would not result in notable impacts to local demographics, increased demands for services such as schools, churches, and healthcare facilities are not anticipated. In the event of an emergency along the transmission line ROW, local law enforcement, fire, and/or emergency medical services response would likely be required. Lexington operates a police department and a fire department, and Henderson and Chester counties both operate fire departments, all of which could respond in the event of an emergency. As the adjacent communities provide an extensive network of emergency services, and emergencies along the transmission line are anticipated to be a rare occurrence, implementation of the Action Alternative would not have a notable impact on the demand for emergency services in the area.

3.12.2.2.3 Environmental Justice

As indicated in Figure 3-4, six block groups within the study area meet the criteria for consideration as environmental justice populations under EO 12898. Under the Action Alternative, the construction and operation of the proposed transmission line could result in minor impacts to nearby residents, including temporary impacts such as increased traffic, noise, fugitive dust, and air emissions during the construction period, as well as long-term visual impacts, land use limitations, and potential for decreased property value. However, construction activities would be temporary and would typically have minimal impact on area residents due to the distance between residences and the proposed ROW. Long-term impacts such as decreased visual impacts, property value, and land use limitations have been minimized through community and landowner involvement in the selection of the proposed transmission line route. In addition, the proposed transmission line would not result in any substantial long-term emissions or releases of air pollutants, noise, or hazardous materials that would have a direct impact on human health or welfare. Therefore, impacts to environmental justice populations associated with the proposed project would be minor and would not be disproportionate, as impacts would be consistent across all communities (i.e., environmental justice and non-environmental justice) living along the transmission line corridor.

3.13 Long-term and Cumulative Impacts

The presence of the transmission line would present long-term visual effects to the mostly rural character of the local area. However, because the route of the proposed line would traverse mostly rural areas with few residences and would involve only a few road crossings, the transmission line would not be especially prominent in the local landscape. Likewise, the establishment of easements for the proposed ROW with local landowners would 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 transmission line.

The availability of a reliable power supply is one factor in improving the overall infrastructure in the local area, which over time could make the area more attractive to

additional commercial and residential development. However, the extent and degree of such development depends on a variety of factors and cannot be predicted accurately. Cumulative impacts of the construction, maintenance, and operation of the proposed transmission line have been examined to the extent practicable in resource sections above. Thus, residential and commercial growth of this mainly rural area would be a minor, long-term and cumulative consequence of the proposed transmission system improvements.

3.13.1 Postconstruction Effects

3.13.1.1 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 transmission line generates an electric field that occupies the space between the conductors and other conducting objects such as the ground, transmission line structures, or vegetation. A magnetic field is generated by the current (i.e., the movement of electrons) in the conductors. The strength of the magnetic field depends on the current, the design of the line, and the distance from the line.

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

Magnetic fields can induce currents in conducting objects. Electric fields can create static charges in ungrounded, conducting materials. The strength of the induced current or charge under a transmission line varies with: (1) the strength of the electric or magnetic field, (2) the size and shape of the conducting object, and (3) whether the conducting object is grounded. Induced currents and charges can cause shocks under certain conditions by making contact with objects in an electric or magnetic field.

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

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

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

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

Research has been done on the effects of EMFs on animal and plant behavior, growth, breeding, development, reproduction, and production. Research has been conducted in the laboratory and under environmental conditions, and no adverse effects or effects on health or the above considerations have been reported for the low-energy power frequency fields (World Health Organization (WHO) 2007a). Effects associated with ungrounded, metallic objects' static charge accumulation and 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 animals or on associations between surrogate measures of power line fields and certain types of cancer. Research has been ongoing for several decades.

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

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

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

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

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

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

3.13.1.2 Lightning Strike Hazard

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

3.13.1.3 Transmission Structure Stability

TVA transmission lines are designed to meet standards specified by the NESC. TVA designs their transmission lines such that a risk analysis of seismic hazards specifically for transmission line construction is not necessary. NESC states that as long as the design meets the wind and ice loading conditions that would create the most effect on the line, the transmission line would provide sufficient capacity to withstand seismic loading.

Pole structures similar to those shown in Figure 2-1 would be used if a 161-kV transmission line is needed. These structures have demonstrated a good safety record. They are not prone to rot or crack like wooden poles, nor are they subject to substantial storm damage due to their low cross-section in the wind.

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

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

3.13.2 Other Impacts

No major impacts from air quality and solid waste are expected to result from the relatively short-term activities of construction. Guidelines and specifications found on TVA's Transmission website contain procedures for addressing these issues (TVA 2024).

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

3.14 Unavoidable Adverse 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 transmission line could result in a small amount of localized siltation.
- Incompatible vegetation would not be permitted to grow within the transmission line ROW or to a determined height adjacent to the ROW that would endanger the transmission line. 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 permanent loss of about 98 acres of forested habitat.
- Any burning of cleared material would result in some short-term air pollution.
- ROW construction would involve tree clearing and conversion of 3.74 acres of forested wetland to emergent or scrub-shrub wetland habitat.
- The proposed transmission line would result in minor, long-term visual effects on the landscape in the immediate local area.

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

Land within the ROW of the proposed transmission line would be committed to use for electrical system needs for the foreseeable future. Approximately 194 acres of land would be purchased (as described in Section 2.2.1.1) and some of this acreage would be converted from their current use of pasture, agriculture, and as forested land to use as a ROW. The proposed ROW would support the 161-kV transmission line (see Figure 1-1), with use of existing access roads outside the ROW. Agricultural uses of the ROW could and would likely continue. However, periodic clearing of the ROW would preclude forest management within the ROW for the operational life of the transmission line. These losses of long-term productivity with respect to timber production and as wildlife habitat are minor both locally and regionally.

3.16 Irreversible and Irretrievable Commitments of Resources

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

The materials used for construction of the proposed transmission line would be committed for the life of the line. 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 transmission line 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 transmission line could continue.

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CHAPTER 4 – LIST OF PREPARERS

NEPA Project Management

Anita E. Masters (TVA)

Education:	M.S., Biology/Fisheries; B.S., Wildlife Management
Project Role:	NEPA Project Manager, NEPA Coordinator, NEPA Compliance, Document Preparation, and Technical Editor
Experience:	36 years in Project Management, Managing and Performing NEPA Analyses; ESA Compliance; CWA Evaluations; Community/Watershed Biological Assessments

Jordan Sikkema (TVA)

Education:	M.S., Environmental Science; B.S., Biology and Chemistry
Project Role:	Environmental Program Manager, NEPA Coordinator,
Experience:	4 years as environmental support to Transmission Projects, 13 years in environmental conservation, restoration or remediation projects

Other Contributors

Brandon Whitley (TVA)

Education:	B.S. Wildlife & Fisheries Science, QHP-IT
Project Role	Wetlands
Experience	5 years of experience with Wetland/Stream Assessments, Wetland/Stream Regulations, NEPA and CWA Compliance

Carrie C. Williamson, P.E., CFM (TVA)

Education:	M.S., Civil Engineering; B.S., Civil Engineering; Professional Engineer; Certified Floodplain Manager
Project Role:	Floodplains
Experience:	11 years in Floodplain and Flood Risk; 11 years in Compliance Monitoring; 3 years in River Forecasting

Chloe K. R. Sweda (TVA)

Education:	B.S., Earth and Environmental Sciences
Project Role:	Managed Areas and Natural Areas
Experience:	5 years in natural resource management

Cory Chapman (TVA)

Education:	B.S., Wildlife and Fisheries, QHPIT
Project Role:	Aquatic Ecologist
Experience:	6 years in Fisheries, ESA and CWA Compliance

John Hunter Lewis Shelton (TVA)

Education:	M.S., Environmental Science; B.S., Biology
Project Role:	Vegetation, Threatened and Endangered Plants
Experience:	7 years Botanical Surveys, Plant Taxonomy, Plant Ecology, Geospatial Analysis

John S. Roberts

Education:	A.S. Civil Engineering, Registered Land Surveyor
Project Role:	Civil Design Technician; Project and Siting Alternatives; Document Review
Experience:	14 years Surveying; 7 years Civil Design Technician Siting

Leah Stephens (WSP)

Education:	B.A., Environmental Studies
Project Role:	Visual Resources, Socioeconomics and Environmental Justice
Experience:	4 years of experience in NEPA and environmental consulting

Matt Reed (TVA)

Education	M.S., Wildlife and Fisheries Science
Project Role	Aquatic Ecology and Threatened & Endangered Species
Experience	13 years working with threatened and endangered aquatic species in the Southeastern United States; 7 years in ESA, NEPA, and CWA compliance and stream assessments

Natalie Reiss (WSP)

Education:	B.A., Biology
Project Role:	Technical Review
Experience:	9 years of experience in NEPA analysis and documentation

Rebecca Porath (WSP)

Education	M.S., Wildlife and Fisheries Science
Project Role	Technical Review
Experience	24 years of experience in NEPA documentation and other environmental compliance

Stacey Mather, CWB (WSP)

Education	B.S., Forestry, Fisheries, and Wildlife Biology
Project Role	QA/QC
Experience	Over 23 years of experience in Consulting specializing in NEPA, Wetlands, CWA Permitting and Compliance, and environmental approval processes.

Zach Buecker (TVA)

Education:	B.S., Biology, PWS, QHP
Project Role:	Wetlands
Experience:	13 years of experience with Wetland/Stream Assessments, Wetland/Stream Regulations, NEPA and CWA Compliance

CHAPTER 5 – LITERATURE CITED

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, Mississippi, USA. Technical Report WRP-DE-17.

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

Brahana, J.V. and M.W. Bradley. 1985. Delineation and Description of the Regional Aquifers of Tennessee – The Knox Aquifer in Central and West Tennessee, U.S. Geological Survey Water Resources Investigations Report 83-4012. Retrieved from https://pubs.usgs.gov/wri/wri834012/pdf/wrir_83-4012_a.pdf (accessed December 29, 2023).

Brahana, J.V. and M.W. Bradley. 1986. Preliminary delineation and description of the regional aquifers of Tennessee: The Central Basin Aquifer System. U.S. Geological Survey, Water-Resources Investigations Report 82-4002. Retrieved from https://pubs.usgs.gov/wri/wrir82-4002/pdf/wrir_82-4002_a.pdf (accessed December 28, 2023).

Brahana, J.V., D. Mulderink, and M.W. Bradley. 1986. Preliminary delineation and description of the regional aquifers of Tennessee: The Cretaceous Aquifer System of West Tennessee. U.S. Geological Survey, Water-Resources Investigations Report 83-4039. Retrieved from https://pubs.usgs.gov/wri/wri834039/pdf/wrir_83-4039_a.pdf (accessed December 28, 2023).

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.

Carney, D. A., and B. M. Burr. 1989. Life histories of the bandfin darter, *Etheostoma zonistium*, and the firebelly darter, *Etheostoma pyrrhogaster*, in western Kentucky. Illinois Natural History Survey, Biological Notes 134. December 1989.

Centers for Disease Control and Prevention. 2011. CDC Health Disparities and Inequalities Report — United States, 2011. MMWR, January 14, 2011; Vol. 60 (Suppl). Retrieved from http://www.cdc.gov/mmwr/pdf/other/su6001.pdf (accessed December 2023).

City of Henderson. 2023. Utilities Department, Domestic Water Distribution. Retrieved from https://www.hendersontn.gov/utilities.html (accessed December 29, 2023).

City of Lexington. 2023. Water Treatment and Distribution. Retrieved from https://www.lexingtontn.gov/utilities_water.html (accessed December 29, 2023).

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.

Council on Environmental Quality. 1997. Environmental Justice Guidance under the National Environmental Policy Act, Executive Office of the President, Washington, D.C. Retrieved from: https://www.epa.gov/sites/production/files/2015-02/documents/ej_guidance_nepa_ceq1297.pdf (accessed December 2023).

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.

Davies, G. and T. Karpynec. 2023. *Phase I Cultural Resources Survey for the Tennessee Valley Authority's Proposed Bud Crockett – Henderson 161-kV Transmission Line, Chester and Henderson Counties, Tennessee*. Report prepared by TRC, Nashville for TVA, Knoxville. Report on file at the Tennessee Valley Authority Cultural Resources Library, Knoxville, Tennessee.

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

Environmental Protection Agency. 1974. Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety. Office of Noise Abatement and Control, Arlington, Virginia.

------. 1990. Memorandum of Agreement between Department of the Army and the Environmental Protection Agency Concerning the Determination of Mitigation under the Clean Water Act Section 404(b)(1) Guidelines. Retrieved from https://www.epa.gov/sites/production/files/2019-05/documents/1990_army-epa_mitigation_moa.pdf (accessed February 2022).

------. 2019. EJSCREEN Technical Documentation. Office of Policy, Washington, DC. September 2019. Retrieved from: https://www.epa.gov/sites/production/files/2017-09/documents/2017_ejscreen_technical_document.pdf (accessed December 2023).

------. 2022. How's My Waterway, Waterbody Report, Assessment Information from 2022. Retrieved from https://mywaterway.epa.gov/community/lexington%20tennessee/overview (accessed January 2, 2024).

------. 2023a. Designated Sole Source Aquifer in EPA Region IV. Retrieved from https://epa.maps.arcgis.com/apps/webappviewer/index.html?id=9ebb047ba3ec41ada1877155fe31356b (accessed December 29, 2023).

------. 2023b. Overview of Listing Impaired Waters under CWA Section 303 (d). Retrieved from https://www.epa.gov/tmdl/overview-listing-impaired-waters-under-cwa-section-303d (accessed August 11, 2023).

------. 2023c. Environmental Justice. Retrieved from: https://www.epa.gov/environmentaljustice/learn-about-environmental-justice (accessed: December 2023).

Federal Highway Administration. 2011. Highway Traffic Noise: Analysis and Abatement Guidance. FHWA-HEP-10-025. December 2011.

------. 2016. Construction Noise Handbook. Retrieved from http://www.fhwa.dot.gov/environment/noise/construction_noise/handbook/handbook09.cfm (accessed December 2021).

------. 2018. Techniques for Reviewing Noise Analyses and Associated Noise Reports. Final Report. FHWA-HEP-18-067. June 2018. Retrieved from https://www.fhwa.dot.gov/Environment/noise/resources/reviewing_noise_analysis/ (accessed January 2022).

Federal Register (FR). 2023. Vol. 88, No. 80. Executive Order 14096. Revitalizing Our Nation's Commitment to Environmental Justice for All. Retrieved from: eo-14096-revitalizing-commitment-to-environmental-justice.pdf (energy.gov) (accessed December 2023).

Griffith, G. E, J.M. Omernik and S. Azevedo. 1998. Ecoregions of Tennessee (color poster with map, descriptive text, summary tables, and photographs): Reston, Virginia, U.S. Geological Survey (map scale1:1,250,000).

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. Reid, and L. 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. 139 pp.

Hardeman, WD., Miller, R.A., and Swingle, G.D. 1966. Geologic Map of Tennessee: Tennessee Division of Geology, State Geologic Map, scale 1:250,000 Sheet 4 of 4: Geologic map of Tennessee [west sheet]. Retrieved from https://ngmdb.usgs.gov/ngm-bin/pdp/zui_viewer.pl?id=7331 (accessed December 28, 2023).

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.

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.

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.

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: 1–17. Published 28 April 2016. ISSN 2153 733X.

Miller, J.H., Manning, S.T., 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.

National Geographic. 2002. Field Guide to the Birds of North America, Fourth Edition. National Geographic Society. Washington, D.C.

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.

------. 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 February 2022).

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.

Scott, M. L., B. A. Kleiss, W. H. Patrick, C. A. Segelquist. The Effect of Developmental Activities on Water Quality Functions of Bottomland Hardwood Ecosystems: The Report of the Water Quality Workgroup. As reported in: Gosslink, J.G. et al. (1990). Ecological processes and cumulative impacts: illustrated by bottomland hardwood wetland ecosystems / edited. Lewis Publishers, Chelsea, Michigan.

Stallsmith, B. 2010. Status of the flame chub *Hemitremia flammea* in Alabama, USA. Endangered Species Research 12:87-93.

Stephens, S. 2023. *Phase I Archaeological Survey Addendum Report for the Tennessee Valley Authority's Proposed Bud Crockett-Henderson 161-kV Transmission Line Access Routes, Chester and Henderson Counties, Tennessee*. Report prepared by TRC, Nashville for TVA, Knoxville. Report on file at the Tennessee Valley Authority Cultural Resources Library, Knoxville, Tennessee.

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.

Tennessee Department of Environment and Conservation. 2003. Division of Water Quality Tennessee Source Water Assessment Report August 2003. Retrieved from https://www.tn.gov/content/dam/tn/environment/documents/source_water_assessment_epa_report_aug_2003.pdf (accessed December 29, 2023).

------. 2012. *Tennessee Erosion and Sediment Control Handbook* - Division of Water Resources. Nashville, Tennessee. 4th Edition 2012. Retrieved from http://tnepsc.org/TDEC_EandS_Handbook_2012_Edition4/TDEC%20EandS%20Handbook%204th%20Edition.pdf (accessed January 2, 2024).

------. 2017. *Tennessee Rapid Assessment Method for Wetlands*. Nashville, Tennessee: Division of Water Resources, Natural Resources Unit.

------. 2019. Rules of the Tennessee Department of Environment and Conservation – Chapter 0400-40-04 *Use Classifications for Surface Waters*, Revised September 2019. Retrieved from https://publications.tnsosfiles.com/rules/0400/0400-40/0400-40-04.20190911.pdf, (accessed September 27, 2023).

------. 2020. Division of Water Resources Drinking Water Unit, Tennessee Groundwater Monitoring and Management Groundwater 305(b) Report 2020. Retrieved from https://www.tn.gov/content/dam/tn/environment/water/drinking-water-unit/wr_wq_report-groundwater-305b-2020.pdf (accessed December 29, 2023).

------. 2022a. 2022 Groundwater 305(b) Report, Tennessee Groundwater Monitoring and Management. Retrieved from https://storymaps.arcgis.com/stories/8501e94f3ed54aca9665513c20aad302/print (accessed, December 29, 2023).

------. 2022b. 2022 *List of Impaired and Threatened Waters in Tennessee.* Retrieved from https://www.tn.gov/environment/program-areas/wr-water-resources/water-quality/water-quality-reports---publications.html (accessed December 29, 2023).

------. 2023a. Wellhead Protection Program. Retrieved from Wellhead Protection Program (tn.gov) (accessed August 17, 2023).

------. 2023b. TN Water Well Desktop Application. Retrieved from TN Water Well Desktop Application (accessed August 18, 2023).

Tennessee Valley Authority. 1980. Transmission Line Location in Floodplains Subclass Review. The Chattanooga Times. April 7, 1980. p. D3.

_____ 1981. Class Review of Repetitive Actions in the 100-Year Floodplain, FR Vol. 46, No. 76—Tuesday, April 21, 1981. pp. 22845-22846. https://www.govinfo.gov/content/pkg/FR-1981-04-21/pdf/FR-1981-04-21.pdf.

------. 2017. Programmatic Biological Assessment for Evaluation of the Impacts of Tennessee Valley Authority's Routine Actions on Federally Listed Bats. Knoxville, Tennessee. Retrieved from https://www.tva.com/Environment/Environmental-Stewardship/Environmental-Reviews (accessed February 2022).

------. 2019a. *Integrated Resource Plan* and associated *Environmental Impact Statement for TVA's Integrated Resource Plan*. Knoxville, Tennessee. Retrieved from https://www.tva.gov/Environment/Environmental-Stewardship/Integrated-Resource-Plan (accessed February 2024).

_____. 2019b. Transmission System Vegetation Management: Final Programmatic Environmental Impact Statement. Chattanooga, TN. August 2019. Retrieved from https://www.tva.com/environment/environmental-stewardship/environmental-reviews/nepa-detail/Transmission-System-Vegetation-Management-Program.

_____. 2020. Fiscal Year 2021 Transmission System Vegetation Management Final Environmental Assessment. Chattanooga, TN. Retrieved from https://www.tva.com/environment/environmental-stewardship/environmental-reviews/nepa-detail/transmission-system-vegetation-management-fiscal-year-2021.

_____. 2021. Transmission System Routine Periodic Vegetation Management Fiscal Years 2022 and 2023 Final Environmental Assessment. Chattanooga, TN. Retrieved from https://www.tva.com/environment/environmental-stewardship/environmental-reviews/nepa-detail/transmission-system-vegetation-management-fiscal-years-22-and-23.

_____. 2022. *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Construction and Maintenance Activities, Revision 4.* Edited by S.T. Benefield, R.L. Brannon, J.C. Buttram, B.V. Dalton, G.D. Dalton, C.A. Henley, W.G. Martin, A.E. Masters, C.L. Phillips, C.A. Suttles, and R.C Wilson. Chattanooga, Tennessee. Retrieved from https://tva-azr-eastus-cdn-ep-tvawcm-prd.azureedge.net/cdn-tvawcma/docs/default-source/energy/transmission/a-guide-for-environmental-protection-and-best-management-practices-for-tva-construction-and-maintenance-activities-august-2022ea9924e6-329f-4d3a-a0ac-d66bb9aa0894.pdf?sfvrsn=b9e08843_3 (accessed January 2, 2024).

_____. 2023a. Transmission System Routine Periodic Vegetation Management Fiscal Year 2024. Final Environmental Assessment. Chattanooga, TN. Retrieved from https://www.tva.com/environment/environmental-stewardship/environmental-reviews/nepa-detail/transmission-system-routine-periodic-vegetation-management-fiscal-year-2024.

_____. 2023b. Bat Conservation and Compliance. TVA website: Environment/Environmental Stewardship/Environmental Review. Chattanooga, TN. Retrieved from https://www.tva.com/environment/environmental-stewardship/environmental-reviews (accessed September 2023).

_____. 2023c. Beech. Retrieved from https://www.tva.com/energy/our-power-system/hydroelectric/beech (accessed December 31, 2023).

_____. 2024. Tennessee Valley Authority. Transmission System Related Guidelines and Specifications. Retrieved from https://www.tva.com/Energy/Transmission-System/Transmission-System-Projects (accessed January 2024).

S. Stephens. 2023. *Phase I Cultural Resource Survey, Tennessee Valley Authority's Proposed Bud Crockett-Henderson 161-kV Transmission Line, Chester and Henderson Counties, Tennessee*. TRC Environmental, Inc. Report on file at the Tennessee Valley Authority Cultural Resources Library, Knoxville, Tennessee.

U.S. Army Corps of Engineers. 2012. Regional Supplement to the Corps of Engineers *Wetland Delineation Manual: Atlantic and Gulf Coastal Plain Region* (Version 2.0), ed. J.S. Wakeley, R.W. Lichvar, and C.V. Noble. ERDC/EL TR-10-20. Vicksburg, Mississippi: U.S. Army Engineer Research and Development Center.

U.S. Census Bureau. 2011. Decennial Census 2010. Table ID: P1 Total Population. Retrieved from https://data.census.gov/cedsci/ (accessed December 2023).

------. 2020. 2020 Decennial Census Redistricting Data (PL 94-171). Retrieved from https://data.census.gov/cedsci/ (accessed December 2023).

------. 2022. American Community Survey 2018-2022. Detailed Tables. Retrieved from https://data.census.gov/cedsci/ (accessed December 2023).

------. 2023. Poverty Thresholds for 2022. Retrieved from: http://www.census.gov/data/tables/time-series/demo/income-poverty/historical-poverty-thresholds.html (accessed December 2023).

U.S. Climate Data. 2023. Climate Bristol -Tennessee. Retrieved from https://www.usclimatedata.com/climate/lexington/tennessee/united-states/ustn0288 (accessed December 29, 2023).

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.

U.S. Department of Housing and Urban Development. 1985. The Noise Guidebook, HUD-953-CPD Washington, D.C., Superintendent of Documents, U.S. Government Printing Office.

U.S. Fish and Wildlife Service. 1982. National Wetlands Inventory. Retrieved from https://www.fws.gov/program/national-wetlands-inventory/wetlands-data (accessed February 2022).

------. 2007. National Bald Eagle Management Guidelines. U.S. Department of the Interior, Fish and Wildlife Service, Washington, D.C.

------. 2023. Range-wide Indiana Bat and Northern Long-eared Bat Survey Guidelines. U.S. Fish and Wildlife Service, Region 3, Bloomington, MN.

U.S. Forest Service. 1995. Landscape Aesthetics, A Handbook for Scenery Management, Agriculture Handbook Number 701.

U.S. Geological Survey. 2023a. Science in Your Watershed. Retrieved from https://water.usgs.gov/wsc/a_api/wbd/subbasin06/06010102.html (accessed December 31, 2023).

------. 2023b. Water-Year Summary for Site USGS 03584421. Retrieved from: https://waterdata.usgs.gov/nwis/wys_rpt/?site_no=03594421&agency_cd=USGS (accessed December 27, 2023).

------. 2023c. Geographic Names Information System (GNIS) Dataset. Retrieved from: https://geonames.usgs.gov/apex/ (accessed December 2023).

U.S. Water Resources Council. 1978. Guidelines for Implementing Executive Order 11988, Floodplain Management. FR Vol. 43, No. 29—Friday, February 10, 1978. pp. 6030-6054. https://www.energy.gov/sites/prod/files/2015/09/f26/Floodplain%20Management%20Guidelines_1978.pdf.

Weary, D.J. 2008. Preliminary Map of Potentially Karstic Carbonate Rocks in the Central and Southern Appalachian States. U.S. Open-File Report OF-2008-1154, Version 1.0. Retrieved from https://pubs.usgs.gov/of/2008/1154/ (accessed December 29, 2023).

Wells, F.G. 1933. Ground-Water Resources of Western Tennessee. Tennessee Division of Geology, with a discussion of the Chemical Character of the Water by F.G. Wells and M.D. Foster. U.S. Geological Survey Water-Supply Paper 656, 319 pp. Retrieved from https://pubs.usgs.gov/wsp/0656/report.pdf (accessed December 28, 2023).

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, Mississippi.

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

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

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

Appendix A – Coordination & Consultation Correspondence

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

2023-10-03 09:40:15 CDT

James Osborne
TVA

RE: Tennessee Valley Authority (TVA), Bud Crockett-Henderson 161 kv TL New Building; CRMS 65703170707, Project#: SHPO0003808, , Chester County, Henderson County, TN

Dear James Osborne:

Pursuant to your request, this office has reviewed documentation concerning 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).

Based on the information provided, we concur that the project area contains cultural resources eligible for listing in the National Register of Historic Places. We further concur that the project as currently proposed will not adversely affect the Montgomery High School or the Thompsie Edwards House.

This office has no objection to the implementation of this project as currently planned. If project plans are changed or previously unevaluated archaeological resources 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. Include the Project # if you need to submit any additional information regarding this undertaking. Questions and comments may be directed to Casey Lee, who drafted this response, at Casey.Lee@tn.gov, +16152533163. We appreciate your cooperation.

Sincerely,

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

Ref:MSG10251106_1h56tAs1PFDhRwKzxPd

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

12-15-2023 09:28:39 CST

James Osborne
TVA

RE: Tennessee Valley Authority (TVA), Bud Crockett-Henderson 161 kv TL New Building; CRMS 65703170707, Project#: SHPO0003808, Chester County, Henderson County, TN

Dear James Osborne:

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).

In the final report, please address the following editorial comments.

1. All USGS topographic maps included in the report must be labeled with the official map name and number
2. The figures (maps) included in Appendix A should be incorporated into the appropriate section of the report text instead of attached as an appendix.

Considering the information provided, we concur that no archaeological resources 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. Complete and/or updated Tennessee Site Survey Forms should be submitted to the Tennessee Division of Archaeology for all sites recorded and/or revisited during the

current investigation. Please provide your Project # when submitting any additional information regarding this undertaking. Questions or comments may be directed to Jennifer Barnett, who drafted this response, at Jennifer.Barnett@tn.gov, +16156874780.

Your cooperation is appreciated.

Sincerely,

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

Appendix B – Transmission Environmental Protection Procedures Right-Of-Way Vegetation Management Guidelines (Rev. (9) February 2022)

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Transmission Environmental Protection Procedures
Right-Of-Way Vegetation Management Guidelines

1.0 Overview

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

B. Each year TVA assesses the conditions of the vegetation on and along its rights-of-way. This is accomplished by aerial inspections, ground inspections, periodic field inspections, aerial photography, LiDAR data and information from TVA personnel, property owners andthe general public. TVA utilizes this data to evaluate vegetation clearances and identifies vegetation on and off ROW that does or could potentially pose a risk to reliability.

C. TVA transmission foresters develop a vegetation re-clearing plan that is specific to each line segment and is based on terrain conditions, species mix, growth, and density.

2.0 Right-of-Way Management Methods

A. TVA takes an Integrated Vegetation Management (IVM) approach that is based on a carefully planned, multi-dimensional strategy developed in consultation with forestry and habitat experts. Integrated vegetation management aims to improve safety and prevent power outages by creating healthy and self-sustaining ecosystems in ROWs while ensuring compliance with regulatory standards (NERC 2006). These ecosystems foster beneficial, attractive and low-maintenance habitat while discouraging tall, woody species and other, more benign forms of vegetation can thrive. Integrated vegetation management encourages early successional native habitats that pose less threat to power reliability yet offer safe havens for desirable plants and animals.By combining selective use of herbicides with physical removal, integrated vegetation management can more thoroughly eradicate unsuitable vegetation and allow more compatible species to fill in, making it more difficult for tall-growing trees to re-establish.

TVA executes its transmission vegetation maintenance on a 3-year cycle based on data that is acquired by various inspection methods. LiDAR, ground inspection andaerial inspection data are utilized to evaluate the next year's scheduled work to determine the annual vegetation maintenance work scope. LiDAR technology provides a detailed vegetation threat analysis that can be used to assess risk as well as prioritize vegetation management work plans. This detailed analysis supports TVA's efforts to target incompatible species as well as promote the growth of compatible vegetation. This precision management approach is effective in reducing overall environmental impact by limiting work to specific areas of incompatibility.

B. TVA uses a variety of herbicides specific to the species present with a variety of possible application techniques. The method most often implemented is selective application from the ground with backpack sprayers or vehicle-mounted sprayers. However, other techniques and methods, such as those described in section 3.0, may be utilized when circumstances dictate. Any herbicides used are applied in accordance with applicable state and federal laws and regulations. Only herbicides registered with the United States Environmental Protection Agency (USEPA) are used.

C. In very steep terrain, in sensitive environmental areas, in extensive wetlands, at stream banks, and in sensitive property owner land use areas, hand clearing may be utilized. Hand clearing is recognized as one of the most hazardous occupations documented by the Occupational Health and Safety Administration.

D. TVA does not encourage tree re-clearing by individual property owners because of the high hazard potential of hand clearing, possible interruptions of the line, and electrical safety considerations for untrained personnel that might do the work.

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

3.0 Herbicide Program

A. TVA has worked with universities (such as Mississippi State University, University of Tennessee, Purdue University and others), chemical manufacturers, other utilities, U.S. Department of Transportation, U.S. Fish and Wildlife Service (USFWS), and U.S. Forest Service (USFS) personnel to explore options for vegetation control. The results have provided strong recommendations to use species-specific, low volume herbicide applications in more situations. Research, demonstrations, and other right-of-way programs show a definite improvement of rights-of-way treated with selective low-volume applications of new herbicides using a variety of application techniques and timing. Table 1 below identifies herbicides currently used on TVA rights-of-way.Table 2 identifies pre-emergent herbicides currently being used on bare ground areas on TVA rights-of-way and in substations. Table 3 identifies TGRs that may be used on tall trees that have special circumstances that require trimming on a regular cycle, e.g., restrictions on complete removal. The rates of application utilized are those listed on the U.S. Environmental Protection Agency (USEPA) approved label and consistent with utility standard practice throughout the Southeast.

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

Trade Name	Active Ingredient	Label Signal Word
Accord/Accord XRT II	Glyphosate/Liquid	Caution
Arsenal	Imazapyr/Liquid/Granule	Caution
Chopper	Imazapyr/RTU	Caution
Clearstand	Imazapyr/Metsulfuron Methyl/Liquid	Caution
Escort	Metsulfuron Methyl/Dry Flowable	Caution
Garlon 4 Ultra	Triclopyr/Liquid	Caution
Habitat	Imazapyr/Liquid	Caution
Krenite S	Fosamine Ammonium	Caution
Milestone VM	Aminopyralid/Liquid	Caution
Pathfinder II	Triclopyr/RTU	Caution
Polaris	Imazapyr/Liquid	Caution
Rodeo	Glyphosate/Liquid	Caution
Roundup	Glyphosate/Liquid	Caution
Roundup Pro	Glyphosate	Caution
Stalker	Imazapyr/Liquid	Caution
Streamline	Aminocyclopyrachlor/ Metsulfuron Methyl/Liquid	Caution
Transline	Clopyralid/Liquid	Caution
Viewpoint	Imazapyr/Aminocyclopyrachlor/ Metsulfuron Methyl/Liquid	Caution

Table 2 - Pre-Emergent Herbicides Currently Used for Bare Ground Areas TVA Rights-of-Way

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

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

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

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

C. Low volume herbicide applications are recommended since research demonstrates much wider plant diversity after such applications. There is better ground erosion protection and more wildlife food plants and cover plants develop. In most situations, there is increased development of wild flowering plants, pollinator plants and shrubs. In conjunction with herbicides, the diversity and density of low-growing plants provide control of tall-growing species through competition.

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

E. Best Management Practices (BMPs) governing application of herbicides are contained within *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Transmission Construction and Maintenance Activities* (TVA 2017) which is incorporated by reference. Herbicides can be liquid, granular, or powder and can be applied aerially or by ground equipment and may be selectively applied or broadcast, depending on the site requirements, species present, and condition of the vegetation.Water quality considerations include measures taken to keep herbicides from reaching streams whether by direct application or through runoff of or flooding by surface water. "Applicators" must be trained, licensed, and follow manufacturers' label instructions, USEPA guidelines, and respective state regulations and laws.

F. When herbicides are used, their potential adverse impacts are considered in selecting the compound,formulation, and application method. Herbicides that are designated "Restricted Use" by USEPA require application by or under the supervision of applicators certified by the respective state control board. Applications are done either by TVA or by contractors in accordance with the following guidelines identified in the TVA BMP manual (TVA 2017):

1. The sites to be treated are selected and application directed by the appropriate TVA official.
2. A pre-flight walking or flying inspection is made within 72 hours prior to applying herbicides aerially. This inspection ensures that no land use changes have occurred, that sensitive areas are clearly identified to the pilot, and that buffer zones are maintained.
3. Aerial application of liquid herbicides will normally not be made when surface wind speeds exceed 5 miles per hour, in areas of fog, or during periods of temperature inversion.

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4. Pellet application will normally not be made when the surface wind speeds exceed 10 miles per hour or on frozen or water saturated soils.
5. Herbicide application should follow manufacturers' label specifications.
6. Application during unstable, unpredictable, or changing weather patterns is avoided. Equipment and techniques are used that are designed to ensure maximum control of the spray swath with minimum drift.
7. Herbicides are not applied to surface water or wetlands unless specifically labeled for aquatic use. Filter and buffer strips will conform at least to federal and state regulations and any label requirements. The use of aerial or broadcast application of herbicides is not allowed within a streamside management zone (SMZ) adjacent to perennial streams, ponds, and other water sources containing sensitive aquatic resources. Hand application of aquatic use herbicides are used only selectively for use within SMZs containing sensitive aquatic resources.
8. For aerial applications, buffers and filter strips (200 feet minimum width) are maintained next to agricultural crops, gardens, farm animals, orchards, apiaries, horticultural crops, and other valuable vegetation.
9. Herbicides are not applied in the following areas or times: (a) in city, state, and national parks or forests or other special areas without written permission and/or required permits; (b) off the right-of-way; and (c) during rainy periods or during the 48-hour interval prior to rainfall predicted with a 20 percent or greater probability by local forecasters when soil active herbicides are used.

G. TVA currently uses primarily low volume applications of foliar and basal applications, e.g., Accord (Glyphosate), Arsenal (Imazapyr), Clearstand (Imazapyr/ Metsulfuron Methyl), Milestone VM (Aminopyralid) and Streamline (Aminocyclopyrachlor / Metsulfuron Methyl).

4.0 Benefits

A. Proper maintenance—including vegetation management—of the ROW and its supporting facilities is crucialto ensuring the reliable transmission of affordable electrical power. Unmanaged and poorly maintained vegetation can cause electricity outages, wildfires, soil erosion, and water quality issues. Utility companies that adopt long-term IVM approaches often benefit from significant vegetation management cost savings, which can be reflected in customer rates.

B. ROW also provides important wildlife habitats. As wildlife habitats in the United States are lost to development, these ROWs become increasingly important. The IVM approach can create natural, diverse, and sustaining ecosystems, such as a meadow transition habitat. A variety of wildlife species (including threatened and endangered species) consider these habitats home, such as butterflies, songbirds, small mammals, and deer. These habitats also encourage the growth of native plant species and can increase plant diversity.

C. Invasive and exotic species are often a problem on the ROW, and, consequently, the surrounding land. IVM techniques (such as selective herbicide application) can minimize this problem, while ensuring native and endangered species are not affected.

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5.0 References

Integrated Vegetation Management (IVM) on Rights-of-Way Fact Sheet. (2012, May) Retrieved from http://www.epa.gov/pestwise/htmlpublications/row_fact_sheet.html

Tennessee Valley Authority. 2017. A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Construction and Maintenance Activities, Revision 3.Edited by G. Behel, S. Benefield, R. Brannon, C. Buttram, G. Dalton, C. Ellis, C. Henley, T. Korth, T. Giles, A. Masters, J. Melton, R. Smith, J.Turk, T. White, R. Wilson. Chattanooga, TN.: Retrieved from <https://www.tva.com/Energy/Transmission-System/Transmission-System-Projects>.

U.S. Forest Service. 1989a. Vegetation Management in the Coastal Plain/Piedmont Final Environmental Impact Statement, Volumes I and II. Southern Region Management Bulletin R8-MB-23, January 1989. Atlanta, Ga.: USDA Forest Service.

———. 1989b. Vegetation Management in the Appalachian Mountains Final Environmental Impact Statement, Volumes I and II. Southern Region Management Bulletin R8-MB-38, July 1989. Atlanta, Ga.: USDA Forest Service.

———. 2002a. Vegetation Management in the Appalachian Mountains Final Environmental Impact Statement Supplement. Southern Region Management Bulletin R8-MB-97A, October 2002. Atlanta, Ga.: USDA Forest Service.

———. 2002b. Vegetation Management in the Coastal Plain/Piedmont Final Environmental Impact Statement Supplement. Southern Region Management Bulletin R8-MB-98A, October 2002. Atlanta, Ga.: USDA Forest Service.

Appendix C – Stream Crossings Along the Proposed Bud Crockett-Henderson 161-kV Transmission Line Rights-of-Way and Access Roads

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Appendix C - Stream Crossings along the Proposed 161-kV Transmission Line Rights-of-Way

Sequence ID	Stream Type	Streamside Management Zone Category (RB, LB)	Stream Name	Field Notes	Coordinates*	
					Begin	End
S001	Perennial	Category A (50 ft)	Unnamed tributary to Beech River	40 feet wide by 10 feet deep. Culverted perennial stream with fish present.	35.64317538 -88.40827567	35.64354176 -88.41229655
S002	Intermittent	Category A (50 ft)	Unnamed tributary to Beech River	Tributary to S001; 2 feet wide by 1 foot deep.	35.64355091 -88.40577041	35.64369391 -88.40366017
S003	Perennial	Category A (50 ft)	Unnamed tributary to Beech River	2 feet deep by 1 foot wide	35.64302377 -88.41297466	35.64277188 -88.40956633
S004	Perennial	Category A (50 ft)	Beech River	100 feet wide by 10 feet deep. Fish present	35.64359826 -88.41213774	35.64205189 -88.41426051
S005	Perennial	Category A (50 ft)	Unnamed tributary to Beech River	10 foot wide by 5 foot deep, fish present in pools.	35.64310376 -88.4139505	35.64221566 -88.41402157
S006	Perennial	Category A (50 ft)	Unnamed tributary to Beech River	10 feet wide by 10 feet deep. Spring influence. water in channel, multiple types of EPT present.	35.64140809 -88.4190005	35.64079279 -88.41809196
S007	Perennial	Category A (50 ft)	Unnamed tributary to Beech River	10 feet wide by 5 feet deep. Unnamed trib to Beech River, fish present.	35.640281 -88.41999833	35.63979472 -88.41877

Sequence ID	Stream Type	Streamside Management Zone Category (RB, LB)	Stream Name	Field Notes	Coordinates*	
					Begin	End
S008	Intermittent	Category A (50 ft)	Unnamed tributary to Beech River	Tributary to S007. 10 feet wide by 5 feet deep. Deeply incised. Water present in channel at time of survey due to recent rains, drought conditions. Well defined bed and bank, moderate sorting and alluvial material. Wetland plants in channel.	35.639302 -88.4202146	35.63996594 -88.42052498
S009	Perennial	Category A (50 ft)	Little Wolf Creek	Mainstem Little Wolf Creek, 30 feet wide by 5 feet deep. Fish present.	35.63131377 -88.42804612	35.63038624 -88.42653469
S010	Perennial	Category A (50 ft)	Unnamed trib to Little Wolf Creek	20 feet wide by 5 feet deep. Backwater Branch to Little Wolf Creek. Fish present.	35.63080369 -88.42814006	35.63078515 -88.42770348
S011	Perennial	Category A (50 ft)	Unnamed trib to Little Wolf Creek	20 feet wide by 5 feet deep. Fish present.	35.63001913 -88.42914763	35.62942238 -88.42732236
S012	Intermittent	Category A (50 ft)	Unnamed trib to Little Wolf Creek	3 foot wide by 3 foot deep. Spring influence, defined bed and bank. Sorting and flow in channel. Iron fungus, a couple small headcuts.	35.6293304 -88.42797655	35.62955172 -88.42955016
S013	Intermittent	Category A (50 ft)	Unnamed trib to Little Wolf Creek	2 feet wide by 2 feet deep. Spring influence, defined bed and bank. Sorting and flow in channel. Iron fungus. Headcuts at the head of pools. Crayfish	35.62918831 -88.42838375	35.62883316 -88.42852467

Sequence ID	Stream Type	Streamside Management Zone Category (RB, LB)	Stream Name	Field Notes	Coordinates*	
					Begin	End
S014	Perennial	Category A (50 ft)	Unnamed trib to Wolf Creek	3 feet wide by 3 feet deep. A road culvert forms a large scour pool. Channel below pool is mostly dry. Moderate bed and bank and sorting.	35.62013856 -88.44794276	35.62103079 -88.44828458
S015	Perennial	Category A (50 ft)	Unnamed trib to Wolf Creek	5 feet wide by feet deep. Water in channel, recent rain event has filled channel with leaves. Heavy iron fungus, occasional crayfish. Sand bottom.	35.62135203 -88.44948608	35.62008149 -88.44873957
S016	Intermittent	Category A (50 ft)	Unnamed trib to Wolf Creek	5x5. Deeply incised dry creek bed. Debris piles and wrack lines, sandy bottom w no veg. DATOS.	35.62079783 -88.45710004	35.61998705 -88.4570127
S017	Perennial	Category A (50 ft)	Unnamed trib to Wolf Creek	20 foot wide by 10 foot wide. fish present.	35.61587469 -88.46684689	35.61418924 -88.46633021
S018	Perennial	Category A (50 ft)	Unnamed trib to Wolf Creek	20 feet wide by 10 feet deep. Deeply incised. Fish present.	35.61070682 -88.46782169	35.61350178 -88.4653404
S019	Intermittent	Category A (50 ft)	Unnamed trib to Wolf Creek	5 feet wide x 5 feet deep deeply incised, water holding in pools, intermittent section.	35.60835413 -88.47059597	35.60935514 -88.46826568
S020	Perennial	Category A (50 ft)	Unnamed trib to Middle Fork Creek	3 feet wide x 1 foot deep. Sinuous. Sorting. Iron oxidizing. Moderate bed and bank. Fish present.	35.55922509 -88.49331293	35.5591341 -88.49399324
S021	Perennial	Category A (50 ft)	Unnamed trib to Middle Fork Creek	6 feet wide x 2 feet deep stream. Fish present	35.55877953 -88.49347865	35.55923391 -88.49439268

Sequence ID	Stream Type	Streamside Management Zone Category (RB, LB)	Stream Name	Field Notes	Coordinates*	
					Begin	End
S022	Perennial	Category A (50 ft)	Middle Fork Creek	20 feet wide x 5 feet deep stream. Fish present	35.5581428 -88.49356734	35.55863529 -88.49465687
S023	Perennial	Category A (50 ft)	Unnamed trib to Middle Fork Creek	20 feet wide x 5 feet deep. Fish present	35.55846765 -88.49433661	35.55756494 -88.4929125
S024	Intermittent	Category A (50 ft)	Unnamed trib to Middle Fork Creek	3 feet wide x 1 foot deep. Iron deposit. Stream filled with debris	35.55782974 -88.49389326	35.55502317 -88.49475715
S025	Intermittent	Category A (50 ft)	Unnamed trib to Middle Fork Creek	8 feet deep by 2 feet wide.	35.54714294 -88.49888184	35.54381566 -88.49884112
S026	Perennial	Category A (50 ft)	Unnamed trib to Jack's Creek	6 feet deep x 2 feet wide stream	35.51022371 -88.50935962	35.51234152 -88.50994781
S027	Intermittent	Category A (50 ft)	Unnamed trib to Jack's Creek	3 feet wide x 1 foot deep. Culverted	35.49165064 -88.50714245	35.48783877 -88.50756285
S028	Intermittent	Category A (50 ft)	Unnamed trib to Jack's Creek	3 feet wide x 1 feet deep stream.	35.48687867 -88.50795645	35.48643739 -88.50830393
S029	Intermittent	Category A (50 ft)	Unnamed trib to Jack's Creek	6-foot-wide x 1 foot deep. Slack water.	35.48645955 -88.50933321	35.48664964 -88.50854365
S030	Perennial	Category A (50 ft)	Jack's Creek	20 feet wide x 3 feet deep. Fish present	35.48608247 -88.50949914	35.4865138 -88.50806788
S031	Intermittent	Category A (50 ft)	Unnamed trib to Jack's Creek	8 feet wide x 1 foot deep stream. Feature crosses TL twice. Raining during survey	35.47527228 -88.51481951	35.47760989 -88.51226399

Sequence ID	Stream Type	Streamside Management Zone Category (RB, LB)	Stream Name	Field Notes	Coordinates*	
					Begin	End
S100R	Intermittent	Category A (50 ft)	Unnamed trib to Wolf Creek	3 feet wide x 2 feet deep sand bottom. Water in channel. Spring influence. Deeply incised. Infiltration from side channels. Reclassified during access road survey.	35.62231917 -88.43325843	35.62382207 -88.43407974
P001	Pond	Category A (50 ft)	N/A	Man made impoundment.	35.64367538 -88.40882208	N/A
P002	Pond	Category A (50 ft)	N/A	Farm pond in ROW	35.64250015 -88.41516354	N/A
P003	Pond	Category A (50 ft)	N/A	Forested oxbow pond adjacent to Asc016	35.62060133 -88.44798199	N/A
P004	Pond	Category A (50 ft)	N/A	Farm pond	35.59896281 -88.47741148	N/A
P005	Pond	Category A (50 ft)	N/A	Farm pond in ROW	35.57696469 -88.48729006	N/A

*Denotes extent of reach assessed.

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

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Appendix D - Noise During Transmission Line and Substation Construction and Operation

At high levels, noise can cause hearing loss; at moderate levels, noise can interfere with communication, disrupt sleep, and cause stress; and at low levels, noise can cause annoyance. Noise is measured in decibels (dB), a logarithmic unit, so an increase of 3 dB is just noticeable, and an increase of 10 dB is perceived as a doubling of sound level. Because not all noise frequencies are perceptible to the human ear, A-weighted decibels (dBA), which filter out sound in frequencies above and below human hearing, are typically used in noise assessments.

Both the U.S. Environmental Protection Agency (USEPA) and the Department of Housing and Urban Development (HUD) have established noise guidelines. USEPA guidelines are based on an equivalent day/night average sound level (DNL), which is a 24-hour average sound level with 10 dB added to hours between 10 p.m. and 7 a.m., since people are more sensitive to nighttime noise. USEPA recommends a guideline of DNL less than 55 dBA to protect the health and well-being of the public with an adequate margin of safety. HUD guidelines use an upper limit DNL of 65 dBA for acceptable residential development and an upper limit DNL of 75 dBA for acceptable commercial development. TVA generally uses the USEPA guideline of 55 dBA DNL at the nearest residence and 65 dBA at the property line in industrial areas to assess the noise impact of a project. In addition, TVA considers 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 G-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 G-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 to carry on a normal conversation.

Construction Noise

Construction noise impacts would vary with the number and specific types of equipment on the job, the construction methods, the scheduling of the work, and the distance to sensitive noise receptors such as houses. Typical construction activities for a substation and a transmission line are described in Section 2.2. Maximum noise levels generated by the various pieces of construction equipment typically range from about 70 to 85 dBA at 50 feet (Bolt et al. 1971). An exception would be the use of track drills for building roads and installing foundations in rocky areas; track drills have a typical maximum noise level of 98 dBA at 50 feet. Use of track drills is not expected to be widespread.

Project-related construction noise levels would likely exceed background noise levels by more than 10 dBA at distances from within 500 feet in developed areas to over 1,000 feet in rural areas with little development. These distances are without the use of track drills; drilling activities could increase the distances by an additional 500 feet. A 10-dBA increase would be perceived as a large increase over the existing noise level and could result in annoyance to adjacent residents. The residential noise level guideline of 55 dBA could also be temporarily exceeded for residences near construction activities.

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

Operational Noise

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

For 500-kV transmission lines, this corona noise when present, is usually about 40-55 dBA. The maximum recorded corona noise has been 60-61 dBA (TVA unpublished data). During rain showers, the corona noise would likely not be readily distinguishable from background noise. During very moist, non-rainy conditions, such as heavy fog, the resulting small increase in the background noise levels is not expected to result in annoyance to adjacent residents. The substation would also produce similar levels of noise from corona discharge, although it is not expected to cause annoyance to nearby residents.

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

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

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

Literature Cited

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

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