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ENVIRONMENTAL ASSESSMENT

HELICON, ALABAMA
POWER SUPPLY IMPROVEMENT PROJECT
Lawrence and Winston Counties, Alabama

PREPARED BY:
TENNESSEE VALLEY AUTHORITY

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Direct comments to:

Kelly R. Baxter
NEPA Compliance
Tennessee Valley Authority
400 West Summit Hill Drive, WT 11-D
Knoxville, Tennessee 37902-1401
Phone: 865.632.2444
Fax: 865.632.3451
E-mail: krbaxter@tva.gov

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ACRONYMS, ABBREVIATIONS, AND GLOSSARY OF TERMS

acre	A unit measure of land area equal to 43,560 square feet
ADEM	Alabama Department of Environmental Management
AMA	American Medical Association
APE	Area of potential effect
BMPs	Best management practices, i.e., accepted construction practices designed to reduce environmental effects
B.P.	Before present
CFR	Code of Federal Regulations
conductors	Cables that carry electrical current
CR	County road
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	Decibel(s)
dBA	A-weighted decibel
DBH	Diameter at breast height, a standard method of expressing the diameter of the trunk of a standing tree to aid in estimating the age of veteran trees
designated critical habitat	A specific geographic area that is essential for the conservation of a threatened or endangered species
distribution line	A series of electrical conductors used to transfer electric power locally between substations or from substations to power consumers; distribution lines carry less electric power than the transmission lines and substations that feed them
DNL	Day/Night levels
easement	A legal agreement that gives TVA the right to use property for a purpose such as a right-of-way for constructing and operating a transmission line
EC	Electric Cooperative
e.g.	Abbreviation for the Latin term, *exempli gratia*, meaning “for example”
EMF(s)	Electric and magnetic field(s)
EO(s)	Executive Order(s)
ESA	Endangered Species Act
feller-buncher	A piece of heavy equipment that grasps a tree while cutting it, which can then lift the tree and place it in a suitable location for disposal; this equipment prevents trees falling into a sensitive area, such as a wetland
FICON	Federal Interagency Committee on Noise
forb	A herbaceous plant other than a grass or a fern
GIS	Geographic information system
guy	A cable connecting a structure to an anchor that helps support the structure
HUD	Department of Housing and Urban Development
ibid	Abbreviation for the Latin term, *ibidem*, meaning “in the same place”; refers to the immediately preceding work cited

i.e.	Abbreviation for the Latin term, *id est*, meaning “that is”
kV	Kilovolt, 1 kV equals 1,000 volts
load	That portion of the entire power in a network consumed within a given area; also synonymous with “demand” in a given area
n.d.	Indicates “no date” or date that Web site was accessed is unknown
NEPA	National Environmental Policy Act
NERC	North American Electric Reliability Corporation
NESC	National Electrical Safety Code
NHPA	National Historic Preservation Act
NIEHS	National Institute of Environmental Health Sciences
NRHP	National Register of Historic Places
NRI	Nationwide Rivers Inventory
OSHA	Occupational Safety and Health Administration
outage	An interruption of the electric power supply to a user
PI	Abbreviation for point of intersection—the point at which a transmission line changes direction (or angles) requiring a transmission line structure with guy wires
radial line	An electronic power line that is capable of carrying electric power in only one direction
riparian	Related to or located on the banks of a river or stream
ROC	Regional Operations Center
ROW(s)	Right(s)-of-way, a corridor containing a transmission line
runoff	That portion of total rainfall that eventually enters a stream or river
SHPO	State Historic Preservation Officer
SMZ(s)	Streamside management zone(s)
SOC	System Operations Center
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
switch	A device used to complete or break an electrical connection
switching station	A facility that usually contains only breakers and switches to change line connections or sectionalize lines, is typically fenced, and usually has a gravel surface
tap line	An electric power line that connects an existing transmission line (at a tap point) to a substation
tap point	A connection point between a tap line and an existing transmission line
transmission line	A series of electrical conductors (“wires”) and their supporting structures used to transmit electric power; transmission lines carry more electric power than distribution lines
TVA	Tennessee Valley Authority
TVARAM	TVA Rapid Assessment Method, a version of the Ohio Rapid Assessment Method designed specifically for the TVA region
underbuild	A construction method in which a distribution line is placed underneath the transmission line on the same structure, thereby using a single structure for both lines

US	United States Highway
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
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
WHO	World Health Organization

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CHAPTER 1

1.0 PURPOSE OF AND NEED FOR ACTION

1.1. Proposed Action - Improve Power Supply

Tennessee Valley Authority (TVA) proposes to improve the existing power supply system in the Helicon area of Winston County, Alabama, by constructing and operating approximately 6.5 miles of new 161-kilovolt (kV) transmission line (i.e., a "tap line"). The proposed tap line would connect Cullman Electric Cooperative's (EC) planned Helicon 161-kV Substation to TVA's existing Addison 161-kV Tap Line, near the existing Addison 161-kV Substation (see Figure 1-1). Additionally, in order to allow for remote control operation of the existing switches at the Addison Tap Point, TVA would mount new cabinets and associated equipment on two switch structures in TVA's Cullman-Moulton 161-kV Transmission Line (see Figures 1-2 and 1-3).

Approximately 4.5 miles of new transmission line would be built on new right-of-way (ROW) 100 feet in width, and about 2 miles of the transmission line would utilize the existing 75-foot-wide ROW of Cullman EC's Jones Chapel-Addison 46-kV Transmission Line, which is no longer in service. TVA would purchase additional rights over the existing ROW, thus sharing this existing easement with Cullman EC, and would purchase an additional 25 feet of new ROW (12.5 feet on either side). In addition, TVA would provide space for a future Cullman EC 26-kV underbuild (i.e., a distribution line placed underneath the transmission line on the same structure) in this section as well. The proposed transmission line would occupy about 79 acres of new and existing transmission line ROW (61 acres of new ROW and 18 acres of existing ROW). The proposed action would serve to reduce power outages and relieve equipment that is near overload.

The proposed action also includes the installation of one switch structure and modifications to two existing switch structures. TVA would install one switch structure within the new transmission line ROW near the Addison Substation in Winston County, Alabama. The work TVA is proposing on the existing switches would consist of modifying an existing switch structure so that the switch can be operated remotely (see Figure 1-2). TVA would accomplish this by mounting new cabinets and associated equipment on existing Switch Structures 823 and 825 in TVA's Cullman-Moulton 161-kV Transmission Line in Lawrence County (see Figures 1-2 and 1-3). Existing gravel roads would be used to access each switch structure, and the work would result in no additional land disturbance. Structure 823 is located within the boundaries of the William B. Bankhead (Bankhead) National Forest. Although only modifications to existing structures would be required, these switches would serve essentially the same function as a switching station. TVA would also provide Cullman EC with two switch structures and revenue metering equipment for installation at the planned 161-kV Helicon Substation.

The TVA system's map board display at TVA's System Operations Center (SOC) and Regional Operations Center (ROC) in Chattanooga would be modified to include the names and numbers of the new facilities. TVA would complete construction and begin operation of the proposed transmission line as soon as December 2011.

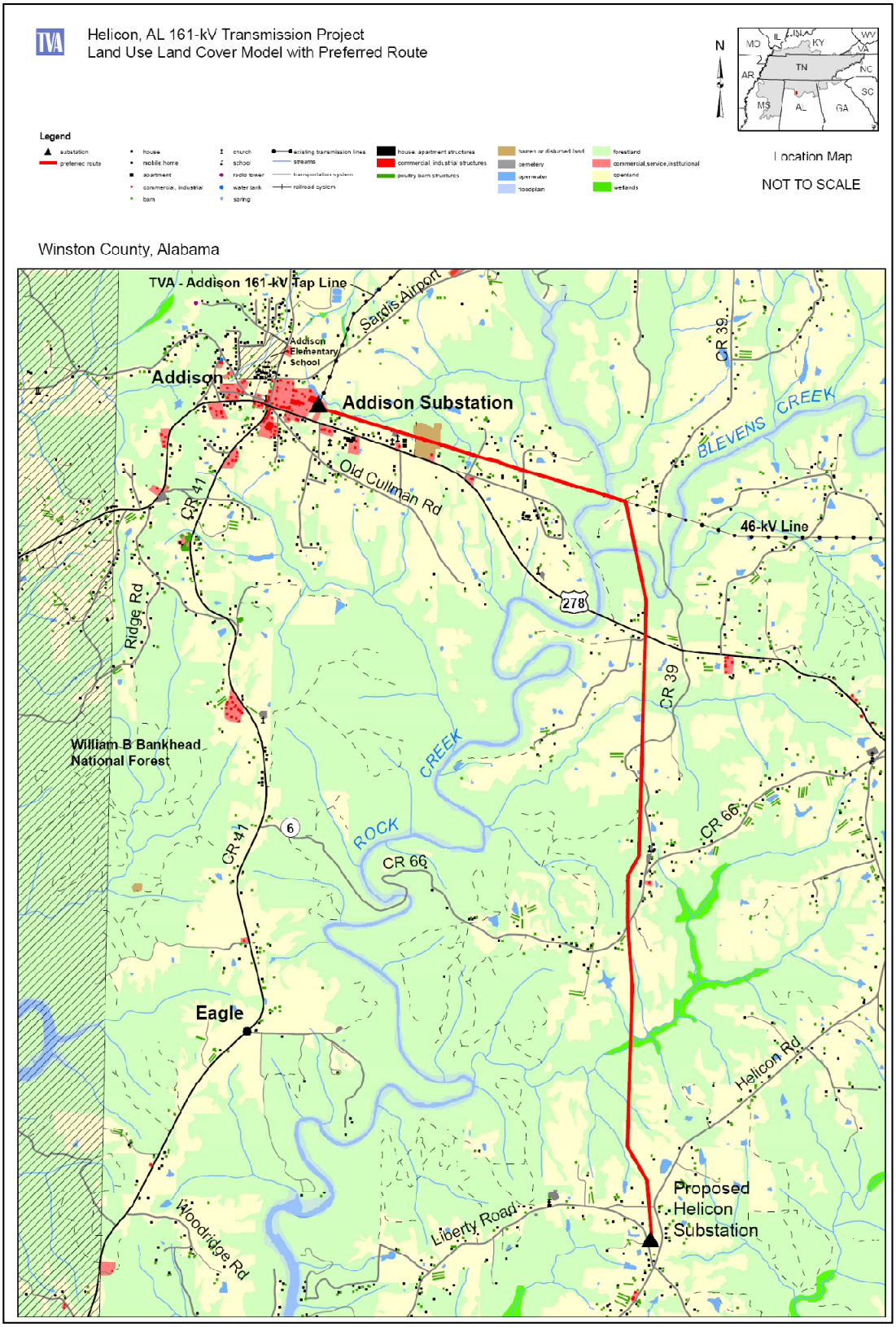

Figure 1-1. Proposed Helicon, Alabama, 161-Kilovolt Transmission Line Route

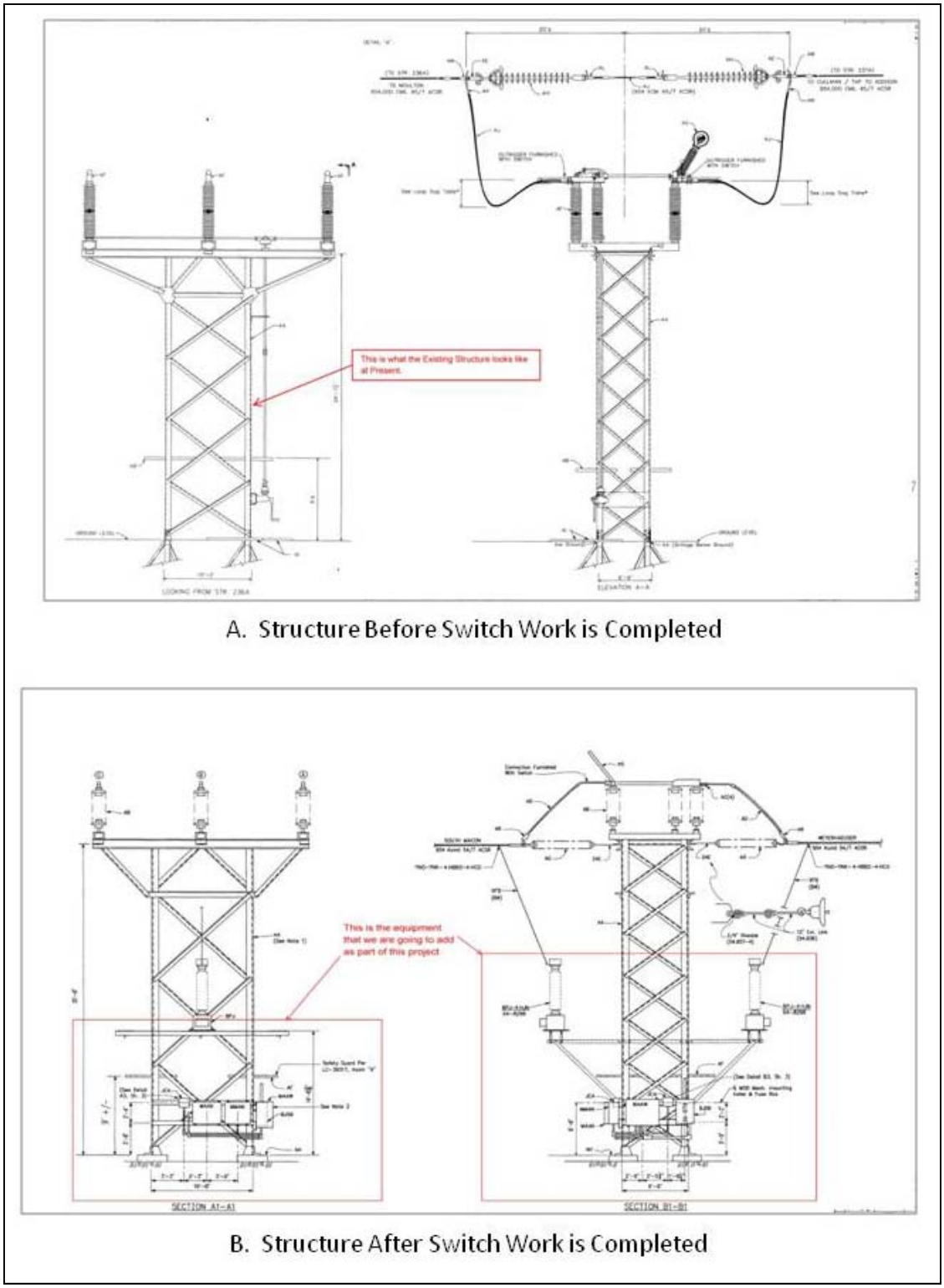

Figure 1-2. Switch Structure Before and After Proposed Switch Equipment is Added

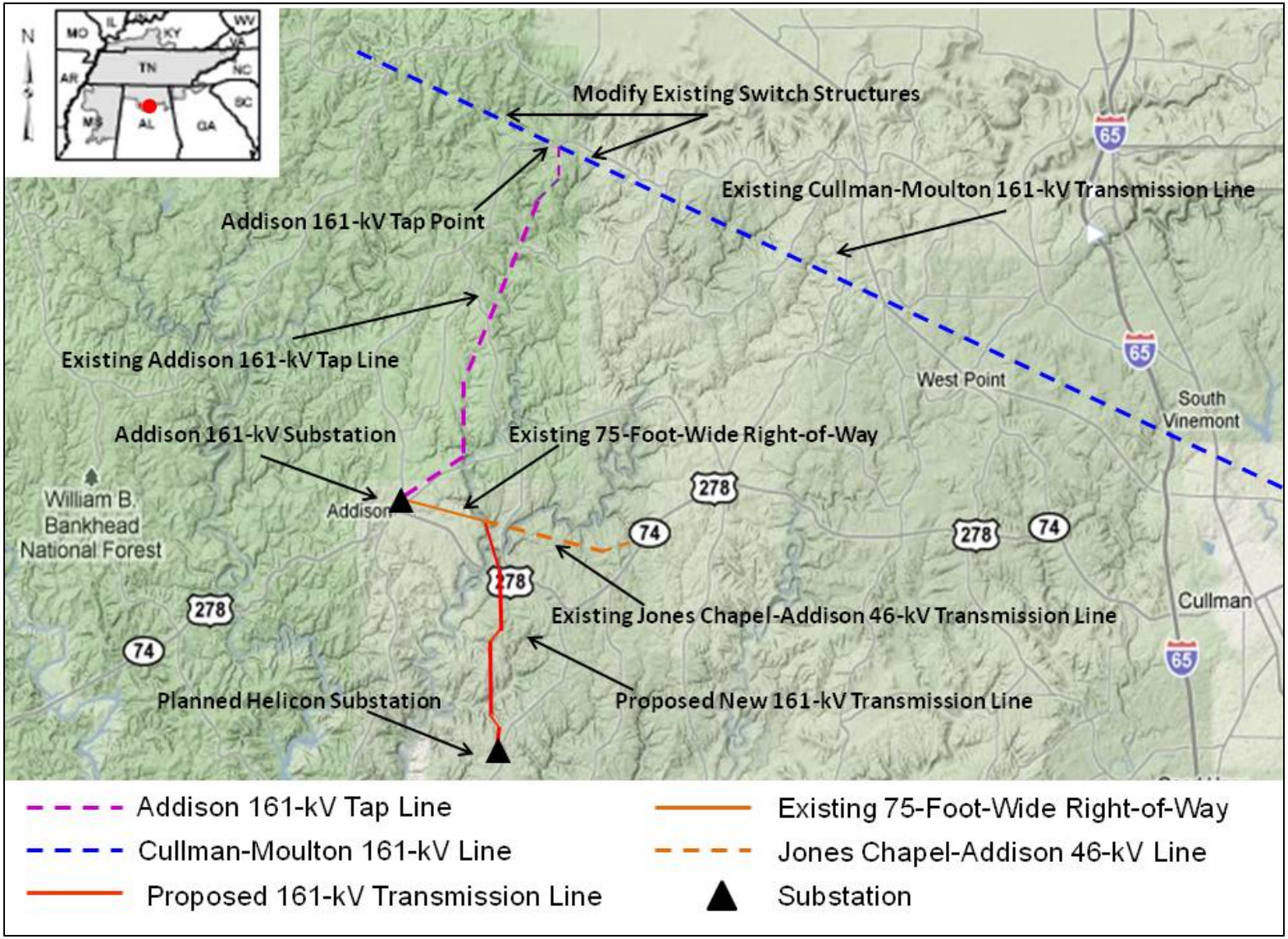

Figure 1-3. Helicon, Alabama, 161-Kilovolt Power Supply Improvement Project Vicinity Map

1.2. Need for the Proposed Action

TVA plans its transmission system according to industry-wide standards provided by the North American Electric Reliability Corporation (NERC) and the National Electrical Safety Code (NESC). The standards state that the power supply system must be able to serve customer loads with adequate voltage and no equipment damage while maintaining adequate line clearances. Cullman EC provides electrical service to the Helicon, Alabama, area by a 23-mile radial transmission line (i.e., an electric power line that is capable of carrying electric power in only one direction) from its Trade 46-kV Substation. Because radial lines provide only one source of power with no backup supply, any failure to these lines would result in outages at the substations served by these lines. Radial transmission lines supply the entire Cullman EC service territory. The substantial radial exposure (i.e., number of miles of radial line) in the area has resulted in increased interruptions in electrical service and outages for the last five years. In addition, the Smith Lake Community near Helicon, a popular area for vacation homes and retirees, continues to experience rapid load growth. Voltage levels at the Trade Substation fall below acceptable TVA reliability criteria during the summer months when the power demand (or "load") is at its peak. Due to the radial exposure and increased power demand in the area, TVA's transformers at the Trade Substation are expected be overloaded by winter 2012.

To ensure that the Helicon area has continuous, reliable service, TVA is proposing to improve power supply by providing additional electric power to the area. The construction of a new transmission line would address the voltage problems and improve reliability in Cullman EC's Helicon service area, thereby allowing TVA to meet NERC reliability criteria. Additionally, the proposed project would allow TVA to ensure the area is provided with a reliable, affordable source of power for continued economic health and residential and commercial growth in the area.

1.3. Decisions

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

- The timing of improvements
- The most suitable route for the transmission line
- The most suitable location for the tap point
- Determining any necessary mitigation and/or monitoring measures to implement in order to meet TVA standards and minimize the potential for damage to environmental resources

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

1.4. Other Pertinent Environmental Reviews or Documentation

In 1995, TVA completed *Energy Vision 2020: An Integrated Resource Plan and Programmatic Environmental Impact Statement* (TVA 1995). This study addresses short- and long-term strategies that would enable TVA to meet the needs of its customers for

electricity through the year 2020 and includes a description of TVA's electric power transmission system.

In 2011, TVA completed *Environmental Impact Statement and Integrated Resource Plan: TVA's Energy and Environmental Future (TVA 2011).* The plan and associated environmental impact statement supports TVA's comprehensive mission of service and its renewed vision to be one of the nation's leading providers of reliable and affordable electric power in a sustainable manner and identifies the resources that will be needed to meet anticipated energy demand in the Tennessee Valley over the next 20 years.

1.5. The Scoping Process and Public Involvement

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

- Alabama-Coushatta Tribe of Texas
- Alabama Department of Archives and History
- Alabama Natural Heritage Program
- Alabama Quassarte Tribal Town
- Cherokee Nation
- Chickasaw Nation
- Choctaw Nation of Oklahoma
- United States Forest Service
- Eastern Band of Cherokee Indians in Oklahoma
- Eastern Shawnee Tribe of Oklahoma
- Jena Band of Choctaw Indians
- Kialegee Tribal Town
- Muscogee (Creek) Nation
- Poarch Band of Creek Indians
- Seminole Nation of Oklahoma
- Seminole Tribe of Florida
- Absentee Shawnee Tribe of Oklahoma
- Shawnee Tribe
- Thlopthlocco Tribal Town
- United Keetoowah Band of Cherokee Indians in Oklahoma

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

TVA developed a public communication plan that included a Web site with information about the proposed project, a map of the alternative routes, and public feedback mechanisms. Public officials and property owners potentially affected by any of the route alternatives were invited to the project open house. TVA placed public notices in the local newspapers to notify the public of the open house, held on November 19, 2009, at the Addison Community Center in Addison, Alabama; 75 people attended.

At the open house, TVA presented a network of 10 alternative transmission line routes comprised of nine alternative line segments and two tap points (see Figure 1-4) to the public for comment. These segments are described in Section 2.3.4. The primary concern expressed by the public was the impact of the new line to residential development and farmland in the area. Owners also voiced concerns about health issues, property value, and impacts of the proposed line on visual quality, along with natural, historical, and archaeological resources.

A 30-day public review and comment period for the proposed transmission line project began November 19, 2009. A toll-free phone number and facsimile number were made available to facilitate comments. During the comment period, landowners contacted TVA to express their concerns, most of which were similar to those expressed at the open house. Following the receipt of public input, TVA evaluated the network of nine alternative line segments for improvements that would reduce power outages and relieve equipment that is near overload (see Section 2.3).

1.6. Issues to be Addressed

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

- Vegetation and wildlife
- Aquatic ecology
- Endangered and threatened species and their critical habitats
- Groundwater and geology
- Surface water
- Wetlands
- Floodplains
- Archaeological and historic resources
- Aesthetics
- Recreation, parks, and natural areas
- Socioeconomics and environmental justice

Potential effects related to prime farmland, air quality, hazardous and nonhazardous wastes, and health and safety were also considered. These effects were found to be absent or minor, and these resources do not require further evaluation.

1.7. Necessary Permits and Approvals

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

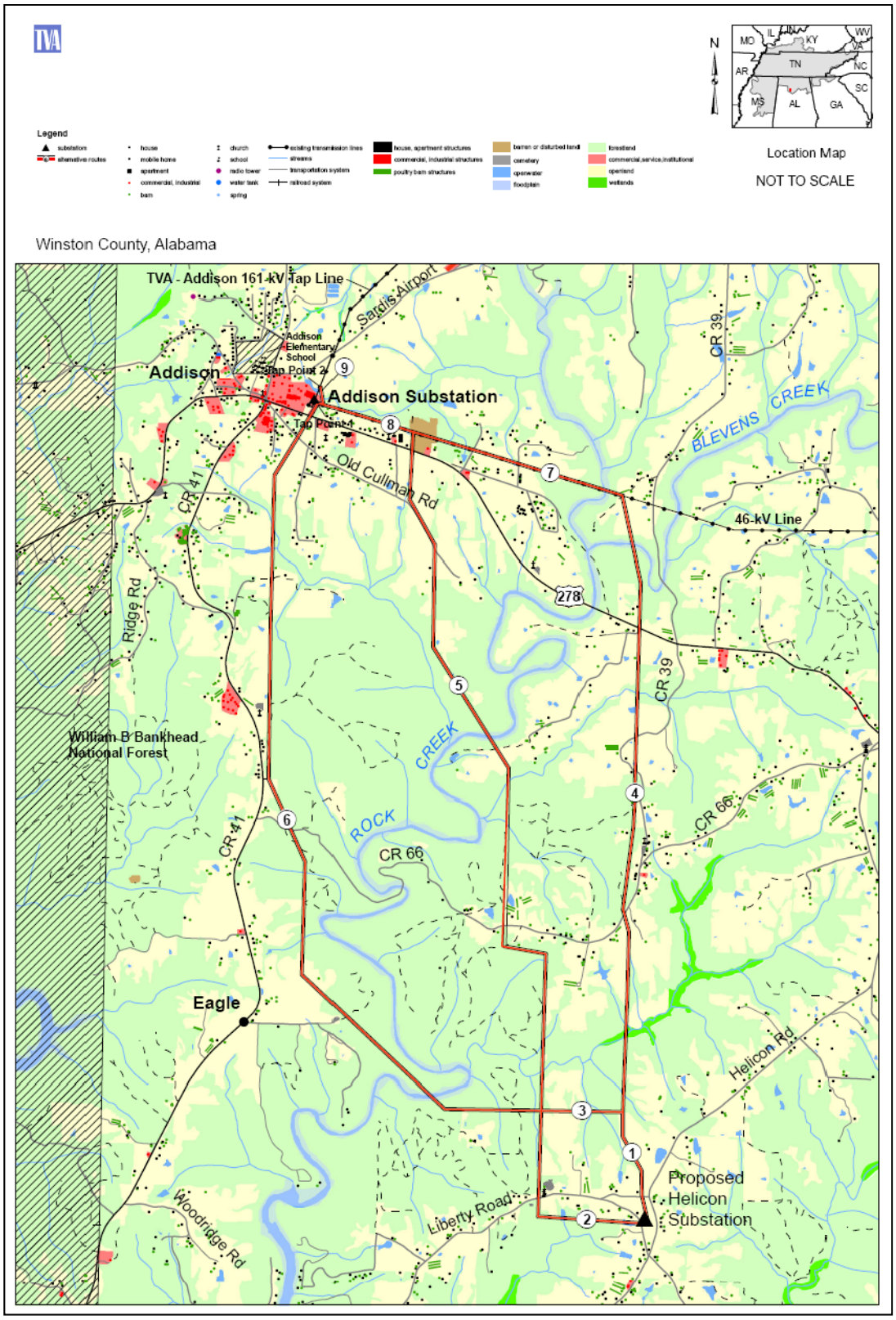

Figure 1-4. Proposed Alternative Transmission Line Segments From the Addison 161-Kilovolt Tap Line to the Helicon 161-Kilovolt Substation

CHAPTER 2

2.0 ALTERNATIVES INCLUDING THE PROPOSED ACTION

As previously described, TVA proposes to connect Cullman EC's planned Helicon 161-kV Substation to TVA's existing Addison 161-kV Tap Line, near the existing Addison 161-kV Substation. The connection would be accomplished by constructing and operating approximately 6.5 miles of new 161-kV transmission line. Additionally, in order to allow for remote control operation of the existing switches at the Addison Tap Point, TVA would mount new cabinets and associated equipment on existing Switch Structures 823 and 825 in TVA's Cullman-Moulton 161-kV Transmission Line.

This chapter describes all of the alternatives explored, provides additional background information about the transmission line construction, operation, and maintenance, and contains the following major sections:

- Description of Alternatives
- Description of Construction, Operation, and Maintenance of the Proposed Transmission Line
- Siting Process
- Comparison of the Alternative Routes
- Identification of the Preferred Alternative

2.1. Alternatives

2.1.1. Alternative 1 – Do Not Construct and Operate a New 161-kV Transmission Line (No Action Alternative)

Under the No Action Alternative, TVA would not construct the proposed transmission line to serve Cullman EC's planned Helicon 161-kV Substation, and the TVA power system in the Helicon area would continue under the current operating conditions. With the continued use of existing facilities to supply power to the area, power outages could result from the failure of overloaded equipment.

To provide reliable power to the area, Cullman EC could decide to build a new transmission line to serve its new substation. Cullman EC could possibly use the preferred route identified by TVA, or it could select another route. If Cullman EC were to independently provide transmission service and construct a new transmission line, the potential environmental effects resulting from the implementation of the No Action Alternative likely would be comparable to those resulting from the adoption of the Action Alternative, depending on the route chosen and the construction methods used by Cullman EC.

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

Under the Action Alternative, TVA would serve Cullman EC's planned Helicon 161-kV Substation by building a 6.5-mile-long 161-kV transmission line connecting the planned substation to TVA's existing Addison 161-kV Tap Line near the existing Addison 161-kV Substation (see Figures 1-1 and 1-3). TVA would provide two switch structures for the

distributor to install in its planned new substation, and TVA would install one switch in the proposed new transmission line ROW near the Addison 161-kV Substation.

Additionally, in order to allow for remote control operation of the switches for the new transmission line, TVA would modify the existing switches at the Addison Tap Point by mounting new cabinets and associated equipment on existing Switch Structures 823 and 825 in TVA's Cullman-Moulton 161-kV Transmission Line (see Figure 1-3).

Beginning at the Addison Tap Line, the first 2 miles of the new transmission line would be located on the distributor's existing Jones Chapel-Addison 46-kV ROW, which is no longer in service. TVA would purchase additional rights and new ROW and provide space for a future Cullman EC 26-kV underbuild in this section. The remaining 4.5 miles of new transmission line would be located on new 100-foot-wide ROW (see Figure 1-4). Access roads would be developed for construction and maintenance of the proposed transmission line.

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

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

Implementation of Alternative 2, the Action Alternative, would provide another source of power to the area to ensure a reliable power supply is available to serve the electric power needs in the Helicon area for the immediate future.

2.1.3. Other Alternatives Considered But Not Selected

2.1.3.1. Distributor to Upgrade Existing Facilities and Construct 26-kV Switching Station

Under this alternative, Cullman EC would increase the capacity in its Trade 46-kV Substation by adding a new 46-kV transformer bank, rebuilding its 11.2-mile temporary Jones Chapel-Trade 46-kV Transmission Line and its 8.25-mile distribution line from its Trade Substation into the Smith Lake Community, and building a 26-kV switching station in the Helicon area. Although this alternative would provide the additional capacity to relieve the overloading problems at the Trade Substation identified in Section 1.2, implementing this option would not address the reliability problems caused by the radial feed transmission lines in the area. Furthermore, this alternative does not address future load growth in the area. For these reasons, this alternative was eliminated from further consideration.

2.1.3.2. Underground Utility Lines

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

Power lines can be buried; however, buried lines tend to be low-voltage distribution lines, i.e., lines that are 13-kV or less rather than high-voltage transmission lines, i.e., lines that

are 69-kV or more. Although low-voltage distribution lines can be laid into trenches and buried without the need for special conduits, some lines require armor casings for safety reasons. Burying high-voltage lines, such as 69-kV, 161-kV, and 500-kV transmission lines require extensive excavation, and these lines must be encased in special conduits or tunnels. Additionally, measures to ensure proper cooling and to provide adequate access are required. Usually, a road along or within the ROW of buried lines must be maintained for routine inspection and maintenance.

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

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

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

2.2.1. Transmission Line Construction

2.2.1.1. Right-of-Way Acquisition and Clearing

The proposed transmission line would be constructed on 100-foot-wide ROW. Approximately 2 miles of the proposed route would follow the distributor's existing 75-foot wide ROW of the Jones Chapel-Addison 46-kV Transmission Line, which is no longer in service. TVA would purchase additional rights over the existing ROW and 25-foot-wide new ROW (12.5 feet on either side of the existing ROW) and provide space for a future Cullman EC 26-kV underbuild in this section. The remaining 4.5 miles of new transmission line would be located on entirely new ROW. TVA would purchase easements from landowners for the new ROW. These easements would give TVA the right to construct, operate, and maintain the transmission line, as well as remove danger trees from the ROW. Danger trees include any trees that are located off the cleared ROW, but that are tall enough to pass within 5 feet of a conductor or strike a structure should it fall toward the transmission line. The fee simple ownership of the land within the ROW would remain with the landowner, and many activities and land uses could occur on the property in the ROW. However, the terms of the easement agreement prohibit certain activities (such as construction of buildings) within the ROW that could interfere with the transmission line or create a hazardous situation.

Because of the need to maintain adequate clearance between tall trees and shrubs and transmission line conductors, as well as to provide access for construction equipment, most tall vegetation would initially 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. 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 include only trees tall enough, or with the potential soon to grow tall enough, to interfere with conductors. In order to limit ground disturbance, clearing in SMZs would be accomplished using hand-held equipment or remote-handling equipment, such as a feller-buncher. TVA *Right-of-Way Clearing Specifications, Environmental Quality Protection Specifications for Transmission Line Construction, Transmission Construction Guidelines Near Streams* (Appendices B, C, D), and Muncy 1999 would be followed in vegetation clearing and construction activities.

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

2.2.1.2. Access Roads

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

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

2.2.1.3. Construction Assembly Areas

A construction assembly area (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. TVA typically leases the property about one month before construction begins. Properties such as paved or graveled parking lots are ideal laydown areas because site preparation is minimal. Selection criteria used for locating potential laydown areas include an area typically 5 acres in size; relatively flat; well drained; previously cleared; preferably graveled and fenced; preferably wide access points with appropriate culverts; sufficiently distant from streams, wetlands, or sensitive environmental features; and located adjacent to an existing paved road near the transmission line. TVA initially attempts to use or lease properties that require no site preparation. However, at times, the property may require some minor grading and installation of drainage structures such as culverts. Likewise, the area may require graveling and fencing. Trailers used for material storage and office space would be parked in the construction assembly area. Following completion of construction activities, all trailers, unused materials, and construction debris would be removed from the site. Removal of fencing installed by TVA and site restoration would be at the discretion of the landowner.

2.2.1.4. Structures and Conductors

The proposed 161-kV transmission line would utilize single-, double-, and triple-pole steel structures (see Figure 2-1). Structure type would depend on terrain and the resulting distance between structures. Structure heights would vary according to the terrain and would range between 70 and 120 feet.

Figure 2-1. Examples of Single-, Double-, and Triple-Pole Steel Structures

Three conductors (i.e., cables that carry the electrical current) are required to make up a circuit in alternating-current transmission lines. For 161-kV transmission lines, each single-cable conductor is attached to fiberglass or ceramic insulators suspended from the structure cross arms. A smaller overhead ground wire or wires are attached to the top of the structures. This ground wire may contain fiber optic communication cables (see Figure 2-1).

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

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

2.2.1.5. Conductor and Ground Wire Installation

Reels of conductor and ground wire would be delivered to various staging areas along the ROW, and temporary clearance poles would be installed at road crossings to reduce interference with traffic. A small rope would be pulled from structure to structure, would be connected to the conductor and ground wire, and would be 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 from the ground and by helicopter aerial surveillance, occurring on five-year (approximately) cycles after operation begins. The inspections are conducted 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 and the area immediately adjoining the ROW is noted. These observations are then used to plan corrective line maintenance and routine vegetation management.

2.2.2.2. Vegetation Maintenance

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

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

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

2.2.2.3. Structure Replacement

Other than vegetation management, little other maintenance work is generally required. The transmission line structures and other components typically last several decades. In the event that a structure needs to be replaced, the structure would normally be lifted out of

the ground by crane-like equipment, and the replacement structure would be inserted into the same hole or an immediately adjacent hole. Access to the structures would be on existing roads where possible. Replacement of structures may require leveling the area surrounding the replaced structures, but there would be little additional area disturbance when compared to the initial installation of the structure.

2.3. Siting Process

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

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

2.3.1. Definition of the Transmission Line Study Area

The first task in defining the study area was to identify the power sources that could supply the identified need. TVA's existing tap to Addison 161-kV Transmission Line was the most practical source because it is the closest 161-kV transmission line, and it would serve as the most reliable power source to the distributor's new Helicon Substation.

The transmission line study area boundaries were chosen to allow for the establishment of two or more corridors that would eventually yield a preferred route on which to construct the transmission line. The study area is shown in Figures 1-1 and 1-4. The northern boundary of the study area is about 1.25 miles north of the proposed tap point (near the existing Addison 161-kV Substation). The east boundary of the study area is approximately 5 miles east of the proposed tap point. The south boundary of the study area is approximately 8 miles south of the proposed tap point and approximately 2.8 miles south of the distributor's proposed substation site. The west boundary of the study area is approximately 2.5 miles west of the proposed tap point and about 1,600 feet west of the Bankhead National Forest boundary.

The total land area of the transmission line study area is approximately 70 square miles. Most of the transmission line study area is contained within Winston County, with the extreme northeastern edge of the study area in Cullman County. Although a portion of the study area extends into Cullman County, all of the route alternatives are located in Winston County. The proposed actions to modify the two existing switch structures near the existing Addison Tap Point in Lawrence County are not included in the transmission line study area.

The 2009 population of Winston County was 23,997 (United States Census Bureau 2009). The county seat is Double Springs, which rests inside the Bankhead National Forest and is near Lewis Smith Lake. Addison is about 14.5 miles northeast of Double Springs. Helicon is a small community located about 6 miles southeast of Addison. Following is a brief description of the features of the transmission line routing study area.

2.3.2. Characterization of the Transmission Line Study Area

2.3.2.1. Natural Features

Winston County is located in the foothills of the Appalachian Mountains in northwest Alabama. It is part of the Cumberland Plateau, a physiographic section of the Appalachian Plateau province (United States Geologic Survey [USGS] 2003), and its terrain varies from low, rolling hills covered with evergreens to spectacular gorges, rock bluffs, and hardwood forests. Much of Winston County sits on the Warrior Coalfield, and the county's soils are a mixture of plateau and coastal soils. The Black Warrior River and its tributaries flow throughout Winston County. Rock Creek, a tributary of the Sipsey River, drains the study area. There are various churches and cemeteries in the study area.

2.3.2.2. Land Use

Due to the presence of the Bankhead National Forest and small population centers, most of the land in the study area is unplanned. Land uses in the study area range from a mix of residential/commercial/light industrial use inside the city of Addison, to large tracts of undeveloped, forested land in the ridge lands in the southern portion. The areas in between are farmlands and scattered residential developments.

2.3.2.3. Transportation

There are a number of major transportation features in the study area. United States Highway (US) 278 runs east-to-west through the northern portion of study area. Other roads include Old Cullman Road near the Addison Tap Line and Substation; Helicon Road and Liberty Road, which intersect near the proposed Helicon 161-kV Substation site; as well as numerous Winston County roads, including County Road (CR) 41, CR 66, and CR 39 (see Figure 1-4). There are two airports within Winston County, with one occurring inside the study area. The Addison Municipal Airport is approximately 1.25 miles northeast of the tap point, along the northern boundary of the study area. The Double Springs-Winston County Airport is outside of the study area, approximately 9.25 miles to the west-southwest of the proposed tap point.

2.3.3. Data Collection

TVA's initial data collection included geographic data such as topography, land use, transportation, environmental features, cultural resources, near-term future development, and land conservation information for the study area. Information sources used in the transmission line study included design drawings for area transmission lines, data collected into a geographic information system (GIS), including USGS digital line graphs, and Winston County tax maps. Various proprietary data maintained by TVA in a corporate geo-referenced database, including TVA Natural Heritage database file data on sensitive plants and animals, sensitive natural features, such as wetlands and caves, as well as data on archaeological and historical resources, were used.

Additionally, TVA took new aerial color orthophotography of the proposed project area in June 2009. These images were geo-referenced to produce an accurate image of the Earth, by removing the distortions caused by camera tilt and topographic relief displacements, and then digitized for use in the GIS. This aerial photography was then interpreted to obtain land use and land cover data, such as forests, agriculture, wetlands, houses, barns, commercial and industrial buildings, churches, and cemeteries.

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

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

2.3.4. Establish and Apply Siting Criteria

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

2.3.4.1. Transmission Line Routing Criteria

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

- **Engineering Criteria** include considerations such as total length of the transmission route, width of new ROW, number of primary and secondary road crossings, the presence of pipeline and transmission line crossings, and total line cost.

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

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

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

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

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

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

The straight-line distance from the TVA source transmission line to the planned Cullman EC substation site is about 5.5 miles. This distance, along with the steep terrain in the western portion of the study area and the scattered residential and commercial development in the area, limits the number of practicable alternative corridors that could be identified and studied for the project. Using information gathered during the systems studies and data development phases, potential tap point locations were identified on TVA's existing Addison 161-kV Tap Line (see Figure 1-4).

The optimal location for the new tap point would be near the existing Addison 161-kV Substation for three primary reasons. First, the Addison Substation is the closest point on the source line to the distributor's proposed substation, thereby minimizing the length of a new transmission line to serve the new substation. Additionally, this area provides good access for construction and maintenance. Finally, the Addison 161-kV Tap Line heads in a northeastern direction from the Addison Substation, and the terrain to north of the substation is steep. Therefore, a tap point further north in the source line would have resulted not only in increased line length but also constructability and access challenges.

The two new switches at the distributor's new substation would allow for future line connections into the substation. Electric system reliability concerns required one switch in the tap line itself near the tap point. This switch location must meet line-engineering requirements and be accessible by road in all weather conditions, including high water. These restrictions, along with the need for the tap point to be in close proximity to the Addison Substation as described above, resulted in only two possible tap point locations (Figure 1-4).

Nine route segments, as shown in Figure 1-4, were developed using the identified tap point locations, Cullman EC's new substation location, and the GIS-based land use/land cover model and other data layers, such as property boundaries, digital elevation model results

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

Both of the alternative tap point locations are currently undeveloped. Tap Point 1 is located between Structures 669 and 670 on the tap to Addison line and is approximately 200 feet northeast of Structure 670. Tap Point 1 is located behind an existing commercial building and provides for easy access for both construction and maintenance. Tap Point 2 is located in an undeveloped pasture between Structures 669 and 668 on the tap to Addison Transmission Line. This proposed tap point is approximately 275 feet northeast of Structure 669 and 725 feet northeast of Structure 670. Access to this location would be uncomplicated, but would require a new gate and access road along the existing ROW to provide permanent access for maintenance.

Segment 1 (see Figure 1-4) begins at the distributor's proposed Helicon Substation and proceeds north, crossing CR 3193 just north of the substation site. This segment then bends slightly to the northwest and then north again before terminating into Segments 3 and 4. Segment 1 is on all new ROW, utilizing a combination of the distributor's property at the new substation and private property, and is approximately 0.69 mile long.

Segment 2 (see Figure 1-4) begins at the distributor's substation and heads west, then turns north and crosses CR 40 (Liberty Road), and terminates at the beginning of Segments 5 and 6. Segment 2 is on all new ROW, utilizing a combination of the distributor's property at its new substation and private property, and is approximately 1.33 miles long.

Segment 3 (see Figure 1-4) begins at the end of Segment 1, continuing in a west direction before terminating into Segments 5 and 6. Segment 3 utilizes all new ROW and is approximately 0.5 mile long.

Segment 4 (see Figure 1-4) begins at the end of Segment 1, proceeding in a northern direction across rolling terrain. The segment crosses CR 66, then CR 39, and finally US 278 before terminating into Segment 7. Segment 4 also crosses Blevens Creek just north of the US 278 crossing, in addition to some small streams. Segment 4, which is approximately 3.81 miles long, uses all new ROW.

Segment 5 (see Figure 1-4) begins at the terminations of Segments 2 and 3, west of Segment 4. The segment heads north, crossing a couple of small streams before turning west and then north again and crossing CR 66. After crossing a couple more small streams, the segment turns northwest, crossing Rock Creek. Segment 5 then turns north again, then northwest, paralleling Old Cullman Road/Old US 278 briefly before finally turning north, crossing US 278 and terminating into the beginning of Segment 8 and the end of Segment 7. Segment 5 utilizes all new ROW and is approximately 4.57 miles long.

Segment 6 (see Figure 1-4) begins at the ends of Segments 2 and 3, heading west and crossing a small stream. The segment then turns northwest, crossing Rock Creek and proceeding in this direction toward CR 41. Segment 6 then turns north, then northwest crossing CR 66 before turning north again. South of Old Cullman Road/Old US 278, the segment turns northeast, crossing over Old Cullman Road/Old US 278 and US 278, before

terminating into Tap Point 1. Segment 6 is approximately 5.44 miles long and uses all new ROW.

Segment 7 (see Figure 1-4) begins at the end of Segment 4, about 2 miles east of Tap Point 1 and roughly 0.8 mile north of US 278, proceeding in a west and slightly northwest direction along Cullman EC's existing Jones Chapel-Addison 46-kV Transmission Line, terminating into the beginning of Segment 8 and the end of Segment 5. This segment uses new ROW and rights acquired over the distributor's existing ROW. Because the existing ROW is only 75 feet wide, TVA would have to purchase an additional 25 feet of new ROW, 12.5 feet on either side of the existing ROW. The steep gorge along Segment 7 in the vicinity of Rock Creek would be spanned by any transmission line. The existing structures and conductor would be replaced. Segment 7 is approximately 1.34 miles long.

Segment 8 (see Figure 1-4) begins at the end of Segment 5, about 0.57 mile east of Tap Point 1 and north of US 278, proceeding in a west and slightly northwest direction along the existing ROW, terminating into the beginning of Segment 9 and the end of Segment 6. Segment 8 would use new ROW and rights acquired over the distributor's existing ROW, as described in the previous paragraph. This segment is approximately 0.57 mile long.

Segment 9 (see Figure 1-4) runs from the end of Segments 6 and 8, going northwest, terminating at Tap Point 2 on the existing tap to Addison Transmission Line. Segment 9 is approximately 0.11 mile long and uses all new ROW.

In order to reach the tap point at the end of Segments 6 and 8, about 350 feet of new ROW is required. This small amount of additional ROW, coupled with rounding approximations, accounts for the slight differences in the total route lengths compared to the individual segment lengths added together.

Ten alternate transmission line routes consisting of a combination of these nine constituent segments (see Figure 1-4 and Table 2-1) were then developed. These routes were evaluated as described below.

Table 2-1. Alternative Route Corridors

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

2.3.4.3. Route Evaluation and Identification

Each of the 10 alternative routes offered different opportunities and constraints. Opportunities include characteristics such as open land, areas less suitable for

development, and lack of sensitive environmental areas and land use conflicts. The assessment of the opportunities and constraints for these alternative routes are summarized below by engineering, environmental, land use, and cultural criteria.

Engineering

The presence of the distributor's existing 46-kV transmission line just east of TVA's Addison Substation represented a key opportunity in selecting a preferred route. As previously mentioned, this ROW is 75 feet wide and thus would only require an additional 25 feet (12.5 feet on either side). The existing ROW, represented by Segments 7 and 8, is utilized to some extent in the majority of the route alternatives. The steep terrain in the western portion of the study area presented a major challenge for route selection because of its potential effect to construction and design. The difficulty is compounded by the requirement that any points where the direction of the route changes (angle points called point of intersection or a PI) must be on a flat or elevated portion of the land and must have room for the required structure guys. It is not desirable to route transmission lines on terrain with a slope greater than 30 percent due to the increased construction difficulty, safety concerns, and the increased potential for erosion on the cleared ROW. Alternative Routes 3 and 6 cross steeper terrain than the other routes. The length of the alternative routes ranged from 6.4 to 7.7 miles, with Alternative Route 9 being the longest.

Environmental

Due to the small amount of sensitive environmental resources in the area (e.g., no sensitive streams, very few wetland areas, uncommon plant habitat), the primary environmental constraint was the amount of forest clearing required. The routes that utilize the existing ROW resulted in less forested clearing and thus fewer environmental constraints. Alternative Routes 4 and 9 are approximately 1 mile longer than the other alternative routes and affect the most forested acreage. These routes had the least favorable scores in this category. Route 1 affects the smallest amount of forested acreage, and along with Route 7, had the most favorable score. All of the alternative routes cross one large stream (Rock Creek) and several small streams.

Land Use

Alternative Routes 4 and 9 affect more parcels than the other alternatives, with Alternative Routes 2 and 8 affecting the fewest number of parcels. Alternative Routes 2 and 8, the two shortest routes, scored the best in this category.

Cultural

Due to the sporadic development as well as the presence of an existing transmission line in the area, visual impact was not a major constraint in routing the new transmission line. Similarly, the land use and land cover analysis revealed no known archaeological sites, caves, cemeteries, or historic sites in the study area. As a result, all of the routes received the same low (favorable) score in this category.

Upon completion of the analysis described in Section 2.3.4.1, there was a logical spread in the overall scores of the alternative routes. Alternative Routes 4 and 9 were the two poorest scoring alternatives, primarily due to high numerical values for both environmental and land use criteria. Similarly, environmental scores were the primary reason that Alternative Routes 3, 5, 6, and 10 scored poorly overall relative to other routes. The top four routes (Alternative Routes 1, 2, 7, and 8) received similarly favorable scores.

Alternative Routes 2, 7, and 8 had identical scores, only slightly higher (and less favorable) than Route 1.

The numerical scores ranking the alternative routes ranged from 26 (ranked best) for Alternative Route 1 to 43 (ranked poorest) for Alternative Route 9.

Table 2-2. Alternative Route Option Rankings

Route Rankings	Total Score Based on Criteria Analysis[1]	Alternative Route	Constituent Segments
1	26	1	1, 4, 7, 8
2	27	2	1, 3, 5, 8
2	27	7	1, 4, 7, 8, 9
2	27	8	1, 3, 5, 8, 9
3	29	3	1, 3, 6
4	33	5	2, 5, 8
4	33	10	2, 5, 8, 9
5	35	6	2, 6
6	42	4	2, 3, 4, 7, 8
7	43	9	2, 3, 4, 7, 8, 9

[1]The lowest numerical value would have the least amount of adverse impacts and would be the most favorable score. The highest numerical value would have the most adverse impacts and would be the least favorable score.

2.4. Comparison of Alternative Routes

From two alternative tap points and based on nine possible alternative transmission line segments, TVA established and considered 10 alternative routes ranging between 6.40 and 7.67 miles in length for this project. This section provides analysis of the route segments and their relation to alternative routes.

2.4.1. Alternative Transmission Line Routes

To connect Cullman EC's planned Helicon 161-kV Substation to TVA's existing Addison 161-kV Tap Line, all of the proposed routes are primarily oriented in a north-south alignment. As described in Section 2.3.4.2, the tap point would be located near TVA's existing Addison 161-kV Substation.

Following initial routing studies, TVA determined a key aspect of a successful route for a new transmission line to the Helicon Substation would be the utilization of one or both segments (Segments 7 and 8) along the distributor's existing 46-kV transmission line ROW. Use of this ROW would reduce the amount of new ROW required for the new line, resulting in fewer impacts to landowners and the environment. It would also allow the distributor to construct a 26-kV underbuild on TVA's line within this existing ROW in the future.

An additional advantage to following the existing ROW is that it would allow TVA to avoid the western portion of the study area (Segment 6), which presented engineering and constructability concerns due to the steep terrain.

<u>Routes 1 and 7</u>: Route 1, which is 6.5 miles long, is the easternmost route. Of the three shortest routes (Routes 1, 2, and 8), only Route 1 follows the full 1.89 miles of the distributor's existing Jones Chapel-Addison 46-kV ROW. Thus, Route 1 would require the least amount of vegetation clearing for a ROW. Route 1 also has the most favorable terrain

because it crosses the fewest acres of land greater than 20 percent slope. These factors resulted in this alternative route ranking first in the analysis of possible routes. Route 1, which scored 26 in the analysis, terminates at Tap Point 1. Route 7 is almost identical to Route 1, except it also utilizes Segment 9 and thus terminates at Tap Point 2. Route 7, which is 6.54 miles long, tied for second best in the analysis with a score of 27.

Routes 2 and 8: Route 2, which is 6.40 miles long, is one of four routes (along with Routes 5, 8, and 10) that traverse the center portion of the study area along Segment 5. It uses 0.57 mile of the distributor's existing transmission line ROW. Routes 2, 7, and 8 ranked second best with a score of 27 in the analysis. Route 2 terminates at Tap Point 1. Route 8, which is 6.46 miles long, is identical to Route 2 except it also utilizes Segment 9 and thus terminates at Tap Point 2.

Route 3: Route 3 is 6.66 miles long and is located on all new ROW. It is one of two routes to utilize Segment 6 along westernmost portion of the study area. It utilizes none of the distributor's existing transmission line ROW. This alternative ranked as the third-best score in the analysis, with a score of 29, and terminates at Tap Point 1.

Routes 4 and 9: Route 4, which is 7.62 miles long, utilizes 1.89 miles of the distributor's existing transmission line ROW. This is the second-longest route, primarily because it uses both Segments 2 and 3 to provide an alternative that would avoid Segments 1 and 5 if necessary. This alternative ranked sixth best in the analysis of possible routes with a score of 42 and terminates at Tap Point 1. Route 9 is the longest route at 7.67 miles long and differs from Route 4 only in that it also utilizes Segment 9 and thus terminates at Tap Point 2. Route 9 scored poorest in the analysis with a score of 43.

Routes 5 and 10: Route 5, which is 6.54 miles long, uses 0.57 mile of the distributor's existing transmission line ROW. This alternative ranked fourth best in the analysis of possible routes with a score of 33 and terminates at Tap Point 1. Route 10 is identical to Route 5 except it also utilizes Segment 9 and thus terminates at Tap Point 2. Route 10, which is 6.59 miles long, also tied for fourth in the analysis with a score of 33.

Route 6: Route 6, which heads west out of the distributor's substation along Segment 2, travels through the western portion of the study area and is located entirely on new ROW. This route is 6.79 miles long and is one of two routes that does not use any existing ROW. This route, as well as Route 3, would cross the most acreage of steep terrain, along Segment 6. Route 6 ranked fifth in the analysis of possible routes with a score of 35. It terminates at Tap Point 1.

2.4.2. Identification of Preferred Transmission Line Route

Alternative Routes 1, 2, 7, and 8 scored the best in the analysis. Alternative Routes 1 and 7 use the easternmost corridor along Segment 4 and are identical except for the tap point. Similarly, the lone distinction between Alternative Routes 2 and 8, which follow the middle corridor along Segment 5, is that they connect to the source line at different tap points. Alternative Route 1 requires the least amount of new ROW, would be easier to design and construct because of the terrain, and utilizes the maximum amount of the distributor's existing ROW. Furthermore, this route connects to Tap Point 1, which as described in Section 2.3.4., provides better access and requires less transmission line than Tap Point 2. For these reasons, Alternative Route 1 was selected as the preferred route option.

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

Several minor adjustments were made to the transmission line route during field surveys. These modifications include several along Segment 4 and one along Segment 7. Two PIs along Segment 4 were moved to provide adequate clearance from creeks, and another was shifted slightly to avoid a chicken house. Along Segment 7, a small cemetery was discovered in the distributor's existing ROW, so a PI was added to provide adequate clearance from this landmark. After property owners reviewed the changes, the sections were resurveyed to identify the final route.

2.5. The Preferred Alternative

The Action Alternative is TVA's Preferred Alternative. TVA would build a 161-kV transmission line from Cullman EC's planned new Helicon Substation to a tap point just outside TVA's existing Addison 161-kV Substation. TVA's preferred route for the Action Alternative is Alternative Route 1, which consists of Alternative Route Segments 1, 4, 7, and 8 and would terminate into Tap Point 1. The transmission line route would be approximately 6.5 miles in length. The preferred route begins at TVA's existing Addison 161-kilovolt Tap Line and heads southeast for about 2 miles on existing ROW, before turning south for another 4.5 miles to the planned substation in Arley, Alabama..

CHAPTER 3

3.0 AFFECTED ENVIRONMENT

Introduction

The existing condition of the environmental resources that could be affected by the proposed actions are described in this chapter. The affected environment descriptions below are based on field surveys conducted in 2010, on published and unpublished reports, and on personal communications with resource experts. This information establishes the baseline conditions against which the decision-maker and the public can compare the potential effects of the alternatives under consideration.

The scope of the environmental review project area includes portions of Winston and Lawrence counties, Alabama. However, as previously discussed (see Section 1.1), the proposed actions in Lawrence County would not involve land disturbance and would take place within existing TVA ROW; existing access roads would be used. The new transmission line project area is comprised of 6.5 miles of 100-foot-wide ROW and areas associated with project construction, operation, and maintenance of the transmission line and access roads.

Potential effects related to prime farmland, air quality, hazardous and nonhazardous wastes, noise, and health and safety were also considered and found to be minimal or absent because of the nature of the action. TVA has identified other resources that would be potentially affected by the proposed project construction, operation, and maintenance through preliminary internal scoping. These resources are considered in this chapter and in Chapter 4.

3.1. Vegetation

Habitat assessments for the proposed transmission line corridor were conducted in July 2010. The project area occurs in a landscape disturbed and shaped by previous agricultural and development practices (existing roads, residential and industrial buildings). As of 2008, there were at least 1,750,000 acres of forestland in Winston County and the adjacent counties (United States Forest Service [USFS] 2010).

The proposed project area is located in the Southern Table Plateaus and Dissected Plateau Level IV ecoregion (Griffith et al. 2001). About 70 percent of the project area occurs in the Dissected Plateau ecoregion, which is situated between the transmission line crossings of Blevens and Rock creeks and the southern terminus of the proposed transmission line corridor. The Dissected Plateau contains steep, forested gorges that harbor plant species that generally occur farther north. The remaining 30 percent of the project area occurs in the Southern Table Plateaus ecoregion between the existing Addison Substation and the Blevens and Rock creeks crossing. The topography along this portion of the transmission line corridor exhibits less relief than that found in the Dissected Plateau and is more agreeable to grazing and agriculture.

Two main types, herbaceous vegetation (70 percent) and forested vegetation (30 percent), characterize vegetation in the proposed transmission line ROW and access roads. The forested vegetation occurring in the project area is comprised of two main subtypes,

deciduous and mixed evergreen-deciduous. Deciduous forests are the most prevalent forest subtype in the project area and account for about 85 percent of total forest cover.

Herbaceous vegetation is characterized as having greater than 75 percent cover of forbs and grasses and less than 25 percent cover of other types of vegetation and predominates in the project area. Existing transmission line ROWs and pasture are the most common types of herbaceous vegetation found along the proposed transmission line ROW. These areas are heavily disturbed by previous and/or present land use and contain plant species indicative of early successional habitats. Common plant species observed include Carolina horse nettle, Chinese privet, crab grass, Japanese stilt grass, Johnson grass, tall fescue, white clover, and yellow bristle grass.

One small area of herbaceous vegetation contained predominantly native prairie species, including the rare Eggert's sunflower. Other plants observed in this prairie area include big bluestem, hairy sunflower, little bluestem, rosinweed sunflower, and whorled rosinweed.

Deciduous forest is characterized as having trees with overlapping crowns where deciduous species account for more than 75 percent of the canopy cover. The overstory of deciduous forests in the project area are dominated by a variety of tree species including American beech, big leaf magnolia, black gum, black oak, chestnut oak, loblolly pine, mockernut hickory, red maple, sugar maple, sweetgum, white oak, and yellow-poplar. Average overstory tree size often ranged between 12 and 24 inches in diameter at breast height (DBH). A considerable portion of the forested area north of CR 148 had smaller trees and had been more recently disturbed than the previously described forested area. The herbaceous layer observed in the deciduous forest is sparse and contains relatively few species. Common species observed include Christmas fern, partridgeberry, slender wood oats, spotted wintergreen, trumpet creeper, and Virginia creeper.

Mixed evergreen-deciduous forest is described as having more than 25 percent canopy cover of both evergreen and deciduous trees and accounts for about 15 percent of total forest cover in the project area. In the project area, these forest stands have a unique, regionally distinct species composition indicative of the globally rare Cumberland Plateau Mesic Hemlock - Hardwood Forest plant community (NatureServe 2009). This plant community is rare and local, but it does occur in similar habitat throughout the nearby Bankhead National Forest (ibid). The forest type is largely a linear feature on the landscape because it occurs in close association with gorges that closely follow stream corridors.

In the project area, characteristic woody species of this plant community observed include American beech, American holly, big-leaf magnolia, big-leaf styrax, Canada hemlock, horse sugar, mountain laurel, mountain camellia, oak-leaf hydrangea, river cane, spicebush, witch hazel, and yellow-poplar. The herbaceous layer included Christmas fern, little brown jug, and spotted wintergreen.

The Cumberland Plateau Mesic Hemlock - Hardwood Forest plant community is unique in several respects, but the presence of Canada hemlock as a prominent member of the overstory delineates this community type from other similar deciduous forest types occurring in the region. These relict, disjunct populations of Canada hemlock are at the extreme southwestern edge of the species range. This separation from large, contiguous hemlock stands may help buffer the species from the nonnative hemlock woolly adelgid

(*Adelges tsugae*), a parasitic insect responsible for catastrophic declines in Canada hemlock populations over much of the core range of the species.

The Cumberland Plateau Mesic Hemlock - Hardwood Forest plant community occurs in two areas and is between 500 and 750 feet across at the widest point. An existing transmission line ROW crosses one occurrence adjacent to Rock Creek. Structures on the new proposed transmission line would be taller than the wooden poles on the distributor's existing ROW and would allow forest near the bottom of the gorge to be spanned, which may allow areas that are currently cleared to return to a forested condition. The second occurrence of the rare plant community occurs along slopes surrounding Blevins Creek. The forest in this area is relatively undisturbed, and construction activities would clear 1 to 2 acres of the rare plant community. Forested areas near the stream at the bottom of the slope would likely be spanned.

The entire ROW would occupy 79 acres, with 61 acres of new ROW and 18 acres of existing ROW, and TVA would be clearing 25 acres of forest. No forested areas in the project area have structural characteristics indicative of old-growth forest stands (Leverett 1996).

Executive Order 13112 (Invasive Species) was issued in 1999 to enhance federal coordination and response to the complex and accelerating problem of invasive species. This EO directs federal agencies to prevent the introduction of invasive species and provide for their control to minimize the economic, ecological, and human health impacts that those species potentially cause. Invasive plant species are nonnative species that can degrade natural areas and displace native species, generally by outcompeting native species, or by altering ecological communities or ecosystem processes (Morse et al. 2004).

TVA has compiled a list of invasive species considered high priority because of their potential to spread rapidly, displace native vegetation, and occur in dense stands of numerous individuals (Appendix F). No plants identified on the Federal Noxious Weed List (United States Department of Agriculture [USDA] 2010) were observed in the project area; however, seven invasive plants (Table 3-1) considered as a severe threat to native plant communities were observed.

Table 3-1. Invasive Plant Species Observed in the Proposed Right-of-Way

Common Name	Scientific Name
Common privet	*Ligustrum sinense*
Japanese honeysuckle	*Lonicera japonica*
Japanese stilt/Nepal grass	*Microstegium vimineum*
Johnson grass	*Sorghum halepense*
Kudzu	*Pueraria montana*
Tall fescue	*Festuca elatior*
Tree-of-heaven	*Ailanthus altissima*

3.2. Wildlife

Habitat assessments along the proposed transmission line corridor were conducted in July 2010, and proposed access roads were field-reviewed in November 2010. The project area occurs in a landscape partially disturbed and shaped by previous agricultural and development practices (existing roads, residential and industrial buildings). Steep slopes

were characteristic throughout much of the route. Exposed rock was present in the forested slopes on either side of Blevens Creek and north of US 278. Aquatic features were present within both herbaceous and forested habitats and include wetlands, farm ponds, streams, and wet-weather conveyances.

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

Forested wildlife habitat included deciduous forest and mixed evergreen-deciduous forest. These forested areas provide habitat for American crow, downy woodpecker, pileated woodpecker, white-breasted nuthatch, and wild turkey, as well as numerous Neotropical migrant birds such as black-and-white warbler, hooded warbler, ovenbird, red-eyed vireo, wood thrush, and yellow-rumped warbler. Eastern gray squirrel and white-tailed deer are mammals frequently found in deciduous forests. Scattered rock outcrops within these forests provide habitat for woodrats and other small mammals. Eastern zigzag salamanders were observed during field surveys, and common reptiles include black rat snake, copperhead, eastern box turtle, and ring-necked snake. Wetlands and streams within deciduous woodlands provide habitat for amphibians such as American and Fowler's toads, northern cricket frog, red salamander, red-spotted newt, southern leopard frog, and spotted salamander.

No recorded caves and no documented heron colonies are known from within 3 miles of the proposed project area, and no other unique habitats have been reported from the project area. During field investigations, unique and important terrestrial habitats were sought out, and no caves, heronries, or other unique habitats were observed during the field surveys.

3.3. Aquatic Ecology

The proposed Helicon 161-kV Transmission Line and access roads crosses the Southwestern Appalachians Ecoregion within the Rock Creek drainages. Aquatic communities in the project area would vary depending on water quality, size, and habitat conditions both within and along watercourses. Aquatic species were not sampled during field surveys; however, aquatic communities are expected to be similar to those previously described in the region (Boschung and Mayden 2004; Williams et al. 2008).

A total of 44 watercourses including six perennial, four intermittent, seven ponds, and 27 wet-weather conveyances occur along the proposed transmission line and access roads

routes (Appendix G). The location of each of these watercourses was recorded using a global positioning system, and a habitat assessment form was completed for each perennial and intermittent stream during August 2010 field surveys. A listing of perennial and intermittent stream crossings in the project area, as well as observed stream substrate conditions is provided as Appendix G. Additional information regarding watercourses in the vicinity of the project area can be found in Section 3.6.

Because transmission line and access road construction and maintenance activities mainly affect riparian conditions and in-stream habitat, TVA evaluated the condition of both of these features at each stream crossing along the proposed route. From these habitat assessments, riparian condition was assigned to one of three classes to indicate the current condition of streamside vegetation across the length of the proposed transmission line (Table 3-2). The three classes are defined below.

Table 3-2. Riparian Condition of Streams Located Within the Project Area

Riparian Condition	Number of Perennial Streams	Number of Intermittent Streams	Total
Forested	6	3	9
Partially forested	0	1	1
Nonforested	0	0	0
Total	**6**	**4**	**10**

- Forested - Riparian area is fully vegetated with trees, shrubs, and herbaceous plants. Vegetative disruption from mowing or grazing is minimal or not evident. Riparian width extends more than 60 feet on either side of the stream.
- Partially forested - Although not forested, sparse trees and/or scrub-shrub vegetation is present within a wider band of riparian vegetation (20 to 60 feet). Disturbance of the riparian zone is apparent.
- Nonforested - No or few trees are present within the riparian zone. Significant clearing has occurred, usually associated with pasture or cropland.

TVA then assigns appropriate SMZs and best management practices (BMPs) based upon these evaluations and other considerations (such as state impaired waters i.e., the 2008 Alabama Department of Environmental Management [ADEM] 303(d) list, and presence of endangered or threatened aquatic species). Implementation of these BMP measures minimizes the potential for impacts to water quality and in-stream habitat for aquatic organisms.

3.4. Endangered and Threatened Species

Species listed at the federal level as endangered or threatened are protected under the ESA, which is administered by the United States Fish and Wildlife Service (USFWS). Section 7 of this act requires federal agencies to conserve these species and to consult with USFWS in situations where a federal action may affect these species or their habitats. The State of Alabama also ranks species occurring within the state considered threatened, endangered, or deemed in need of management.

3.4.1. Plants

Prior to project-related botanical surveys, no Alabama state-listed or federally listed plant species were known to occur within a 5-mile vicinity of the project area. Five federally listed plant species and two plants that are candidates for federal listing are known from Lawrence and Winston counties, but no federally listed plants or suitable habitats for those species were observed in the project area (Table 3-3). However, two state-listed species, Eggert's sunflower and mountain camellia, were observed within the proposed ROW during botanical surveys. No designated critical habitat for plant species occurs in the project area.

Eggert's sunflower was removed from the federal list of threatened and endangered species on August 15, 2005, because recovery efforts since its listing in May 1997 led to new populations being identified and other populations being secured. The plant, which is more adaptable than scientists previously realized, is known to exist only in Alabama, Kentucky, and Tennessee. In Alabama, Eggert's sunflower was previously known from four counties, Blount, DeKalb, Franklin, and Madison. However, TVA botanists observed an unrecorded population in Winston County during field surveys. Eggert's sunflower prefers rolling-to-flat uplands in full sun or partial shade and is often found in open fields or thickets along wooded borders and with other tall plants and small trees. It persists in, and may even invade, roadsides, power line ROWs, or fields that have suitable open habitat. The foreseeable threat with the greatest impact is habitat degradation/loss.

A large, previously unrecorded population containing several hundred individual Eggert's sunflower plants was observed just west of Rock Creek on a southeast-facing slope within the distributor's existing ROW. This is the first reported occurrence of Eggert's sunflower in Winston County. This small open area within the ROW represents important habitat for this species which requires open conditions to thrive. Nearly all other open, nonforested areas in this region of Alabama are grazed, cropped, developed, or otherwise heavily disturbed and are unsuitable habitat for this species.

Mountain camellia grows in the forest understory or at the edges of openings along streams. It thrives under partial shade, but it can tolerate heavy shade or full sun. Though found in eight states (northern Alabama and Georgia, western North Carolina and South Carolina, and eastern Kentucky, Tennessee, and Virginia), this uncommon species is mostly confined to the southern Appalachian Mountains. In Alabama, mountain camellia is known from Cherokee, Cullman, De Kalb, Franklin, Jackson, Lawrence, Marion, and Winston counties.

Mountain camellia was observed in two locations within the project area. The first occurrence of mountain camellia is located on a terrace along the west bank of Rock Creek. The plants occur in an area that is frequently scoured by floodwaters. The accumulation of woody debris, the early successional nature of the site, and the growth habit of the species make discerning individuals difficult, but approximately 50 to 100 plants occur in the proposed new ROW. A second, smaller population of mountain camellia was found in a forested riparian area along Jones Branch in the proposed new ROW. Four colonial mountain camellias were observed at this site.

3.4.2. Terrestrial Animals

A review of the TVA Natural Heritage database indicated one federally listed animal species and no Alabama state-listed animal species are known from within 3 miles of the project area. One federally listed animal species, one federally protected animal species, and one

federal candidate animal species are known from Winston County and three federally listed animal species are known from Lawrence County, Alabama (Table 3-3). However, as previously discussed (see Section 1.1), the proposed actions in Lawrence County would not involve land disturbance. No federally or state-listed terrestrial animal species were observed during field surveys conducted in July 2010, and no designated critical habitat for terrestrial animal species occurs in the project area. Habitat requirements for the terrestrial animals with a federal status known to occur within the vicinity of the project area follow.

Bald eagle was removed from the federal list of threatened and endangered species on August 9, 2007. Although they are delisted, bald eagles are still protected by the Bald and Golden Eagle Protection Act, the Migratory Bird Treaty Act, and the Lacey Act (USFWS 2007). Bald eagles nest in forested areas near rivers and reservoirs, where they forage (Bryan et al. 2005; Thompson et al. 2005). The closest documented active bald eagle nest is greater than 3 miles from the proposed ROW, and suitable habitat is not available for the bald eagle along the proposed transmission line route.

Optimal red-cockaded woodpecker optimal habitat is characterized as a broad savanna with a scattered canopy of large pines and a dense groundcover containing a diversity of grasses, forbs, and shrub species, historically maintained by fire. They are also known from open, mature pine woodlands. They nest and roost in tree cavities of mature live pines (USFWS 2003). The occurrence records for red-cockaded woodpecker in Winston and Lawrence counties are historical (circa 1978). The nearest occurrence records are from locations greater than 3 miles from the project area, and suitable habitat does not exist within the proposed route.

The gray bat roosts in caves year-round, but no caves were identified in the project area during field surveys. Gray bats typically forage over streams, rivers, and reservoirs (Tuttle 1976). Rock Creek, Blevens Creek, several small streams, and farm ponds would provide foraging habitat for gray bats along the proposed route. Although there is foraging habitat for gray bats in the project area, the nearest known habitat for gray bats is greater than 3 miles from the project area; they have been reported from one cave in Lawrence County.

Indiana bats hibernate in caves during the winter and roost in forested habitat during the summer. Roosts of maternity colonies, males, and nonreproductive females may occur in the cracks and crevices of damaged trees or under sloughing bark on dead or live trees (Tuttle and Kennedy 2002; Harvey 2002). Similar to gray bats, Indiana bats typically forage over streams, rivers, and reservoirs, and foraging habitat does occur in the project area. Indiana bats are not known to occur within a 10-mile radius of the proposed project area in Winston County, but have been documented in Lawrence County. Neither caves nor suitable summer roosting habitat for Indiana bats were identified during field surveys.

The Black Warrior waterdog is found in medium-sized streams with moderate flows and alternating pools and rapids. This species is a bottom dweller that frequently visits semipermanent leaf beds. It seems to be especially sensitive to chemical and physical alterations of its habitat (Ashton and Peavy 1986). Black Warrior waterdogs have been documented in West Sipsey Fork in Winston County and likely occur in suitable stream habitat throughout the north end of the Black Warrior River drainage.

The flattened musk turtle is endemic to clear, shallow streams within the Black Warrior

Table 3-3. Federally and State-Listed Species Known From Lawrence and Winston Counties and/or Within a 3-Mile, 5-Mile, or 10-Mile Radius[1] of the Project Area

Common Name	Scientific Name	Status[2] (Rank[3])	
		Federal	State
Plants			
Price's Potato-Bean	*Apios priceana*	THR	SLNS (S2)
Leafy Prairie-Clover	*Dalea foliosa*	END	SLNS (S1)
Eggert's Sunflower[4]	*Helianthus eggertii*[4]	-	SLNS (S1)
Fleshy-Fruit Gladecress	*Leavenworthia crassa*	CAND	SLNS (S1)
Lyre-Leaf Bladderpod	*Lesquerella lyrata*	THR	SLNS (S1)
White Fringed Orchid	*Platanthera integrilabia*	CAND	SLNS (S2)
Arrowhead	*Sagittaria secundifolia*	THR	SLNS (S1)
Mountain Camellia[4]	*Stewartia ovata*[4]	-	SLNS (S2S3)
Alabama Streak-Sorus Fern	*Thelypteris pilosa* var. *alabamensis*	THR	SLNS(S1)
Birds			
Bald Eagle	*Haliaeetus leucocephalus*	DM	PROT (S3)
Red-Cockaded Woodpecker	*Picoides borealis*	END	PROT (S2)
Mammals			
Gray Bat	*Myotis grisescens*	END	PROT (S2)
Indiana Bat	*Myotis sodalis*	END	PROT (S2)
Amphibian			
Black Warrior Waterdog	*Necturus alabamensis*	CAND	TRKD (S2)
Reptile			
Flattened Musk Turtle	*Sternotherus depressus*	THR	PROT (S2)
Fish			
Tuscaloosa Darter[5]	*Etheostoma douglasi*	-	TRKD (S2)
River Darter[5]	*Percina shumardi*	-	TRKD (S3)
Bankhead Darter	*Percina sipsi*	-	TRKD (S1)
Macroinvertebrates			
A Glossosomatid Caddisfly	*Agapetus hessi*	-	TRKD (S1)
Stannard's Agarodes Caddisfly	*Agarodes stannardi*	-	RARE (S2)
Mussels			
Fine-Lined Pocketbook[5]	*Lampsilis altilis*	THR	SPCO (S2)
Orange-Nacre Mucket[5]	*Lampsilis perovalis*	THR	SPCO (S2)
Alabama Moccasinshell[5]	*Medionidus acutissimus*	THR	PROT (S1)
Dark Pigtoe[5]	*Pleurobema furvum*	END	PROT (S1)
Ovate Clubshell[5]	*Pleurobema perovatum*	END	PROT (S1)
Warrior Pigtoe[5]	*Pleurobema rubellum*	-	TRKD (S1)
Triangular Kidneyshell[5]	*Ptychobranchus greenii*	END	PROT (S1)
Southern Creekmussel[5]	*Strophitus subvexus*	-	TRKD (S3)

Source: TVA Natural Heritage Database, July and August 2010
- = Not applicable
[1]Terrestrial animals = 3-mile radius, Plants = 5-mile radius, Aquatic animals = 10-mile radius for species records
[2]**Status Codes:** CAND = Candidate; DM = Recovered, delisted, and being monitored, END = Endangered; PROT = Protected; RARE = Rare; SLNS = Listed by the State of Alabama, but not assigned a status, SPCO = Special concern/possibly extirpated; THR = Threatened; TRKD = Tracked as sensitive, but has no legal status
[3]**State Ranks:** S1 = Critically Imperiled; S2 = Very rare and imperiled; S3 = Rare, uncommon, or vulnerable, S#S# = Denotes a range of ranks because the exact rarity of the element is uncertain (e.g., S1S2)
[4] State-listed plant species observed in the project area during botanical surveys
[5]Aquatic species known to occur within 10 miles of the project area

River drainage in Alabama and has one of the most restricted ranges of any turtle in North America. It generally occurs north of where the Cumberland Plateau meets the Gulf Coastal Plain (Buhlmann et al. 2008). It inhabits both small creeks and larger free-flowing streams, and stream impoundments having some shallow water, substrates with some rock or cobble, and sufficient food resources, preferably mollusks. Silt and sediment adversely affect this species, and it is less tolerant of habitat degradation than other aquatic species within its range (Mount 1986). Suitable habitat for the flattened musk turtle does not occur in the project area.

3.4.3. Aquatic Animals

A review of the TVA Natural Heritage database in July 2010 indicated six federally listed and seven state-listed aquatic species are known to occur from Winston and Lawrence counties (Table 3-3) and/or within a 10-mile radius of the proposed project area. None of the listed aquatic species in Table 3-3 are known to occur within the potentially affected Rock Creek watershed, however, five federally listed mussel species are known to occur within a 10-mile radius of the proposed project area.

The ovate clubshell, triangular kidneyshell, Alabama moccasinshell, orange-nacre mucket, and the dark pigtoe are known from nearby Sipsey Fork and Bushy Creek Unit 10 designated critical habitat occurring. However designated critical habitat for these or any other species is not present within the Blevins and Rock Creek drainages. These mussel species require high-quality, clean water habitat with moderate currents and sandy or gravel bottoms in small rivers and creeks. The streams in the project area have some gravel and sand components, however, habitat quality has been degraded by sedimentation. Suitable habitat was not observed for these or other state-listed or federally listed aquatic species; therefore, these species are not analyzed further. Habitat requirements for the aquatic species in Table 3-3 are described in Boschung and Mayden (2004) for fish and Williams et al. (2008) for mussels.

3.5. Groundwater and Geology

The project area is located in the Appalachian Plateaus province, within the Cumberland Plateau division (USGS 2003). Erosion of the flat-lying rocks of the Appalachian Plateaus province has produced isolated, sandstone-capped hills that rise several hundred feet above easily eroded limestone beds. The Pennsylvanian-aged Pottsville Formation, which consists of interbedded sandstone and shale, is the plateau-capping formation in upland areas and is the major aquifer in the province (ADEM 2000). The Pottsville Formation overlies Mississippian-aged limestone aquifers, which are productive aquifers because of solution openings that develop in the carbonate rocks. A thick layer of the Chattanooga Shale forms a confining unit for the groundwater flow system in the Appalachian Plateaus aquifers (Miller 1990).

Flow in the Appalachian Plateaus aquifers is affected primarily by topography, structure, and the development of solution openings in the rocks. A thick sequence of shale, sandstone, and coal overlies Mississippian limestone. Recharge to the aquifers is by precipitation on the flat, mesa-like plateau tops. Water then percolates downward through the Pennsylvanian sandstone (Pottsville Formation), primarily along steeply inclined joints and fractures. Some water leaks downward across the interbedded shale into the underlying limestone aquifer. The Pottsville Formation varies greatly in its water-producing capabilities. Yield of the Pottsville is affected by thickness, extent of fracturing, and depth of weathering (Miller 1990).

The quality of the water in the Appalachian Plateaus aquifers is variable, but most of the water is suitable for most uses. In some places, water from the Pottsville contains enough iron and sulfate to stain fixtures and to cause an objectionable odor and taste. The quality of the water generally deteriorates with depth as it becomes more mineralized. Water obtained from the underlying Mississippian limestone aquifers usually is hard with dissolved solids as high as 1,000 milligrams per liter. Water in both the sandstone of the Pottsville Formation and the underlying limestone aquifers is chemically similar. Water from the Pottsville is a calcium-magnesium-bicarbonate type, and water from the Mississippian limestone aquifers is a calcium-bicarbonate type (Miller 1990).

Public water for the surrounding towns of Addison and Arley are supplied by surface water sources. Area campgrounds and parks are supplied by groundwater supplies, as are some private residences throughout the area (USEPA 2010).

3.6. Surface Water

Precipitation in the project area averages about 60 inches per year with the wettest month in March at 6.1 inches and the driest month in October at 3.2 inches. The average annual air temperature is 62 degrees Fahrenheit (ºF), ranging from a monthly average of 42ºF in January to 80ºF in July. Streamflow varies with rainfall and averages about 25 inches of runoff per year or approximately 1.9 cubic feet per second/per square mile of drainage area.

The project area drains to tributaries in the Tombigbee River Basin. These tributaries include Rock Creek (and its tributary Blevens Creek) of Sipsey Fork (at Lewis Smith Lake), of Mulberry Fork, of the Black Warrior River. Blevens Creek and Rock Creek are classified by ADEM for fish and wildlife. Lewis Smith Lake is classified for public water supply, swimming and other whole body water-contact sports, fish, and wildlife. Sipsey Fork, downstream of Lewis Smith Lake, is classified for public water supply, fish, and wildlife. None of the streams in the project area are identified as impaired (i.e., not fully supporting its designated uses) on the 2008 Alabama 303(d) list (ADEM 2008).

3.7. Wetlands

Wetlands are areas inundated by surface water or groundwater such that vegetation adapted to saturated soil conditions are prevalent. Examples include swamps, marshes, bogs, wet meadows, and lacustrine or palustrine shoreline fringes. Field surveys were conducted in July 2010 to delineate wetland areas within the proposed transmission line ROW and the associated access roads.

Wetland determinations were performed according to United States Army Corps of Engineer (USACE) standards, which require documentation of hydrophytic (i.e., wet-site) vegetation, hydric soil, and wetland hydrology (Environmental Laboratory 1987; Reed 1997; United States Department of Defense and USEPA 2003). Broader definitions of wetlands, such as that used by the USFWS (Cowardin et al. 1979), the Tennessee definition (Tennessee Code 11-14-401), and the TVA Environmental Review Procedures definition (TVA 1983), were also considered in this review. Using a TVA-developed modification of the Ohio Rapid Assessment Method (Mack 2001) specific to the TVA region (Tennessee Valley Authority Rapid Assessment Method [TVARAM]), wetlands were categorized by their functions, sensitivity to disturbance, rarity, and ability to be replaced. The categorization

was used to evaluate potential effects to wetlands and to determine the appropriate levels of mitigation for wetland impacts.

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

The proposed transmission line corridor traverses hilly-to-mountainous terrain dominated by upland forest and pastureland, and crosses Blevens Creek and Rock Creek. Four wetlands, totaling 0.49 acre, were identified within the proposed transmission line ROW, and no wetlands occur within the proposed access roads (Table 3-4).

Table 3-4. Wetlands Delineated Within the Proposed Project Area

Wetland Identifier	Type[1]	Wetland Acreage in Proposed Right-of-Way	Estimated Forested Wetland Acreage in Proposed Right-of-Way	TVARAM Category (score)
W001	PEM1E/PSS1B	0.03	--	1 (20)
W002	PEM1E/PFO1E	0.06	0.05	2 (52)
W003	PEM1E	0.30	--	1 (19)
W004	PSS1E/PUBF	0.10	--	1 (28)
Total Acres		**0.49**	**0.05**	

[1]Classification codes as defined in Cowardin et al. (1979): PEM1 = Palustrine emergent, persistent vegetation; PFO1 = Palustrine forested, broad-leaved deciduous; PSS1 = Palustrine scrub-shrub, broad-leaved deciduous; PUB = Palustrine, unconsolidated bottom; B = Saturated; E = Seasonally flooded/saturated; F = Semipermanently flooded.

Wetland W001 is a small emergent wetland that resulted from a failed farm pond. W001 is 0.03 acre in size and is located almost entirely within the proposed ROW. W001 exhibits weakly developed hydric soils and only an ephemeral hydrologic connection to any other waterway. W001 is dominated by hydrophytic vegetation that includes black willow, red maple, and swamp smartweed.

Wetland W002 is a small emergent wetland located at the bottom of a steep stream gorge. This wetland totals an estimated 0.06 acre in size (0.01 acre emergent and 0.05 acre forested) and is located almost entirely within the proposed ROW. W002 exhibits hydric soils and is located on the floodplain of an intermittent tributary to Clifty Creek. W002 is dominated by hydrophytic vegetation that includes black willow, red maple, and green bulrush.

Wetland W003 is a small emergent wetland adjacent to a farm pond. W003 is 0.30 acre in size and is located almost entirely on existing ROW near the northwest end of the proposed corridor. W003 exhibits hydric soils and drains into an unnamed tributary to Rock Creek.

W003 is dominated by hydrophytic vegetation that includes soft rush, straw-colored flatsedge, and tall goldenrod.

Wetland W004 is a small scrub-shrub wetland that resulted from a failed farm pond. W004 is 0.10 acre and is located almost entirely on existing ROW near the northwest terminus of the proposed corridor. W004 exhibits hydric soils and drains into an unnamed tributary to Rock Creek. W004's dominant hydrophytic vegetation is black willow growing in standing water.

3.8. Floodplains

A floodplain is that relatively level land area along a stream or river that is subject to periodic flooding. The area subject to a 1 percent chance of flooding in any given year is considered the 100-year floodplain.

The proposed transmission line route and access roads would cross several floodplain areas associated with stream crossings in the project area (Appendix G). The existing Switch Structures 823 and 825 in TVA's Cullman-Moulton 161-kV Transmission Line are not located within the 100-year floodplain.

3.9. Archaeological and Historic Resources

Human occupation of Winston and Lawrence counties and the other northern Alabama counties occurred from the Paleo-Indian to the Historic period. In northern Alabama, prehistoric archaeological chronology is generally broken into five broad time periods: Paleo-Indian (10,000–8000 B.P. [before present]), Archaic (10,000–3000 B.P.), Gulf Formational (4500-2200 B.P.), Woodland (2200–1100 B.P.), and Mississippian (1100–450 B.P.). Prehistoric land use and settlement patterns vary during each period, but short- and long-term habitation sites are generally located on floodplains and alluvial terraces along rivers and tributaries. Specialized campsites tend to be located on older alluvial terraces and in the uplands. The area that is now Winston County contained just a few aboriginal settlements occupied by Native Americans when Europeans began arriving in the 16th century. European interactions with Native Americans in this area associated with the fur trading industry began in the 17th and 18th centuries. Various excursions and temporary settlements by the British, French, and Spanish occurred prior to this period.

Archaeological Resources

The archaeological area of potential effect (APE) for the proposed transmission line project consists of all areas where land-disturbing activities would take place within the project area. The archaeological APE includes the 6.5-mile-long by 100-foot-wide transmission line ROW and associated access roads.

Prior to the field survey, a records search was conducted, and no previously recorded archaeological resources were identified within the APE. The archaeological survey identified one isolated finding representing a rubble pile associated with the ruins of a historic-period structure (Thomas et al. 2010). The access roads are located in areas that have been previously disturbed, and no archaeological resources were identified.

Architectural Resources

The APE for historic/architectural resources includes any historic structures within a 0.5-mile radius surrounding the proposed transmission line corridor, the two switch

structures, as well as any areas where the project would alter existing topography or vegetation in view of a historic resource.

No previously recorded architectural resources were identified within the APE during a records search, but the field architectural survey identified 58 previously unrecorded architectural resources (Appendix H). Only one of these resources (HS-46, Burdick Gin Company) is considered potentially eligible for listing in the National Register of Historic Places (NRHP). TVA found the other 57 resources ineligible for the NRHP based on lack of architectural distinction and loss of integrity.

3.10. Aesthetics

3.10.1. Visual Resources

The impressions of an area's visual character can have a significant influence on how it is appreciated, protected, and used. The general landscape character of the study area is described in this section.

The physical, biological, and man-made features of an area combine to make the visual landscape character both identifiable and unique. Scenic integrity indicates the degree of unity or wholeness of the visual character. Scenic attractiveness is the evaluation of outstanding or unique natural features, scenic variety, seasonal change, and strategic location. Where and how the landscape is viewed would affect the more subjective perceptions of its aesthetic quality and sense of place. Views of a landscape are described in terms of what is seen in foreground, middleground, and background distances. In the foreground, an area within 0.5 mile of the observer, details of objects are easily distinguished in the landscape. In the middleground, normally between 1 and 4 miles from the observer, objects may be distinguishable, but their details are weak and they tend to merge into larger patterns. Details and colors of objects in the background, the distant part of the landscape, are not normally discernible unless they are especially large and standing alone.

The tap point for the new 6.5-mile transmission line would be near the existing 161-kV Addison Substation. The new line would utilize the existing Cullman EC Jones Chapel-Addison ROW and 25 feet of new ROW (12.5 feet on either side of the existing ROW) for approximately 2 miles to the east. Near CR 3733, the line would turn south on new 100-foot-wide ROW for the remaining 4.5 miles. This segment of the proposed route is mainly heavily vegetated with mature trees, and there are few homes with foreground views. Scenic attractiveness is common. Scenic integrity is moderate.

3.10.2. Noise

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

To correlate annoyance and noise exposure, the Federal Interagency Committee on Noise (FICON) used population surveys (FICON 1992). The surveys provide estimates of the percentage of typical residential populations that would be highly annoyed from a range of background noise and the average community reaction that would be expected (Table 3-5).

The level of possible community reaction shown in these surveys does not necessarily equate to a determination that potential noise impacts would constitute a significant environmental impact in the context of a National Environmental Policy Act (NEPA) review.

Table 3-5. Estimated Annoyance From Background Noise

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

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

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

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

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

3.10.3. Odors

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

3.11. Recreation, Parks, and Natural Areas

The area traversed by the proposed transmission line and access roads is primarily rural countryside. Terrain and general vegetative conditions range from open farmland to rugged forested ridges. Informal outdoor recreation activities such as target practice, hunting, biking, hiking, and off-road vehicle activity may occur on some of the lands within the path of the proposed transmission line. There are no existing public or commercial recreation areas within or in the vicinity of the proposed new transmission line. The proposed line would also cross Rock Creek and Blevens Creek. Recreation uses such as fishing and swimming may occur in the vicinity of these proposed stream crossings.

The project area crosses or abuts the boundaries of Bankhead National Forest. Bankhead National Forest is approximately 181,230 acres and is located in the northwestern portion of Alabama in Lawrence, Winston, and Franklin counties. The national forest features waterfalls, sandstone cliffs, deep gorges, and hardwoods and is an important recreation resource that offers hunting, fishing, and wildlife viewing, along with camping, picnicking, hiking, swimming, and horseback riding. As previously described, there are not any caves or heronries in the project area, and there are no records of any water bodies included on the National Park Service's Nationwide Rivers Inventory (NRI).

As discussed before, the proposed work within Bankhead National Forest would be accomplished entirely within existing TVA ROW, and no land would be disturbed.

3.12. Socioeconomics and Environmental Justice

Socioeconomics

The proposed transmission line would be located in Winston County, and the proposed modifications to the existing switch structures would occur in Lawrence County. The estimated population of Winston County in 2009 was 23,997, a decrease of 3.4 percent since 2000 (United States Census Bureau 2009). The per capita personal income in Winston County in 2008 was $25,707, 83.2 percent of the state average ($30,894), and 65.7 percent of the national average ($36,714). The estimated population of Lawrence County in 2009 was 34,106, a decrease of 2 percent since 2000 (ibid). The per capita personal income in Lawrence County in 2006 was $25,566, 82.7 percent of the state average ($30,894), and 69.6 percent of the national average ($36,714).

The proposed transmission line project occurs in Census Tract 9955. In the project area, three census block groups in the census tract would be impacted by the construction, operation, and maintenance of the transmission line, switch structures, and access roads. Population of these block groups ranges from 833 to 1,621. Table 3-6 provides population data for the block groups and the census tract that would be impacted under the Action Alternative.

Table 3-6. Population of Census Tracts and Block Groups In the Project Area, 2000

Area	Total Population
Census Tract 9955	7,510
Block Group 1	833
Block Group 4	1,621
Block Group 5	1,457
Winston County	24,843
Lawrence County	34,803
Alabama	4,447,100
United States	281,421,906

Source: United States Census Bureau 2000

Environmental Justice

Environmental justice is 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. In the course of assessments under NEPA, TVA evaluates the impact of its actions on minority and low-income populations.

As previously stated, the project area occurs within Census Tract 9955 (United States Census Bureau 2000). Construction activity would be on existing ROW and new transmission line construction areas. The most current data on disadvantaged populations for the block groups that would potentially be impacted are provided in Table 3-7.

Table 3-7. Minority and Low-Income Populations, 2000

Area	Total Population	Percent Minority	Percent Below Poverty Level
Census Tract 9955	7,510	2.2	20.5
Block Group 1	833	2.0	-[1]
Block Group 4	1,621	2.6	-[1]
Block Group 5	1,457	1.8	-[1]
Winston County	24,843	2.7	17.1
Lawrence County	34,809	22.2	15.3
Alabama	4,447,100	29.9	16.1
United States	281,421,906	24.9	12.4

Source: United States Census Bureau, 2000 Census

[1]Information was not available below the census tract level.

3.13. Land Use

As previously stated, aerial color orthophotography was taken in the proposed project area in June 2009. This aerial photography was then interpreted to obtain land use and land cover data, such as houses or apartments, barns, churches, cemeteries, commercial and industrial structures, as well as open land, including agricultural land or pasture, barren or disturbed land, wetlands, floodplains, open water, and forestland. Land use data was transferred to maps that were checked during field investigations to verify the accuracy of the aerial photo interpretations.

The proposed ROW would occupy 79 acres, with 61 acres of new ROW and 18 acres of existing ROW. About 30 percent of the project area is forested, while 70 percent is herbaceous vegetation, primarily consisting of pasture and existing transmission line ROW. There are four small wetlands that cover about 0.05 acre. Land use in the project area is primarily a mixture of farmland and residential development, with little commercial and light industrial uses.

CHAPTER 4

4.0 ENVIRONMENTAL CONSEQUENCES

Introduction

The potential effects of the No Action Alternative and the Action Alternative on the various resources described in Chapter 3 are provided in this chapter. Under the No Action Alternative, TVA would not construct the proposed transmission line to serve Cullman EC's planned substation, and the TVA power system in the Helicon area would continue under the current operating conditions. With the continued use of existing facilities to supply power to the area, power outages could result from the failure of overloaded equipment. To provide reliable power to the area, Cullman EC could decide to build a new transmission line to serve its new substation, which could result in impacts similar to or greater than those described below for the Action Alternative depending on what actions are taken.

4.1. Vegetation

4.1.1. No Action Alternative

Adoption of the No Action Alternative would not result in any project-related direct, indirect, or cumulative impacts to the terrestrial ecology of the region because terrestrial communities would not change. Invasive plant species on site would continue to be present. Terrestrial communities would likely change over time as other factors such as population, land use and development, and recreational patterns change in the area.

4.1.2. Action Alternative

Adoption of the Action Alternative would not significantly affect the vegetative terrestrial ecology of the region. Project-related work would temporarily affect herbaceous plant communities, but these communities would likely recover to their preproject condition in less than one year. Adoption of this alternative would require clearing of approximately 25 acres of forest. Most of these forested communities are common and well represented throughout the region; however, two occurrences of the globally rare Cumberland Plateau Mesic Hemlock - Hardwood Forest plant community occur in the project area.

In the project area, the Cumberland Plateau Mesic Hemlock - Hardwood Forest plant community is between 500 and 750 feet across at the widest point, and the small amounts of clearing associated with the proposed project would not appreciably alter the integrity of the occurrence or significantly increase fragmentation of the plant community because of its inherently linear nature. The clearing would result in a permanent conversion of up to 2 acres of the Cumberland Plateau Mesic Hemlock - Hardwood Forest, but these impacts would not be significant.

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

Converting 25 acres of forestland to managed ROW for construction of the proposed transmission line would be long term in duration, but insignificant. As of 2008, there was at least 1,750,000 acres of forestland in Winston and the adjacent counties (USFS 2010). Cumulatively, project-related effects to forest resources would be negligible when compared to the total acreage of forestland that occurs in the project area.

4.2. Wildlife

4.2.1. No Action Alternative

Under the No Action Alternative, the proposed new transmission line and access roads would not be constructed, and the project area would remain in its current condition. Wildlife and wildlife habitats would not be affected by any project-related actions. Therefore, there would be no direct, indirect, or cumulative impacts to wildlife under the No Action Alternative.

4.2.2. Action Alternative

Under the Action Alternative, construction of the proposed transmission line ROW and access roads would result in a change in the composition of wildlife habitats in the project area. Approximately 25 acres of forested habitats and other woody vegetation would be initially removed from the proposed ROW and would then be converted and maintained as early successional habitat. Bush-hogging of brush may be necessary for some of the existing access roads.

The initial clearing would likely temporarily displace larger animals, such as deer and turkey, from the project area into surrounding areas. Some smaller, less mobile animals occupying the areas to be cleared, such as mice, shrews, frogs, and salamanders, would be impacted by construction activities. Following construction and revegetation of the previously forested areas, wildlife favoring edge and early successional habitat would occupy the proposed ROW, changing the overall species composition of the area to a greater number of species more closely associated with early successional or scrub-shrub habitat and fewer species associated with forested habitat. Larger species that would be affected by these changes would move to adjacent forested habitat.

Areas of the proposed project that would utilize existing ROWs would continue to be maintained as early successional habitat. Small animals occupying the area could be initially affected by the transmission line upgrades and periodically affected by the routine mowing and clearing activities; however, the species composition along these sections of ROW would not change under the proposed Action Alternative.

The majority of the project area is highly disturbed and modified from previous human alterations of the landscape, and the changes from the proposed project would not be regionally significant. Clearing of forested habitat along the route would convert approximately 25 acres to early successional habitat and result in minimal habitat fragmentation, slightly increasing the percentage of forest edge. Overall, the forest conversion would be locally insignificant due to the high amount of habitat fragmentation that already exists along the proposed route. Most species that would be affected by these changes are locally and regionally common. Therefore, the proposed new transmission line is not expected to result in significant direct, indirect, or cumulative impacts to terrestrial wildlife or their habitats.

4.3. Aquatic Ecology

4.3.1. No Action Alternative

Under the No Action Alternative, the project area's conditions would not change, and no direct, indirect, or cumulative impacts to aquatic communities on or adjacent to the project area would occur. However, changes to aquatic life would likely occur over the long term due to factors such as population growth and land use changes within the area.

4.3.2. Action Alternative

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

Potential construction and maintenance impacts include alteration of stream banks and stream bottoms by heavy equipment and runoff of herbicides into streams. Other potential impacts would occur due to removal of streamside vegetation within the riparian zone such as increased erosion and siltation, loss of in-stream habitat, and increased stream temperatures. Siltation has a detrimental effect on many aquatic animals adapted to riverine environments. Turbidity caused by suspended sediment can negatively impact spawning and feeding success of many fish species (Sutherland et al. 2002).

Watercourses, conveying only surface water during storm events (i.e., wet-weather conveyances), would be affected by the proposed transmission line construction and maintenance, but these watercourses would be protected by implementation of standard BMPs as identified in Muncy (1999), designed, in part, to minimize disturbance of riparian areas and subsequent erosion and sedimentation that can be carried to streams.

SMZs are areas along the margins of bodies of open water and are typically covered with vegetation on both sides of the stream. The type of watercourse, primary use of the water resource, topography, or other physical barriers (ibid), determines the width of the SMZ. Standard BMPs would be used in carrying out construction activities in these zones in order to protect stream banks and water quality (ibid). Because appropriate standard BMPs would be implemented during construction, operation, and maintenance of the proposed transmission line and access roads, any impacts to aquatic life resulting from the proposed action would be insignificant.

4.4. Endangered and Threatened Species

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

4.4.1. No Action Alternative

Under the No Action Alternative, TVA would not construct the proposed transmission line and access roads. Thus, any federally or state-listed species and their habitats in the project area would not be directly affected by any TVA project-related actions. The status

and conservation of any potentially affected listed species would continue to be determined by the actions of others. Changes to the area would nonetheless occur over time, as factors such as population trends, land use and development, quality of air, water, and soil, recreational patterns, and cultural, ecological, and educational interests change within the area. Therefore, there would be no direct, indirect, or cumulative impacts on endangered and threatened species and their critical habitats under the No Action Alternative.

4.4.2. Action Alternative

4.4.2.1. Plants

Adoption of the Action Alternative would not impact federally listed plant species because no individual plants or habitat for supporting federally listed species occurs in the project area. However, two state-listed species, Eggert's sunflower and mountain camellia, occur in the project area.

Eggert's sunflower is extremely rare and critically imperiled in Alabama (with five or fewer occurrences or very few remaining individuals) and is known to occur in four counties in Alabama, not including the unrecorded occurrence found during botanical surveys for the proposed project. The species can persist under closed canopy forest cover, but requires open conditions to thrive. Periodic disturbance associated with power line operation and maintenance does not necessarily preclude Eggert's sunflower from occupying transmission line ROWs, but effects of construction-related disturbance and aerial applications of herbicide have the potential to negatively impact the species.

In order to minimize potential impacts to Eggert's sunflower, TVA would commit to implementing the conservation measures listed below:

- Clearing of woody vegetation in areas with Eggert's sunflower would be accomplished with a feller-buncher.
- Heavy equipment would not be used during construction to recontour, remove tree stumps, or otherwise intentionally disturb the soil profile in areas containing Eggert's sunflower.
- TVA botanists would coordinate with TVA construction personnel to erect temporary fencing around areas where Eggert's sunflower occurs during construction activities.
- Areas containing Eggert's sunflower would be revegetated only with native species or the nonnative, noninvasive annual species of barley, foxtail millet, oats, perennial ryegrass, rye, Sudangrass, or winter wheat.
- TVA would not use aerial application of herbicide in areas where Eggert's sunflower grows; mowing, hand-clearing, or selective spraying of herbicide would be used to control woody vegetation in the ROW.

TVA botanists would visit the sites where Eggert's sunflower occurs during the summer following construction to assess the effectiveness of the conservation measures. If the implemented measures have not provided adequate protection, further measures would be developed and implemented to provide further protections.

Expansion of the existing transmission line ROW adjacent to the plant may even increase habitat for the species and result in a beneficial effect. TVA has successfully employed

comparable mitigation measures to prevent impacts to other federally or state-listed plant species on previous transmission line projects. With the implementation of the conservation measures described above, the proposed action would not result in significant direct or indirect effects to Eggert's sunflower. No cumulative impacts to Eggert's sunflower are anticipated.

The state-listed mountain camellia is known from at least 20 locations across Alabama, and there are two occurrences in the project area. The occurrence near Rock Creek, at the bottom of a steep gorge, would be spanned by the proposed transmission line (as mentioned in Section 2.3.4.2), thereby eliminating potential impacts to this occurrence. A second occurrence of mountain camellia was observed near Jones Branch. The landscape surrounding the Jones Branch occurrence of mountain camellia is not as steep as the area along Rock Creek, so the proposed transmission line would not span the area, thereby altering mountain camellia's shady habitat. However, mountain camellia does not require full shade to survive and has been observed in part sun to full sun conditions along streamsides. The mountain camellias along Jones Branch occur within the SMZ. Because SMZs are protected during construction and maintenance of transmission lines, the mountain camellias occurring within the SMZ would not be adversely impacted by the project. The BMPs associated with areas near perennial streams are designed to minimize unnecessary disturbance to shrubs and other low-growing vegetation; therefore, the plants would not be extirpated from the site. If the mountain camellia plants were disturbed during vegetation clearing, the plants would likely resprout. Impacts to mountain camellia would be minor, because it can tolerate part sun to full sun conditions, and the plants would be protected from disturbance in the SMZ. Adoption of the Action Alternative would not significantly impact mountain camellia. No additional mitigation measures would be necessary to protect the mountain camellia. Cumulative impacts to mountain camellia would be minor or absent.

4.4.2.2. Terrestrial Animals

Under the Action Alternative, no impacts are expected to bald eagle, red-cockaded woodpecker, Black Warrior waterdog, or flattened musk turtle because habitat to support these species does not occur in the project area. Impacts to these species and their habitats are not anticipated under the Action Alternative. Suitable roosting habitat for gray and Indiana bats does not occur in the project area, but foraging habitat for both gray and Indiana bats occurs along the proposed route. Implementation of the Action Alternative would not affect this foraging habitat because standard BMPs that would minimize sediment and pollutant input into water bodies would be implemented during construction activities.

4.4.2.3. Aquatic Animals

No federally or state-listed aquatic species are known to occur within the potentially affected watershed. Appropriate BMPs and SMZs would be implemented during construction, operation, and maintenance of the proposed transmission line and access roads. Therefore, no direct, indirect, or cumulative impacts to listed aquatic species are anticipated.

4.5. Groundwater and Geology

4.5.1. No Action Alternative

Under the No Action Alternative, there would be no effects to groundwater resources or geological features because the proposed transmission line would not be constructed. The

TVA power system in the Helicon area would continue under the current operating conditions, and periodic and routine maintenance of the ROW would continue. Thus, there would be no direct, indirect, or cumulative effects to groundwater or geological resources under the No Action Alternative.

4.5.2. Action Alternative

Under the Action Alternative, standard BMPs (Muncy 1999) would be used to avoid contamination of groundwater and to control sediment infiltration in the project area during construction and maintenance of the proposed transmission line. The vegetation management guidelines and procedures to minimize potential impacts, as described in Appendix B, would be followed during periodic vegetation maintenance in the ROW. With the implementation of BMPs and routine precautionary measures, direct, indirect, and cumulative impacts to groundwater from the proposed action would be insignificant.

4.6. Surface Water

4.6.1. No Action Alternative

Under the No Action Alternative, there would be no direct, indirect, or cumulative impacts to surface water quality because there would be no change from the current situation. Therefore, no environmental effects to current surface water conditions would occur. However, changes to surface water would likely occur over the long term due to other factors such as population growth and land use changes in the area.

4.6.2. Action Alternative

Under the Action Alternative, stream and soil disturbances associated with access roads and other construction activities have the potential to result in adverse surface water and water quality impacts. To minimize the potential impacts to surface water, TVA routinely includes precautions in the design, construction, and maintenance of its transmission line projects. Permanent stream crossings that cannot be avoided would be designed not to impede runoff patterns and the natural movement of aquatic fauna. Temporary stream crossings and other construction and maintenance activities would comply with appropriate state permit requirements and TVA requirements as described in Muncy (1999). Canopies in all SMZs would be left undisturbed unless there were no practicable alternative. ROW maintenance would employ manual and low-impact methods wherever possible. In areas requiring chemical treatment, only USEPA-registered herbicides would be used in accordance with label directions that were/are designed in part to restrict applications in the vicinity of receiving waters and to prevent unacceptable aquatic impacts. Proper implementation of these controls would result in only minor temporary direct and indirect impacts to surface waters. No cumulative impacts are anticipated.

4.7. Wetlands

Activities in wetlands are regulated under Section 404 and Section 401 of the Clean Water Act and are addressed by EO 11990, Protection of Wetlands. Section 404 requires that certain activities in jurisdictional wetlands be authorized by the USACE through a Nationwide General Permit or Individual Permit. Section 401 requires water quality certification by the state for projects permitted by the federal government (Strand 1997). EO 11990 requires agencies to minimize wetland destruction, loss, or degradation and preserve and enhance natural and beneficial wetland values, while carrying out agency

responsibilities. TVARAM is used as an aid in guiding wetland mitigation decisions consistent with TVA's independent responsibilities under NEPA and EO 11990.

4.7.1. No Action Alternative

Under the No Action Alternative, no disturbance to wetlands within the proposed transmission line ROW would occur, and no wetlands would be affected. TVA would continue to maintain vegetation in existing ROWs, and BMPs would be used for all maintenance activities to ensure that wetland impacts are temporary and insignificant. Changes to wetlands would nonetheless occur over time as other factors such as population trends, land use and development, quality of air/water/soil, recreational patterns, and cultural, ecological, and educational interests change within the area. The proposed project would not have direct, indirect, or cumulative impacts on wetlands under the No Action Alternative.

4.7.2. Action Alternative

The proposed transmission line would span the two emergent wetlands, the scrub-shrub wetland, and the 0.05-acre forested wetland located within the ROW; no structures would be placed in the wetlands. Because little to no vegetation clearing would occur in the wetlands, they would continue functioning in the same capacity as current conditions. Wetlands located within the proposed ROW would be subject to periodic ROW vegetation management. Because these wetlands contain low-growing vegetation and/or would be spanned by the proposed transmission line, they would be maintained the same as or similar to existing conditions, resulting in sustaining existing wetland functions. There are no wetlands near the proposed access roads, therefore, no wetland impacts are anticipated from the proposed access roads.

Cumulative impact analysis of wetland effects took into account wetland loss and conversion at a watershed-level scale. This project would not result in any permanent wetland loss or conversion; therefore, no cumulative wetland impacts are anticipated under the Action Alternative. Potential indirect wetland impacts would be reduced to an insignificant level during the transmission line and access road construction and ROW maintenance activities through implementation of standard BMPs (Muncy 1999). Because of these measures, the proposed project would have no significant direct, indirect, and/or cumulative impacts to wetland areas and the associated wetland functions and values provided within the project area and general watershed.

4.8. Floodplains

4.8.1. No Action Alternative

EO 11988, Floodplain Management, directs all federal agencies to take actions to reduce the risk of flood loss, to minimize the impacts of floods on human safety, and to preserve the natural and beneficial values served by floodplains. The EO is not intended to prohibit floodplain development in all cases, but rather to create a consistent government policy against such development under most circumstances. The EO requires that agencies avoid actions in the 100-year floodplain unless there is no practicable alternative.

4.8.2. Action Alternative

The proposed transmission line route and several access roads cross 100-year floodplain areas in Winston County. Consistent with EO 11988, an overhead transmission line and

related support structures and access roads are considered repetitive actions that would result in minor impacts to the 100-year floodplain.

The construction of the support structures for the proposed transmission line would not be expected to result in any increase in flood hazard from either increased flood elevations or changes in flow-carrying capacity of the streams being crossed. To minimize adverse impacts, any new road construction in the floodplain would be done in such a manner that upstream flood elevations would not be increased. In addition, to minimize impacts to natural and beneficial floodplain values, the ROW would be revegetated where natural vegetation is removed as described in Appendix C. Under the Action Alternative, direct, indirect, or cumulative impacts to floodplains associated with this project would be minor, and the proposed project would comply with the TVA Flood Control Storage Loss Guideline and EO 11988.

4.9. Archaeological and Historic Resources

Historic and cultural resources, including archaeological resources, are protected under various federal laws, including the Archaeological Resources Protection Act, the Native American Graves Protection and Repatriation Act, and the NHPA. Section 106 of the NHPA requires federal agencies to consult with the respective State Historic Preservation Officer (SHPO) when proposed federal actions could affect these resources.

4.9.1. No Action Alternative

Under the No Action Alternative, there would be no direct, indirect, or cumulative impacts to historic resources because there would be no changes to the project area. Changes to cultural resources may occur independently over time due to factors such as population increases, changes in land use, and the potential for development to occur in the area.

4.9.2. Action Alternative

TVA found that no archaeological resources potentially eligible for the NRHP would be affected, and no further investigations are recommended. TVA considers architectural site HS 46 (Burdick Gin Company) potentially eligible for listing in the NRHP. However, TVA has determined that the visual line of sight to the transmission line ROW, which is obscured by large industrial buildings, would not be affected by the proposed undertaking. No other historic properties (architectural resources and archaeological resources) are considered eligible for listing in the NRHP. Therefore, under the Action Alternative, the proposed undertaking would not adversely affect any historic properties that are potentially eligible or currently listed in the NRHP. Consequently, no direct, indirect, or cumulative impacts to historic resources are anticipated.

SHPO Consultation

Pursuant to regulations (36 CFR Part 800) implementing Section 106 of the NHPA, TVA consulted with the Alabama SHPO to assess potential impacts to historic properties in the APE. In a letter dated September 20, 2010 (see Appendix A), TVA sought concurrence from the Alabama SHPO for its findings that no architectural resources potentially eligible for the NRHP would be affected by the proposed project and the proposed undertaking would not adversely affect any historic properties (archaeological or architectural resources) potentially eligible or currently listed in the NRHP. In a response letter dated October 25, 2010 (Appendix A), the Alabama SHPO concurred with TVA's determination. Therefore, the proposed undertaking would have no effect on architectural properties potentially eligible or currently listed in the NRHP.

Tribal Consultation
Pursuant to 36 CFR §§ 800.2 (c)(2)(ii), 800.3 (f)(2), and 800.4 (a)(4)(b), TVA consulted with the appropriate federally recognized tribes (see Section 1.5) in letters dated September 20, 2010, regarding historic properties within the proposed project's APE that may be of religious and cultural significance to tribes. The tribes contacted by TVA identified no issues or objections regarding the proposed project. Correspondence is included in Appendix A.

4.10. Aesthetics

Visual consequences were examined in terms of visual changes between the existing landscape and proposed actions, sensitivity of viewing points available to the public, their viewing distances, and visibility of proposed changes. Scenic integrity indicates the degree of intactness or wholeness of the landscape character. These measures help identify changes in visual character based on commonly held perceptions of landscape beauty and the aesthetic sense of place.

4.10.1. No Action Alternative

Under the No Action Alternative, TVA would not build the transmission line. Aesthetics including visual resources, noise, and air quality would not be affected. The existing scenic attractiveness would remain common to the area, and the scenic integrity would remain moderate to low. Changes to scenic quality of the area, noise levels, and air quality would nonetheless occur over time as other factors such as population trends, land use and development, quality of air/water/soil, recreational patterns, and cultural, ecological, and educational interests change within the area.

4.10.2. Action Alternative

4.10.2.1. Visual Resources

The visual attributes of existing scenery, along with the anticipated attributes resulting from the proposed action are reviewed and classified in the visual analysis process. The classification criteria are adapted from a scenic management system developed by the USFS and integrated with planning methods used by TVA. The classifications are based on methodology and descriptions from the USDA (1995) and TVA (2003). Sensitivity of viewing points available to the public, their viewing distances, and visibility of proposed changes are also considered during the analysis. Scenic integrity indicates the degree of intactness or wholeness of the landscape character. These measures help identify changes in visual character based on commonly held perceptions of landscape beauty and the aesthetic sense of place. The foreground, middleground, and background viewing distances were previously described in Section 3.10.

The threshold of significance is the extent or magnitude of alteration to the existing landscape that is sufficient to change the scenic value class by two levels or more, the threshold of significance (Appendix I). This is mainly a factor of existing development along the roadway, to include numerous wood service poles and associated lines. Direct visual impacts would be minor and insignificant, and no indirect or cumulative impacts are anticipated.

Under the Action Alternative, the new structures and transmission lines would be visually similar to transmission lines and poles seen in the landscape now. Area residents would have foreground views of the new line and structures that would be similar to myriad

service poles and lines currently seen in the landscape. New access roads would be visually similar to other roads that are seen in the area now. Operation, construction, and postconstruction maintenance activities, such as ROW clearing and line maintenance for the proposed transmission line upgrades and new lines and structures, would be visually insignificant. There may be some minor visual discord during the construction period due to an increase in personnel and equipment and the use of laydown and material storage areas. These visual obtrusions would be temporary until the proposed ROW and laydown areas have been restored using TVA standard BMPs (Muncy 1999). Therefore, there are no significant direct, indirect, or cumulative visual impacts anticipated as a result of the construction and operation of the proposed transmission line and access roads.

4.10.2.2. Noise

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

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

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

These techniques include limiting construction activities to daylight hours and ensuring that construction equipment would be adequately muffled and maintained. Because of the sequence of construction activities, construction noise at a given point along the transmission line would be limited to a few periods of a few days each. The temporary nature of construction would reduce the duration of noise impacts on nearby residents. Direct construction noise impacts would be minor and insignificant, and no indirect or cumulative impacts are anticipated.

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

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

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

Periodic maintenance activities, particularly vegetation management, would produce noise comparable to that of some phases of transmission line construction. This noise, particularly from bush hogging or helicopter operation, would be loud enough to cause some annoyance. Maintenance activities, however, would be of very short duration and very infrequent occurrence and therefore expected to be insignificant. Direct operational noise impacts would be minor and insignificant, and no indirect or cumulative impacts are anticipated.

4.10.2.3. Odors

Under the Action Alternative, vehicles and equipment used during construction and operation would emit exhaust fumes. To limit exhaust emissions, equipment and vehicles would be properly muffled and maintained. Additionally, trees and other vegetation cleared from the ROW during construction may be burned. The resulting odors may be noticeable to nearby residents but would be expected to be temporary and insignificant because of the relatively short-term activities of construction. Appendices B and C contain procedures to address objectionable odors caused by smoke or fumes that could result during the construction and operation of the proposed transmission line. Construction and operation of the transmission line are not expected to produce any other noticeable odors. Direct odor impacts would be minor and insignificant, and no indirect or cumulative impacts are anticipated.

4.11. Recreation, Parks, and Natural Areas

4.11.1. No Action Alternative

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

4.11.2. Action Alternative

Under the Action Alternative, construction and maintenance of the transmission line may result in some minor shifts in the informal recreational use patterns in the immediate vicinity of the project. The proposed switch modifications in Bankhead National Forest would be

accomplished within the existing TVA ROW; existing gravel roadways would be used for access, and no ground disturbance would be required. Impacts to Bankhead National Forest would be short-term and are anticipated to be minor and insignificant. TVA has coordinated the proposed work with Bankhead National Forest staff, and the proposed work has been reviewed and approved. There are no other natural areas, ecologically significant sites, or NRI water bodies in the project area, and no indirect, direct, or cumulative impacts to any other ecologically significant sites are anticipated. Therefore, temporary and insignificant changes to the project area would occur, and no significant direct, indirect, or cumulative effects to local recreation, parks, or natural areas are expected.

4.12. Socioeconomics and Environmental Justice

4.12.1. No Action Alternative

Under the No Action Alternative, there is likelihood of overloading at the existing Cullman EC substation. This overloading could lead to outages and such outages could be expensive, especially for commercial or industrial consumers. Power supply problems for the Helicon area would continue to worsen, creating economic and social problems in the area. A noticeable increase in the risk of an outage could diminish the desirability of property located in the impacted area, which would in turn negatively affect property values and marketability. It could also decrease the attractiveness of the area for location of businesses.

4.12.2. Action Alternative

Socioeconomics

Under the Action Alternative, construction of the proposed line would have a minor positive impact on the local economy. Once completed, the project would result in more reliable power delivery, which would likely result in beneficial impacts to the regional economy.

Generally, the project area is sparsely populated and rural in nature. Much of the eastern portion of the area is used for residential development or farming activities. The portion to the west is primarily hardwood forest. Construction of the proposed transmission line would have a small impact on these land uses. These impacts would not be significant, especially over the long term.

TVA would purchase easements from property owners in areas that would require the acquisition of new ROW. Property owners would be offered fair market value for these rights. The easement would give TVA the right to construct the transmission line, including the placement of structures, and operate and maintain the transmission line and the ROW. Because construction would be short term, and most materials would be brought into the area, the economic effect on the local economy would be minor and insignificant.

In situations where the proposed transmission line is near homes, some short-term adverse impacts on property value and marketability could occur. However, these impacts would be highly variable and not readily predictable. Long-term adverse effects on property values are unlikely. One recent study (Chalmers and Voorvaart 2009) concluded, “A presumption of material negative effects of high voltage transmission lines on property values is not warranted.” Research results vary, and some early studies found little impact of transmission lines on property values. Some more recent studies indicate that impacts in the range of 5 to 10 percent are possible for properties adjacent to a transmission line. The size of the impact appears to be sensitive to distance, with little or no impact to properties

that are not adjacent or very close (within 200 feet) to the transmission line. The degree of effect depends on distance from the transmission line as well as the appearance of the ROW and how it blends visually with the neighborhood (Hamilton and Schwann 1995; Gregory and von Winderfeldt 1996; Electric Power Research Institute 2003). Another study determined if the transmission line is at least partially screened from view by trees, landscaping, or topography, negative effects are reduced considerably, and negative impacts due to transmission line proximity usually diminish entirely in four to 10 years (Pitts and Jackson 2007). Direct, indirect , and cumulative socioeconomic impacts would be minor and insignificant.

Environmental Justice
Under the Action Alternative, minority and low-income populations in the Helicon power service area would share in the benefits of reliable power and would not be disproportionately affected by impacts that may occur. There are no significant concentrations of minority or low-income populations near the proposed transmission line. For this reason and because of the relatively low minority population and poverty rates in the general area, no disproportionate impacts to disadvantaged groups or minority populations are expected.

4.13. Land Use

Land use planning serves to guide new development and involves guidelines that implement community goals and consider community resources. Land use dictates where people live, work, and spend their leisure time. Land use affects the availability of goods and services, aesthetic quality, perceived levels of traffic congestion or crowds and how people interact with one another, among other factors. Changes and/or conflicts in land use typically occur when a new planned development is not compatible with or consistent with current land uses.

4.13.1. No Action Alternative

Under the No Action Alternative, no foreseeable changes to existing land use would occur in the project area and there would be no direct, indirect or cumulative land use impacts. Changes to land use in the area would nonetheless occur over time as other factors such as population trends, development, quality of air/water/soil, recreational patterns, and cultural, ecological, and educational interests within the area change.

4.13.2. Action Alternative

Adoption of the Action Alternative would alter land use in the vicinity of the proposed transmission line and access roads. During the public comment period, the public expressed concerns was over impacts on residential development and farmland. Minimization of land use impacts was an important part of the transmission line siting process and siting considerations included proximity to houses, schools, and barns, property boundaries, slope and terrain characteristics, and sensitive environmental resources. Development of the proposed transmission line route used data to locate segments that would best meet project needs by avoiding or reducing conflict with the siting considerations described above. The preferred route was selected based on these considerations in order to minimize land use conflicts.

The proposed change in land use in the project area is compatible with current land use. Construction of the proposed transmission line As described in Chapter 2.0, the fee simple ownership of the land within the ROW would remain with the landowner, and many

activities and land uses could occur on the property, with the exception of certain activities (such as construction of buildings) within the ROW that could interfere with the transmission line or create a hazardous situation. Although land owners would be prohibited from constructing buildings within the ROW, other land uses allowable in the ROW include driveways, parking lots, lawns, and most agricultural activities. Therefore, direct, indirect, and cumulative land use impacts would be minor and insignificant.

4.14. Postconstruction Effects

4.14.1. Electric and Magnetic Fields

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

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

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

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

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

Implanted medical devices historically had a potential for power equipment strong-field interference when they came within the influence of low-frequency, high-energy workplace exposure. However, the older devices and designs (i.e., those beyond 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 (American Medical Association [AMA] 2007).

Research has been done on the effects of EMFs on animal and plant behavior, growth, breeding, development, reproduction, and production. Research has been conducted in the laboratory and under environmental conditions, and no adverse effects or effects on health or the above considerations have been reported for the low-energy power frequency fields (World Health Organization [WHO] 2007a). Effects associated with ungrounded, metallic object's static charge accumulation and discharge in dairy facilities have been found when the connections from a distribution line meter have not been properly installed on the consumer's side of a distribution circuit.

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

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

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

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

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

on the potential for adverse health effects from such fields (AMA 1994; United States Department of Energy 1996; NIEHS 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 milligaus at the edge of the ROW for lines with voltages of 230-kV and less. The expected magnetic field strengths at the edge of the proposed ROW would fall well below these standards. Consequently, the construction and operation of the proposed transmission line are not anticipated to cause any significant impacts related to EMFs.

4.14.2. Lightning Strike Hazard

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

4.14.3. Transmission Structure Stability

The pole structures that would be used on the proposed 161-kV transmission lines (see Figure 2-1) have demonstrated a good safety record. They are not prone to rot or crack, like wooden poles, nor are they subject to substantial storm damage due to their low cross-section in the wind.

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

4.15. Summary of TVA Commitments and Proposed Mitigation Measures

TVA would undertake the following nonroutine measures to reduce the potential for adverse environmental effects to Eggert's sunflower and archaeological resources.

In order to minimize potential impacts to Eggert's sunflower, TVA would commit to implementing the conservation measures listed below:

- Clearing of woody vegetation in areas with Eggert's sunflower would be accomplished with a feller-buncher.
- Heavy equipment would not be used during construction to recontour, remove tree stumps, or otherwise intentionally disturb the soil profile in areas containing Eggert's sunflower.
- TVA botanists would coordinate with TVA construction personnel to erect temporary fencing around areas where Eggert's sunflower occurs during construction activities in order to avoid impacts.
- Areas containing Eggert's sunflower would be revegetated only with native species or the nonnative, noninvasive annual species of barley, foxtail millet, oats, perennial ryegrass, rye, Sudangrass, or winter wheat.

- TVA would not use aerial application of herbicide in areas where Eggert's sunflower grows; mowing, hand-clearing, or selective spraying of herbicide to control woody species would be used to control woody vegetation in the ROW.

CHAPTER 5

5.0 LIST OF PREPARERS

Kelly R. Baxter

Position:	NEPA Specialist
Education:	M.S., Plant Science and Landscape Systems; B.S., Botany
Experience:	8 years in Botany, Land Use and Environmental Impact Analyses, and NEPA Compliance
Involvement:	Project Management, NEPA Compliance, and Document Preparation

W. Nannette Brodie

Position:	Senior Environmental Scientist
Education:	B.S., Environmental Science; B.S., Geology; Professional Geologist
Experience:	14 years in Environmental Analyses, Surface Water Quality, and Groundwater Hydrology Evaluations
Involvement:	Groundwater/Surface Water

Adam J. Dattilo

Position:	Botanist
Education:	M.S., Forestry; B.S., Natural Resource Conservation Management
Experience:	8 years in Ecological Restoration and Plant Ecology; 4 years in Botany
Involvement:	Threatened and Endangered Plant Species, Botany, Plant Ecology, and Invasive Plant Species

Britta P. Dimick

Position:	Wetlands Biologist
Education:	M.S., Botany-Wetlands Ecology Emphasis; B.A., Biology
Experience:	11 years in Wetlands Assessments, Botanical Surveys, Wetlands Regulations, and/or NEPA Compliance
Involvement:	Wetlands

Patricia Bernard Ezzell

Position:	Native American Liaison and Historian
Education:	M.A., History with an emphasis in Historic Preservation; B.A., Honors History
Experience:	24 years in History, Historic Preservation, and Cultural Resource Management; 8 years in Tribal Relations
Involvement:	Cultural Resources

Jerry G. Fouse

Position:	Recreation Manager
Education:	M.B.A.; B.S., Forestry and Wildlife
Experience:	36 years in Natural Resources, Recreation Planning, and Economic Development
Involvement:	Recreation

James P. Groton

Position:	Contract Wetlands Biologist
Education:	M.S., Forestry; B.S., Natural Resources
Experience:	31 years in Environmental Impact Assessment; 21 years in Wetlands Assessment and Delineation
Involvement:	Wetlands

Michaelyn S. Harle

Position:	Contract Archaeologist
Education:	Ph.D., Anthropology
Experience:	11 years in Archaeology
Involvement:	Historic Archaeological and Architectural Resources

Heather M. Hart

Position:	Contract Natural Areas Biologist
Education:	M.S., Environmental Science and Soils; B.S., Plant and Soil Science
Experience:	8 years in Surface Water Quality and Soil and Groundwater Investigations; 6 years in Environmental Reviews
Involvement:	Natural Areas (Managed Areas and Ecologically Significant Sites)

John M. Higgins, P.E.

Position:	Water Quality Specialist
Education:	Ph.D., Environmental Engineering; B.S. and M.S., Civil Engineering
Experience:	36 years in Environmental Engineering and Water Resources Management
Involvement:	Surface Water and Wastewater

Clinton E. Jones

Position:	Senior Aquatic Community Ecologist
Education:	B.S., Wildlife and Fisheries Science
Experience:	17 years in Environmental Consultation and Fisheries Management
Involvement:	Aquatic Ecology and Aquatic Threatened and Endangered Species

Holly G. Le Grand

Position:	Biologist/Zoologist
Education:	M.S., Wildlife; B.S., Biology
Experience:	6 years in Biological Surveys, Natural Resource Management, and Environmental Reviews
Involvement:	Terrestrial Ecology, Threatened and Endangered Species

Todd C. Liskey

Position:	Siting Specialist
Education:	M.B.A.; B.S., Civil Engineering
Experience:	17 years in Transmission Line Planning and Preparation of Environmental Review Documents
Involvement:	Project Coordination, Purpose and Need for Action, Alternatives including the Proposed Action

Robert A. Marker

Position:	Contract Recreation Planner
Education:	B.S., Outdoor Recreation Resources Management
Experience:	37 years in Recreation Resources Planning and Management
Involvement:	Recreation Resources

Roger A. Milstead

Position:	Program Manager, Flood Risk
Education:	B.S., Civil Engineering
Experience:	33 years in Floodplain and Environmental Evaluations
Involvement:	Floodplains

David T. Nestor

Position:	Contract Biologist
Education:	M.S., Botany; B.S., Aquaculture, Fisheries, and Wildlife Biology
Experience:	10 years in Floristic Surveys; 3 years in Wetland Delineations
Involvement:	Threatened and Endangered Plant Species, Vegetation, Plant Ecology, and Invasive Plant Species

W. Chett Peebles, ASLA

Position:	Specialist, Landscape Architect
Education:	Bachelor of Landscape Architecture
Experience:	22 years in Site Planning, Design, and Scenic Resource Management; 5 years in Architectural History and Historic Preservation
Involvement:	Visual Resources and Historic Architectural Resources

Craig L. Phillips

Position:	Contract Biologist
Education:	M.S. and B.S., Wildlife and Fisheries Science
Experience:	5 years Sampling and Hydrologic Determinations for Streams and Wet-Weather Conveyances; 4 years in Environmental Reviews
Involvement:	Aquatic Ecology/Threatened and Endangered Species

Peggy W. Shute

Position:	Manager (Retired), Biological Permitting and Compliance, Endangered Species Compliance Officer
Education:	M.S., Zoology; B.S., Biology
Experience:	21 years in Environmental Impact Assessment for Endangered Species; 28 years Endangered Aquatic Species
Involvement:	Threatened and Endangered Species

Jan K. Thomas

Position:	Contract Natural Areas Specialist
Education:	M.S., Human Ecology
Experience:	11 years in Health and Safety Research, Environmental Restoration, Technical Writing; 6 years in Natural Area Reviews
Involvement:	Natural Areas (Managed Areas, Nationwide Rivers Inventory, and Ecologically Significant Sites)

W. Richard Yarnell

Position:	Archaeologist
Education:	B.S., Environmental Health
Experience:	39 years in Cultural Resources Management
Involvement:	Historic Archaeological and Architectural Resources

CHAPTER 6

6.0 LITERATURE CITED

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Appendix A – Correspondence

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

September 20, 2010

Ms. Stacye Hathorn
Alabama Historical Commission
468 South Perry Street
Montgomery, Alabama 36130-0900

Dear Ms. Hathorn:

TENNESSEE VALLEY AUTHORITY (TVA) CULTURAL RESOURCES SURVEY OF THE PROPOSED HELICON 161 KV TRANSMISSION LINE (TL), WINSTON COUNTY, ALABAMA

TVA proposes to construct and operate a 6.5-mile 161-kV TL in Winston County in the vicinity of Addison and Helicon, Alabama. The proposed TL would begin at TVA's existing Addison 161-kV TL. The first two miles of the proposed TL would utilize the existing 75-foot-wide right-of-way (ROW) of Cullman Electric Cooperative's Jones Chapel-Addison 46-kV TL and an additional 25-feet of new ROW easement. The remaining 4.5 miles would be a new 100-foot-wide ROW easement. TVA considers the area of potential effect (APE) to be the 6.5-mile-long by 100-foot-wide TL ROW. The architectural APE was identified as a 0.5-mile-wide area linearly centered along the proposed TL ROW.

TRC, Inc. conducted a records search using the resources of the Alabama Online Cultural Resources Database and the Alabama Historical Commission, to document previously recorded cultural resources within the APE. No previously recorded archaeological or architectural properties were recorded within the APE. Following the archival research, TRC conducted the cultural resources survey. Enclosed is the draft report titled *Cultural Resource Survey for the Proposed Helicon 161 kV Transmission Line, Winston County, Alabama*.

The archaeological survey identified one site (1WI551) representing a rubble pile associated with the ruins of a historic-period structure. TVA finds site 1WI551 ineligible for the National Register of Historic Places (NRHP) due to lack of integrity and research potential. The architectural survey identified fifty-eight previously unrecorded architectural resources. TVA finds fifty-seven of these resources ineligible for the NRHP based on lack of architectural distinction and/or loss of integrity. Only one of these resources (HS-46, The Burdick Gin Company) is considered potentially eligible for the NRHP. The visual line-of-sight of HS-46 is obscured by large industrial buildings and would not be affected by the proposed undertaking

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

TVA has reviewed the enclosed report and agrees with the recommendations of the authors. It is TVA's finding that no cultural resources potentially eligible for the NRHP would be affected by the proposed undertaking and no further investigations are recommended. Pursuant to 36 CFR Part 800, TVA is seeking your concurrence with our findings and recommendations.

Ms. Stacye Hathorn
Page 2
September 20, 2010

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

Sincerely,

A. Eric Howard
Federal Preservation Officer
Manager (Acting), Cultural Compliance
WT 11D-K

MH:RY:IKS
Enclosure
cc: Cynthia M. Anderson, LP 5D-C
Tina I. Broyles, MR 2W-C
Thomas Cureton, Jr., MR 4G-C
Susan J. Kelly, LP 5U-C
Todd C. Liskey, MR 4G-C
Anita E. Masters, LP 5U-C
Khurshid K. Mehta, WT 6A-K
EDMS, WT 11D-K

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

September 20, 2010

To those listed:

TENNESSEE VALLEY AUTHORITY (TVA) CULTURAL RESOURCES SURVEY OF THE HELICON 161 KV TRANSMISSION LINE (TL), WINSTON COUNTY, ALABAMA

TVA proposes to construct and operate a 6.5 mile 161-kV TL in Winston County in the vicinity of Addison and Helicon, Alabama. The proposed TL would begin at TVA's existing Addison 161-kV TL. The first two miles of the proposed TL would utilize the existing 75-foot-wide right-of-way (ROW) of Cullman Electric Cooperative's Jones Chapel-Addison 46-kV TL and an additional 25 feet of new ROW easement. The remaining 4.5 miles would be a new 100-foot-wide ROW easement. TVA considers the area of potential effect (APE) to be the 6.5-mile-long by 100-foot- wide TL ROW. The architectural APE was identified as a 0.5-mile-wide area linearly centered along the proposed TL ROW.

TVA contracted with TRC, Inc. to conduct a cultural resources survey. TRC conducted a records search using the resources of the Alabama Online Cultural Resources Database to identify previously recorded cultural resources within the APE. No previously recorded archaeological or architectural properties were recorded within the APE. Following the archival research, TRC conducted the cultural resources survey. An online version of the draft report titled *Cultural Resource Survey for the Proposed Helicon 161 kV Transmission Line, Winston County, Alabama* can be found at portal.trcsolutions.com.

The archaeological survey identified one archaeological site (1WI551) representing a rubble pile associated with the ruins of a historic-period structure. TVA finds site 1WI1551 ineligible for the National Register of Historic Places (NRHP) based on lack of integrity and low research potential.

TVA is consulting with the following federally recognized Indian tribes regarding properties within the proposed project's APE that may be of religious and cultural significance to them and eligible for listing in the NRHP: Cherokee Nation, Eastern Band of Cherokee Indians, United Keetoowah Band of Cherokee Indians in Oklahoma, The Chickasaw Nation, Muscogee (Creek) Nation, Alabama-Coushatta Tribe of Texas, Alabama Quassarte Tribal Town, Kialegee Tribal Town, Thlopthlocco Tribal Town, Poarch Band of Creek Indians, Seminole Nation of Oklahoma, Seminole Tribe of Florida, Absentee Shawnee Tribe of Oklahoma, Eastern Shawnee Tribe of Oklahoma, and the Shawnee Tribe.

It is TVA's finding that no cultural resources potentially eligible for the NRHP would be affected by the proposed undertaking and no further investigations are recommended. By this letter, TVA is providing notification of these findings and is seeking your comments regarding this undertaking and any properties that may be of religious and cultural significance and may be eligible for the NRHP pursuant to 36CFR § 800.2 (c)(2)(ii), 800.3 (f)(2), and 800.4 (a)(4)(b).

Those listed
Page 2
September 20, 2010

If you have any questions, please contact me by telephone at 865/632-6461 or e-mail at pbezzell@tva.gov. Please respond within 30 days of receipt of this letter, if you have any comments on the proposed undertaking.

Sincerely,

Pat Bernard Ezzell

Pat Bernard Ezzell
Tribal Liaison and Corporate Historian
Federal Determinations
WT 11D-K

MH:PBE:IKS
Enclosure
cc: Cynthia M. Anderson, LP 5D-C
Tina I. Broyles, MR 2W-C
Thomas Cureton, Jr., MR 4G-C
Susan J. Kelly, LP 5U-C
Todd C. Liskey, MR 4G-C
Anita E. Masters, LP 5U-C
Khurshid K. Mehta, WT 6A-K
EDMS, WT 11D-K

THOSE LISTED:

Dr. Richard Allen
Policy Analyst
Cherokee Nation
Post Office Box 948
Tahlequah, Oklahoma 74465

Governor Bill Anoatubby
The Chickasaw Nation
Post Office Box 1548
Ada, Oklahoma 72821-1548

Ms. Augustine Asbury
Cultural Preservation Coordinator
Alabama Quassarte Tribal Town
Post Office Box 187
Wetumka, Oklahoma 74883

Mr. Bryant Celestine
Tribal Historic Preservation Officer
Alabama-Coushatta Tribe of Texas
571 State Park Rd. 56
Livingston, Texas 77351

Mr. Charles Coleman
NAGPRA Representative
Thlopthlocco Tribal Town
Route 1, Box 190-A
Weleetka, Oklahoma 74880

Ms. Natalie Deere
Tribal Historic Preservation Officer
Seminole Nation of Oklahoma
Post Office Box 1498
Wewoka, Oklahoma 74884

Ms. Robin DuShane
Cultural Preservation Director
Eastern Shawnee Tribe of Oklahoma
127 West Oneida
Seneca, Missouri 64865

Mr. Henry Harjo
Environmental Director
Kialegee Tribal Town
Post Office Box 332
Wetumka, Oklahoma 74883

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

cc: Mr. Russ Townsend
Tribal Historic Preservation Officer
Eastern Band of the Cherokee Indians
Post Office Box 455
Cherokee, North Carolina 28719

Mr. Ted Isham
Manager
Cultural Preservation
Muscogee (Creek) Nation
Post Office Box 580
Okmulgee, Oklahoma 74447

Ms. Karen Kaniatobe
Tribal Historic Preservation Officer
Absentee Shawnee Tribe of Oklahoma
2025 S. Gordon Cooper
Shawnee, Oklahoma 74801

Ms. Lisa C. LaRue
Director, Language, History and Culture &
Acting Tribal Historic Preservation Officer
United Keetoowah Band
of Cherokee Indians in Oklahoma
Post Office Box 746
Tahlequah, Oklahoma 74464

Mr. Kirk Perry
Administrator
Division of Policy and Standards
The Chickasaw Nation
Post Office Box 1548
Ada, Oklahoma 72821-1548

Ms. Jennifer Pietarila
Archaeological Data Analyst
Seminole Tribe of Florida
Ah-Tah-Thi-Ki Museum
HC-61 Box 21-A
Clewiston, Florida 33440

cc: Ms. Anne Mullins
Project Coordinator
Seminole Tribe of Florida
Ah-Tah-Thi-Ki Museum
HC-61, Box 21-A
Clewiston, Florida 33440

cc: Mr. Willard Steele
Tribal Historic Preservation Officer
Seminole Tribe of Florida
Ah-Tah-Thi-Ki Museum
HC-61, Box 21-A
Clewiston, Florida 33440

Ms. Julie Ray
Preservation & Repatriation Manager
The Chickasaw Nation
Post Office Box 1548
Ada, Oklahoma 72821-1548

cc: Ms. Virginia (Gingy) Nail (w/Enclosure)
Tribal Historic Preservation Officer
The Chickasaw Nation
Post Office Box 1548
Ada, Oklahoma 72821-1548

Mr. Emman Spain
Cultural Preservation Department
Muscogee (Creek) Nation
Post Office Box 580
Okmulgee, Oklahoma 74447

Mr. Ron Sparkman
Chairman
Shawnee Tribe
Post Office Box 189
Miami, Oklahoma 74355

cc: Ms. Kim Jumper (w/Enclosure)
Tribal Historic Preservation Officer
Shawnee Tribe
Post Office Box 189
Miami, Oklahoma 74355

Mr. Robert Thrower
Tribal Historic Preservation Officer
Poarch Band of Creek Indians
5811 Jack Springs Road
Atmore, Alabama 36502

Chief Glenna J. Wallace
Eastern Shawnee Tribe of Oklahoma
127 West Oneida
Seneca, Missouri 64865

Mr. Elliot York
Archaeological Data Analyst
Seminole Tribe of Florida
Ah-Tah-Thi-Ki Museum
HC-61, Box 21-A
Clewiston, Florida 33440

Baxter, Kelly Renee

Subject: FW: Cultural Resources Survey of the Helicon 161-KV Transmission Line, Winston County, Alabama
Attachments: @

From: Jennifer Pietarila [mailto:JenniferPietarila@semtribe.com]
Sent: Thursday, October 07, 2010 2:37 PM
To: Ezzell, Patricia Bernard
Subject: Cultural Resources Survey of the Helicon 161-KV Transmission Line, Winston County, Alabama

Hello Ms. Ezzell,

The Seminole Tribe of Florida's Tribal Historic Preservation Office (STOF-THPO) has received the Tennessee Valley Authority's correspondence concerning the aforementioned project. The STOF-THPO has no objection to your findings at this time. However, the STOF-THPO would like to be informed if cultural resources that are potentially ancestral or historically relevant to the Seminole Tribe of Florida are inadvertently discovered during the construction process. We thank you for the opportunity to review the information that has been sent to date regarding this project. Please reference ***THPO-006927*** for any related issues.

I have attached a letter of concurrence for your records.

Thank you,

Jennifer Pietarila
Archaeological Data Analyst
Compliance Review
Tribal Historic Preservation Office
Seminole Tribe of Florida
(863)983-6549 ext. 12217

1

STATE OF ALABAMA
ALABAMA HISTORICAL COMMISSION
468 SOUTH PERRY STREET
MONTGOMERY, ALABAMA 36130-0900

FRANK W. WHITE
EXECUTIVE DIRECTOR

TEL: 334-242-3184
FAX: 334-240-3477

October 25, 2010

Eric Howard
TVA
400 West Summit Hill Drive
Knoxville, Tennessee 37902-1499

Re: AHC 10-1281
Cultural Resource Assessment
Helicon 161kV Transmission Line
Winston County, Alabama

Dear ~~Mr. Howard:~~ Eric

Upon review of the cultural resource assessment conducted by TRC, we have determined that project activities will have no adverse effect on cultural resources eligible for or listed on the National Register of Historic Places. Therefore, we concur with the proposed project activities.

However, should artifacts or archaeological features be encountered during project activities, work shall cease and our office shall be consulted immediately. Artifacts are objects made, used or modified by humans. These include but are not limited to arrowheads, broken pieces of pottery or glass, stone implements, metal fasteners or tools, etc. Archaeological features are stains in the soil that indicate disturbance by human activity. Some examples are postholes, building foundations, trash pits and even human burials. This stipulation shall be placed on the construction plans to insure contractors are aware of it.

We appreciate your efforts on this project. Should you have any questions, please contact Greg Rhinehart at (334) 230-2662. Please have the AHC tracking number referenced above available and include it with any correspondence.

Truly yours,

Elizabeth Ann Brown
Deputy State Historic Preservation Officer

EAB/LAW/GCR/gcr

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

January 25, 2011

Mr. Frank White
Alabama Historical Commission
468 South Perry Street
Montgomery, Alabama 36130-0900

Dear Mr. White:

TENNESSEE VALLEY AUTHORITY (TVA) CULTURAL RESOURCES SURVEY OF THE PROPOSED HELICON 161-kV TRANSMISSION LINE, WINSTON COUNTY, ALABAMA

Enclosed is one hardcopy and electronic copy of the final report entitled *Cultural Resource Survey for the Proposed Helicon 161 kV Transmission Line, Winston County, Alabama*.

Your concurrence with the findings and recommendations of the study were documented in your October 25, 2010, letter. Pursuant to 36 CFR § 800(11)(d), TVA is providing documentation of findings of no historic properties affected.

This documents the Section 106 review of this project. If project plans are altered or there are inadvertent discoveries during construction, TVA will consult with your office.

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

Sincerely,

A. Eric Howard
Manager
Cultural Compliance
WT 11D-K

MH:IKS:PS
Enclosures
cc: Cynthia M. Anderson, LP 5D-C
Brenda E. Brickhouse, LP 5U-C
Tina I. Broyles, MR 2W-C
Thomas Cureton Jr., MR 4G-C
Susan J. Kelly, LP 5U-C
Todd C. Liskey, MR 4G-C
Anita E. Masters, LP 5U-C
Khurshid K. Mehta, WT 6A-K
EDMS, WT 11D-K

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

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Tennessee Valley Authority
Right-of-Way Clearing Specifications

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

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

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

3. Land and Landscape Preservation - The clearing contractor shall exercise care to preserve the condition of cleared soils by avoiding as much compacting and deep scarring as possible. As soon as possible after initial disturbance of the soil and in accordance with any permit(s) or other state or local environmental regulatory requirements, cover material shall be placed to prevent erosion and sedimentation of water bodies or conveyances to surface water or groundwater. In areas outside the clearing, use, and access areas, the natural vegetation shall be protected from damage. The contractor and his employees must not deviate from delineated access routes or use areas and must enter the site at designated areas that will be marked. Clearing operations shall be conducted to prevent any unnecessary destruction, scarring, or defacing of the remaining natural vegetation and adjacent surroundings in the vicinity of the work. In sensitive public or environmental areas, appropriate buffer zones shall be observed and the methods of clearing or reclearing modified to protect

the buffer and sensitive area. Some areas may require planting native plants or grasses to meet the criteria of regulatory agencies or commitments to special program interests.

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

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

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

7. Water Quality Control - The contractor's clearing and disposal activities shall be performed using BMPs that will prevent erosion and entrance of spillage, contaminants, debris, and other pollutants or objectionable materials into drainage ways, surface water, or groundwater. Special care shall be exercised in refueling

equipment to prevent spills. Fueling areas shall be remote from any sinkhole, crevice, stream, or other water body. Open burning debris will be kept away from streams and ditches and shall be incorporated into the soil.

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

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

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

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

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

11. Burning - The contractor shall obtain applicable permits and approvals to conduct controlled burning. The contractor will comply with all provisions of the permit, notification, or authorization including burning site locations, controlled draft, burning hours, and such other conditions as stipulated. If weather conditions such as wind speed or wind direction change rapidly, the contractor's burning operation may be temporarily stopped by TVA's field engineer. The debris to be burned shall be kept as

clean and dry as possible and stacked and burned in a manner that produces the minimum amount of smoke. Residue from burning will be disposed of according to permit stipulations. No fuel starters or enhancements other than kerosene will be allowed.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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Tennessee Valley Authority
Environmental Quality Protection Specifications for Transmission Line Construction

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

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

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

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

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

   Unless ponding previously occurred (i.e., existing low-lying areas), water should not be allowed to pond on the structure sites except around foundation holes; the water must be directed away from the site in as dispersed a manner as possible. At tower or

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

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

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

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

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

9. Water Quality Control - TVA and contractor construction activities shall be performed by methods that will prevent entrance or accidental spillage of solid matter, contaminants,

debris, and other objectionable pollutants and wastes into flowing caves, sinkholes, streams, dry watercourses, lakes, ponds, and underground water sources.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

16. Vehicle Exhaust Emissions - TVA and/or the contractors shall maintain and operate equipment to limit vehicle exhaust emissions. Equipment and vehicles that show excessive emissions of exhaust gasses and particulates due to poor engine adjustments or other inefficient operating conditions shall not be operated until corrective repairs or adjustments are made.

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

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

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

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

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

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Appendix D – Tennessee Valley Authority Transmission Construction Guidelines Near Streams

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Tennessee Valley Authority
Transmission Construction Guidelines Near Streams

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

Three Levels of Protection

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

(A) Standard Stream Protection

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

Guidelines:

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

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

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

minimize soil disturbance and impacts to the SMZ and surrounding area. Stumps can be cut close to ground level but must not be removed or uprooted.

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

(B) Protection of Important Permanent Streams

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

Guidelines:

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

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

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

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

(C) Protection of Unique Habitats

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

Guidelines:

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

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

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

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

Additional Help

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

Revision April 2007

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

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

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

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

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

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

1.0 Overview

A. The Tennessee Valley Authority (TVA) must manage the vegetation on its ROWs 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 ROW.

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

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

2.0 Right-of-Way Management Options

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

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

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

D. TVA does not encourage tree reclearing by individual property owners because of the high hazard potential of hand clearing, possible interruptions of the line, and

electrical safety considerations for untrained personnel that might do the work. Private property owners may reclear the ROW with trained reclearing professionals.

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

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

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

3.0 Herbicide Program

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

4.0 References

Muncy, J. A. 1999. *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Transmission Construction and Maintenance Activities,* revised edition. Edited by C. Austin, C. Brewster, A. Lewis, K. Smithson, T. Broyles, and T. Wojtalik. Norris: Tennessee Valley Authority, Technical Note TVA/LR/NRM 92/1.

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Revision April 2008

Appendix F – Invasive Nonnative Pest Plant Species and Nonnative, Noninvasive Species Suitable for Public Use Areas

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Invasive Plant Species of High Priority to TVA

Common name, Scientific name

Common privet, *Ligustrum sinense*
Autumn olive, *Elaeagnus umbellata*
Japanese honeysuckle, *Lonicera japonica*
Kudzu, *Pueraria montana*
Multiflora rose, *Rosa multiflora*
Sericea lespedza, *Lespedeza cuneata*
Oriental bittersweet, *Celastrus orbiculatus*
Tree-of-heaven, *Alianthus altissima*
Hairy jointgrass, *Arthraxon hispidus*
Amur bush honeysuckle, *Lonicera mackii* (and other closely related species)
Japanese/Nepal grass, *Microstegium vimineum*
Alligatorweed, *Alternathera philoxeroides*
Japanese bromegrass, *Bromus japonicus*
Common cucklebur, *Xanthium strumarium*
Tall fescue, *Festuca elatior**
Johnson grass, *Sorghum halapense*
Japanese wisteria, *Wisteria floribunda*
Purple loosestrife, *Lythrum salicaria*
Common reed, *Phragmites australis*
Japanese knotweed, *Polygonum cuspidatum*
Eurasian watermilfoil, *Myriophyllum spicatum*
Spinyleaf naiad, *Najas minor*
Hydrilla, *Hydrilla verticillata*
Princess tree, *Paulownia tomemtosa*

Watch List:
Giant salvinia, *Salvinia molesta*
Water hyacinth, *Eichhornia crassipes*

January 2002

Invasive Nonnative Pest Plants of Tennessee

Rank 1 — Severe Threat: Nonnative plant species that possess characteristics of invasive species and spread easily into native plant communities and displace native vegetation

Scientific Nomenclature	Common Name
Ailanthus altissima (Mill.) Swingle	Tree-of-heaven
Albizia julibrissin Durz.	Mimosa
Alliaria petiolata (Bieb.) Cavara & Grande	Garlic-mustard
Celastrus orbiculata Thunb.	Asian bittersweet
Dioscorea oppositifolia L.	Air-potato
Elaeagnus umbellata Thunb.	Autumn olive
Elaeagnus pungens Thunb.	Thorny-olive
Euonymus fortunei (Turcz.) Hand.-Mazz.	Winter creeper
Hedera helix L.	English ivy
Lespedeza cuneata (Dum.-Cours.) G. Don	Sericea lespedeza
Ligustrum sinense Lour.	Chinese privet
Ligustrum vulgare L.	Common privet
Lonicera fragrantissima Lindl. & Paxton	January jasmine
Lonicera japonica Thunb.	Japanese honeysuckle
Lonicera maackii (Rupr.) Maxim.	Amur bush honeysuckle
Lonicera morrowii A. Gray	Morrow's bush honeysuckle
Lonicera tatarica L.	Tartarian honeysuckle, twinsisters
Lonicera x bella Zabel	Bush honeysuckle
Lythrum salicaria L. [all varieties and cultivars]	Purple loosestrife
Microstegium vimineum (Trin.) A.	Camus Nepalgrass, Japanese grass
Myriophyllum spicatum L.	Eurasian water milfoil
Paulownia tomentosa (Thunb.) Sieb. & Zucc. ex Steud	Princess tree
Phragmites australis (Cav.) Trin. ex Steud.	Common reed
Polygonum cuspidatum Seib. & Zucc	Japanese knotweed, Japanese bamboo
Pueraria montana (Lour.) Merr.	Kudzu
Rosa multiflora Thunb.	Multiflora rose
Solanum viarum Dunal	Tropical soda apple
Sorghum halepense (L.) Pers.	Johnson grass
Spiraea japonica L.f.	Japanese spiraea

Rank 2 — Significant Threat: Nonnative plant species that possess characteristics of invasive species but are not presently considered to spread as easily into native plant communities as those species listed as **Rank 1— Severe Threat**

Scientific Nomenclature	Common Name
Alternanthera philoxeroides (Mart.) Griseb.	Alligatorweed
Artemisia vulgaris L.	Mugwort, common wormwood
Arthraxon hispidus (Thunb.) Makino	Hairy jointgrass
Berberis thunbergii DC.	Japanese barberry
Bromus commutatus Schrad.	Meadow brome
Bromus japonicus Thunb. ex Murray	Japanese bromegrass
Bromus secalinus L.	Rye brome
Bromus tectorum L.	Thatch bromegrass, cheat grass
Carduus nutans L.	Musk thistle, nodding thistle
Centaurea biebersteinii DC.	Spotted knapweed
Cirsium arvense L. (Scop.)	Canada thistle
Cirsium vulgare (Savi) Ten.	Bull thistle
Clematis ternifolia DC.	Leatherleaf clematis
Conium maculatum L.	Poison hemlock
Coronilla varia L.	Crown vetch
Daucus carota L.	Wild carrot, Queen Anne's-lace
Dipsacus fullonum L.	Fuller's teasel
Dipsacus laciniatus L.	Cutleaf teasel
Euonymus alata (Thunb.) Sieb.	Burning bush
Festuca arundinacea Schreb.	Tall fescue
Festuca pratensis Huds.	Meadow fescue
Hesperis matronalis L.	Dame's rocket
Hydrilla verticillata (L.f.) Royle	Hydrilla, water thyme
Lespedeza bicolor Turcz.	Bicolor lespedeza, shrubby bushclover
Ligustrum japonicum Thunb.	Japanese privet
Lysimachia nummularia L.	Moneywort, creeping Jenny
Mahonia bealei (Fortune) Carriere	Oregon grape
Melilotus alba Medik.	White sweet clover
Melilotus officinalis (L.) Lam.	Yellow sweet clover
Miscanthus sinensis Andersson	Zebra grass, Chinese silver grass
Murdannia keisak (Hassk.) Hand.-Mazz.	Asian spiderwort
Myriophyllum aquaticum (Vell.) Verdc.	Parrot's feather, water milfoil
Nandina domestica Thunb.	Nandina, sacred-bamboo
Rorippa nasturtium-aquaticum (L.)	Hayek Watercress
Polygonum caespitosum Blume	Bunchy knotweed, oriental lady's-thumb
Populus alba L.	White poplar
Potamogeton crispus L.	Curly pondweed
Setaria faberi R.A.W. Herrm.	Nodding foxtail-grass, Japanese bristle-grass
Setaria italica (L.) P. Beauv.	Foxtail-millet
Setaria pumila (Poir.) Roem. & Schult.	Yellow foxtail, smooth millet
Setaria viridis (L.) P. Beauv.	Green millet
Torilis arvensis (Huds.) Link	Spreading hedge-parsley
Tussilago farfara L.	Coltsfoot
Verbascum thapsus L.	Common mullein
Vicia sativa L.	Garden vetch
Vinca minor L.	Common periwinkle
Wisteria sinensis (Sims) DC.	Chinese wisteria
Wisteria floribunda (Willd.) DC.	Wisteria
Xanthium strumarium L.	Common cocklebur, rough cocklebur

Rank 3 — Lesser Threat: Nonnative plant species that spread in or near disturbed areas and are not presently considered a threat to native plant communities

Scientific Nomenclature	Common Name
Allium vineale L.	Field garlic
Arundo donax L.	Giant reed, elephant grass
Bromus catharticus Vahl	Bromegrass, rescue grass
Bromus inermis Leyss.	Smooth bromegrass
Broussonetia papyrifera (L.) L'Her. ex Vent.	Paper mulberry
Lithospermum arvense (L.) I. M. Johnston	Corn gromwell
Cardiospermum halicacabum L.	Balloonvine, love-in-a-puff
Centaurea cyanus L.	Bachelor's button, cornflower
Chrysanthemum leucanthemum L.	Ox-eye daisy
Cichorium intybus L.	Chicory
Egeria densa Planch.	Brazilian elodea, Brazilian water-weed
Elaeagnus angustifolia L.	Russian olive
Eschscholzia californica Cham.	California poppy
Fatoua villosa (Thunb.) Nakai	Hairy crabweed
Glechoma hederacea L.	Gill-over-the-ground, ground ivy
Iris pseudacorus L.	Pale-yellow iris
Kummerowia stipulacea (Maxim.) Makino	Korean clover
Kummerowia striata (Thunb.) Schindl.	Japanese clover
Melia azedarach L.	Chinaberry
Ornithogalum umbellatum L.	Star of Bethlehem
Pastinaca sativa L.	Wild parsnip
Polygonum persicaria L.	Lady's thumb
Rubus phoenicolasius Maxim.	Wineberry
Senna obtusifolia (L.) H. S. Irwin & Barneby	Sicklepod senna
Tragopogon dubius Scop.	Yellow goat's-beard
Tribulus terrestris L.	Puncturevine
Urtica dioica L.	Stinging nettle
Xanthium spinosum L.	Spiny cocklebur

Watch List A: Nonnative plants that naturalize and may become a problem in the future; includes species that are or could become widespread in Tennessee; at this time, more information is needed, and there is no consensus about their status.

Scientific Nomenclature	Common Name
Agrostis stolonifera L.	Weeping love grass
Alnus glutinosa (L.) Gaertn.	Sticky alder
Bromus hordeaceus L.	Soft brome
Bromus sterilis L.	Poverty brome
Buddleia davidii Franch.	Butterfly bush
Bupleurum rotundifolium L.	Hound's-ear, hare's-ear
Cosmos bipinnatus Cav.	Garden cosmos
Cosmos sulphureus Cav.	Sulpher cosmos
Echium vulgare L.	Viper's bugloss
Hibiscus syriacus L.	Rose of Sharon
Hypericum perforatum L.	Goatweed, St. John's-wort
Mentha spicata L.	Spearmint
Mentha x piperita L.	Peppermint
Muscari atlanticum Boiss. & Reut.	Grape hyacinth
Muscari botryoides (L.) Mill.	Common grape hyacinth
Najas minor All.	Water nymph
Phalaris canariensis L.	Canary grass
Pyrus calleryana Decne.	Bradford pear
Rhamnus frangula L.	Alder buckthorn
Rhodotypos scandens (Thunb.) Makino	Jetbead
Senecio vulgaris L.	Ragwort
Setaria verticillata (L.) P. Beauv.	Bur-foxtail
Solanum dulcamara L.	Bittersweet
Stachys floridana Shuttlew. ex Benth.	Hedge nettle

Watch List B: Nonnative plant species that are severe problems in surrounding states but have not been reported in Tennessee

Scientific Nomenclature	Common Name
Ampelopsis brevipedunculata (Maxim.) Trautv.	Amur peppervine
Polygonum perfoliatum L.	Mile-a-minute, Asiatic tear-thumb
Rhamnus cathartica L.	European buckthorn
Rottboellia cochinchinensis (Lour.) Clayton	Itchgrass
Salvinia molesta Mitchell	Aquarium water-moss
Sapium sebiferum (L.) Roxb.	Chinese tallowtree

Nonnative, Noninvasive Species Suitable For Public Use Areas, Erosion Control/Stabilization, and Wildlife Habitat Plantings

Compiled for the Implementation of Executive Order 13112 on Invasive Species

KENTUCKY 31 AND OTHER FESCUES - for dam reservations, public use areas, and other facilities; transmission line construction stabilization where fescue is currently present as forage or lawn grasses or when landowners request it; not to be used in wildlife plantings or in agricultural license areas

ZOYSIA VARIETIES - for dam reservations, public use areas, and other facilities

BERMUDAGRASS - for dam reservations, public use areas, and other facilities

ANNUAL RYEGRASS - suitable for all sites

FOXTAIL, BROWNTOP AND JAPANESE MILLETS - suitable for all sites

BUCKWHEAT - suitable for wildlife plantings

WINTER WHEAT - suitable for wildlife plantings

OATS - suitable for wildlife plantings

ORCHARDGRASS - suitable for all sites

PERENNIAL RYEGRASS - suitable for all sites

REDTOP - suitable for all sites

RYE - suitable for all sites

TIMOTHY - suitable for all sites

WEEPING LOVEGRASS - for erosion control use only

COMMON, KOBE, KOREAN LESPEDEZA - suitable for all sites

CRIMSON, RED AND LADINO CLOVERS - suitable for all sites

SOYBEANS - suitable for wildlife plantings

SORGHUM-MILO - suitable for wildlife plantings

Appendix G – Perennial and Intermittent Stream Crossings in the Project Area

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Perennial and Intermittent Stream Crossings in the Project Area

Stream ID	Stream Type	Streamside Management Zone Category	Stream Name	Field Notes
001	Other	Category A (50 feet)	Pond	Pond in semiforested section
002	Intermittent	Category A (50 feet)	Unnamed tributary to Clefty Creek	Forested intermittent stream at the base of a hill; substrate consisted of gravel/silt with some intermixed boulders
003	Perennial	Category A (50 feet)	Clefty Creek	Forested 10-foot-wide by 2-foot-deep channel with silt/cobble substrate; evidence of heavy siltation present
004	Intermittent	Category A (50 feet)	Unnamed tributary to Clefty Creek	Forested 4-foot-wide by 1-foot-deep channel with silt/gravel substrate
005	Intermittent	Category A (50 feet)	Unnamed tributary to Clefty Creek	Partially forested riparian conditions
006	Other	Category A (50 feet)	Pond	Small pond with fish observed
007	Other	Category A (50 feet)	Pond	Small pond with fish observed
008	Perennial	Category A (65 feet)	Jones Branch	Forested 10-foot-wide by 5-foot-deep channel with silt/gravel substrate; slope of back-lying land between 6 and 10 percent
009	Intermittent	Category A (50 feet)	Unnamed tributary to Jones Branch	Forested 3-foot-wide by 2-foot-deep channel with mostly clay/silt substrate
010	Perennial	Category A (100 feet)	Blevens Creek	20-foot-wide by 7-foot-deep channel with cobble/gravel substrate; slope of back-lying land is between 21 and 45 percent
011	Perennial	Category A (100 feet)	Rock Creek	18-foot-wide by 3-foot-deep channel with cobble/gravel substrate; slope of back-lying land is between 21 and 45 percent
012	Other	Category A (50 feet)	Pond	Pond
013	Other	Category A (50 feet)	Pond	Pond
014	Other	Category A (50 feet)	Pond	Pond
015	Other	Category A (50 feet)	Pond	Pond
016	Perennial	Category A (50 feet)	Unnamed tributary to Rock Creek	Partially forested riparian condition
017	Perennial	Category A (75 feet)	Unnamed tributary to Rock Creek	Forested riparian condition

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Appendix H – Architectural Resources Identified Within the Area of Potential Effect

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Architectural Resources Identified Within the Visual Area of Potential Effect

Architectural Resource	Visual Effect	NRHP Recommendation
HS-1	Yes	Ineligible
HS-2	No	Ineligible
HS-3	No	Ineligible
HS-4	No	Ineligible
HS-5	Yes	Ineligible
HS-7	Yes	Ineligible
HS-8	No	Ineligible
HS-9	No	Ineligible
HS-10	Yes	Ineligible
HS-12	Yes	Ineligible
HS-13	Yes	Ineligible
HS-14	Yes	Ineligible
HS-15	No	Ineligible
HS-16	Yes	Ineligible
HS-17	Yes	Ineligible
HS-18	No	Ineligible
HS-19	Yes	Ineligible
HS-20	Yes	Ineligible
HS-21	Yes	Ineligible
HS-22	Yes	Ineligible
HS-23	Yes	Ineligible
HS-24	Yes	Ineligible
HS-25	Yes	Ineligible
HS-26	Yes	Ineligible
HS-27	Yes	Ineligible
HS-28	No	Ineligible
HS-30	No	Ineligible
HS-31	No	Ineligible
HS-32	No	Ineligible
HS-33	No	Ineligible
HS-34	No	Ineligible
HS-36	Yes	Ineligible
HS-37	No	Ineligible
HS-38	No	Ineligible
HS-39	No	Ineligible
HS-40	No	Ineligible
HS-46	No	Eligible
HS-47	No	Ineligible
HS-48	No	Ineligible
HS-50	No	Ineligible

Architectural Resource	Visual Effect	NRHP Recommendation
HS-51	No	Ineligible
HS-52	No	Ineligible
HS-53	No	Ineligible
HS-54	No	Ineligible
HS-55	No	Ineligible
HS-56	No	Ineligible
HS-57	No	Ineligible
HS-58	No	Ineligible
HS-59	No	Ineligible
HS-60	No	Ineligible
HS-61	No	Ineligible
HS-62	No	Ineligible
HS-63	No	Ineligible
HS-64	No	Ineligible
HS-65	No	Ineligible
HS-68	No	Ineligible
HS-69	No	Ineligible
HS-70	No	Ineligible

Appendix I – Tennessee Valley Authority Visual Resources – Scenic Value Criteria for Scenery Inventory and Management

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Tennessee Valley Authority
Visual Resources – Scenic Value Criteria for Scenery Inventory and Management

The criteria for classifying the quality and value of scenery has been adapted from a scenic management system developed by the United States Forest Service and integrated with current planning methods used by the Tennessee Valley Authority. The classification process is also based on fundamental methodology and descriptions adapted from the United States Department of Agriculture (1995).

The process and criteria are used to compare the value of scenery to other resource values during inventory and land planning tasks. They are also used to evaluate the extent and magnitude of visual changes that could result from proposed projects, as part of the environmental review required under the National Environmental Policy Act. In addition, they can be useful to help establish management objectives for improving or maintaining the scenic quality of managed lands.

Scenic Attractiveness - 3 Levels

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. The combination of rock outcrops, water bodies, landforms, vegetation patterns, and other natural features that shape landscape character also help define scenic importance. The presence or absence of these features, along with valued attributes such as variety, uniqueness, mystery, pattern, order, vividness, harmony, and balance, are used to classify the scenic attractiveness of a landscape.

Category 1: Distinctive - Areas where the variety of landforms, rock, vegetation patterns, water, and other features have outstanding or unique visual quality. These areas have strong, positive attributes that are relatively uncommon in the characteristic landscape. This category also includes areas in visually strategic locations that have somewhat more common attributes.

Category 2: Common - Areas where the landforms, rock, vegetation patterns, water, and other features have ordinary or common visual quality. These areas have generally positive but typical attributes, with a basic variety of forms, colors, and textures that are normally seen throughout the characteristic landscape.

Category 3: Minimal - Areas where the natural features have little change in form, line, color, or texture resulting in low visual quality. Rock forms and vegetation patterns of any consequence are often not present, and these areas generally have weak or missing attributes. All areas not classified as 1 or 2 are included in this category.

Scenic Integrity - 4 Levels

Integrity is a measure of scenic importance based on the degree of visual unity and wholeness of the natural landscape character. Human alteration can sometimes raise integrity, such as an impounded water body that unifies the landscape while adding variety, mystery, harmony, and balance. Most often, scenic integrity is lowered by human alteration and the addition of visually disruptive elements. The presence and degree of discordant alteration is used to classify the scenic integrity of a landscape.

High: Areas where the valued landscape character appears to be intact and unaltered, with very minor deviation. Any deviation present must repeat the form, line, color, texture, and pattern of the landscape so closely and at such a scale that they are not evident.

Moderate: Areas where the valued landscape character appears to be slightly altered. Noticeable deviations must be visually subordinate to the landscape being viewed and borrow much of the natural form, line, color, texture, and pattern.

Low: Areas where the valued landscape character appears to be modestly altered. Deviations begin to dominate the landscape being viewed, but the alterations should share natural color, shape, edge pattern, and vegetation characteristics in order to remain compatible or complementary.

Very Low: Areas where the valued landscape character appears to be heavily altered. Deviations strongly dominate the landscape and may not share any of the visual attributes. The alterations may be visually disruptive and provide significant negative contrast to the natural landscape characteristics.

Scenic Visibility - 2 Parts, 3 Levels Each

Landscape visibility is a measure of scenic importance based on several essential interrelated considerations, which include viewer context and sensitivity, number of viewers, frequency and duration of view, level of detail seen, and seasonal variation. A large number of highly concerned viewers who view the landscape for a long period may raise the scenic importance significantly. The importance may be much lower when only a few viewers with low concern see the landscape for a brief period. These considerations are combined into two parts that are used to classify the scenic visibility of a landscape.

Sensitivity: The level of scenic importance based on expressed human concern for the scenic quality of land areas viewed. Sensitivity may be derived/confirmed by resident and visitor surveys.

Level 1: High - Areas seen from the reservoir, lakeshore residents, and lake view residents, where the number of viewers and concern for scenic quality are normally quite high.

Level 2: Moderate - Areas seen from principal roadways, use areas, and other public viewing areas. Concern for scenic quality is generally high while the number of viewers, view frequency, and duration are moderate.

Level 3: Low - Areas seen from secondary travel routes, use areas, and any not included in the other levels. Concern may be high in some areas, but number of viewers is generally low.

View Distance: A principal indicator of scenic importance based on the distance an area can be seen by observers and the degree of visible detail within that zone.

Foreground: From 0 feet to 0.5 mile. A distance zone where the individual details of specific objects are important and easily distinguished. Details are most significant within the immediate foreground, 0 - 300 feet.

Middleground: From 0.5 mile to 4 miles. The zone where most object characteristics are distinguishable, but their details are weak and they tend to merge into larger patterns. When landscapes are viewed in this zone, they are seen in broader context. Human alteration may contrast strongly with the larger

patterns and make some middleground landscapes more sensitive than the foreground.

Background: From 4 miles to the horizon. The distant landscape, where specific features are not normally discernible unless they are especially large, standing alone, or have a substantial color contrast. Details are generally not visible and colors are lighter.

Scenic Value Class - 4 Levels

The value class of a landscape is determined by combining the levels of scenic attractiveness, scenic integrity, and visibility. The selection matrix below shows the various combinations and the resulting scenic class. It is a guide that is intended to complement both a thorough field analysis and careful review of the visual absorption capacity.

Excellent: Areas with outstanding natural features that appear unaltered. Very minor deviations may be present but are generally unnoticeable even in the foreground. These areas are highly visible in the foreground and middleground from both land and water. Unaltered areas that may be less outstanding but are in a visually strategic location are also classified as excellent scenic value.

Good: Areas with attractive but common scenic quality and no distinctive natural features. Minor human alteration may be seen in the foreground but is barely noticeable in the middleground. These areas have relatively high visibility from both land and water.

Fair: Areas of common or minimal scenic quality with little or no interesting features. Moderate human alteration provides discordant contrast that is seen in the foreground but is less distinct in the middleground due to compatible form and color. These areas have relatively high visibility from both land and water.

Poor: Areas that have very little scenic importance and/or visually significant disturbances resulting from human activity. The alterations provide discordant contrast in the natural landscape due to incompatible size, shape, color, and material. The areas are clearly visible in the foreground and middleground, and have relatively high visibility from both land and water.

Severity of Impact

The threshold of significance is the extent or magnitude of alteration to the existing landscape that is sufficient to change the scenic value class by two levels or more, the threshold of significance.

SCENIC VALUE CLASS SELECTION MATRIX													
Visibility:	**Sensitivity Level** / **View Distance**	**1 foreground**			**1 middleground**			**2 foreground**			**2 middleground**		
Scenic Attractiveness Categories		**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**
Scenic Integrity Levels	**High**	E	G	F	E	E	G	E	G	F	E	E	G
	Moderate	G	G	F	E	G	F	G	G	F	E	G	F
	Low	F	F	P	F	F	P	F	F	P	F	F	P
	Very low	P	P	P	F	P	P	P	P	P	F	P	P
		Scenic Value Class: **E** = Excellent; **G** = Good; **F** = Fair; **P** = Poor											

Visual Absorption Capacity
Absorption capacity indicates the relative ability of a landscape to accept human alteration with the least loss of landscape character and scenic value. These indicators are useful to help predict potential difficulty or success with proposed development and scenic management. They are based on characteristics of the physical factors found in a landscape. Each characteristic has a capacity range from less to more, and the primary ones are shown in the list below. Visual absorption is also affected by the variety of landscape patterns, and the amount of screening provided by landforms, rock, water bodies, and vegetation.

Factor	Least Capacity to Absorb Change	Greatest Capacity to Absorb Change
Slope	Steep Unstable geology	Level Stable geology
Vegetation	Sparse cover Low cover, grasses and shrubs Few species, little or no pattern	Dense cover Tall cover, trees Multiple species, diverse pattern
Landforms	Simple shape	Diverse shapes, heavily dissected
Soils	Easily eroded Poor; slow revegetation	Erosion resistant Rich; fast revegetation
Shoreline	Simple line, little or no interruption	Multiple interruptions, diverse features
Color	Narrow range of indigenous colors	Broad range of indigenous colors

Desired Landscape Character
Scenic attractiveness and the existing level of scenic integrity serve as the foundation for selecting the preferred landscape character. Lake adjacency and ecosystem trends should be considered along with the historic visual character to help any changes be more complete, attractive, and sustainable. Several types of landscape character and the related long-range objectives for scenic integrity are described below.

Natural evolving landscape character expressing the natural change in ecological features and processes with very limited human intervention.

Natural appearing landscape character that expresses predominantly natural qualities but includes minor human interaction along with cultural features and processes that are relatively unobtrusive.

Pastoral landscape character expressing dominant human developed pasture, range, and meadow, along with associated structures, reflecting historic land uses, values, and lifestyles.

Rural landscape character that expresses sparse but dominant human residential and recreational development, along with associated structures and roadways that reflect current lifestyles.

Urban landscape character expressing concentrations of human activity in the form of commercial, residential, cultural, and transportation, facilities, along with supporting infrastructure.

Visual Management Objectives

Based on the scenic value class, management objectives may be developed to accomplish or maintain the visual character desired for each area.

Preservation:
Areas classified Excellent and managed for a natural evolving landscape character. Only very low impact recreational and scientific activities are allowed, and no facilities are permitted.

Retention:
Areas classified Good and managed for a natural appearing landscape character. Permitted activity or minor development should repeat the natural form, line, color, and texture of the area and remain visually subordinate to the surrounding landscape. Changes in the size, intensity, direction, and pattern of activity should be unobtrusive and not readily evident.

Modification:
Areas classified Good or Fair and managed for pastoral or rural landscape character. Permitted activity and development may dominate the original character but should remain visually compatible with the remaining natural landscape. Vegetation and landform alterations should repeat the natural edges, forms, color, and texture of the surrounding area. The scale and character of structures, roads, and other features should borrow naturally established forms, lines, colors, and patterns to provide the greatest possible visual harmony.

Maximum Modification:
Areas classified Fair or Poor and managed for urban landscape character. Permitted activity and development generally dominates the original visual character. Vegetation and landform alterations should remain visually harmonious with the adjacent landscape. When seen in the foreground and middleground, they may not fully borrow the surrounding natural forms, lines, colors and textures. Likewise, development features seen from the same distances may be out of scale and have significant details that are discordant with the natural landscape character. Overall development should be directed toward achieving the greatest possible visual harmony.

Enhancement:
Any area classified less than Excellent with a relatively short-term management objective intended to restore and/or improve the desired scenic quality. Rehabilitation activities may include alteration, concealment, or removal of obtrusive and discordant elements. Enhancement activities may include addition or modification of natural elements and man-made features to increase the variety and attractiveness of spaces, edges, forms, colors, textures, and patterns.

Reference

United States Department of Agriculture (USDA). 1995. *Landscape Aesthetics, A Handbook for Scenery Management*. Handbook No. 701. USDA, United States. Forest Service.

R3: 2/26/03